

Anesthesia in an adult patient with tracheal hemangiomas: one-lung ventilation for lung lobectomy

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Abstract Primary tracheal tumors are rare in adults, and careful airway management is required during anesthesia for affected patients. We report the case of a patient with tracheal hemangiomas undergoing nontracheal operation. A 61-year-old woman was scheduled for a lung operation. During preoperative examination, hemangiomas were detected on the tracheal mucosa. As she was asymptomatic and the degree of airway stenosis was small, treatment was not required for the hemangiomas, and left upper lobectomy for lung cancer was scheduled. After induction of general anesthesia, a regular tracheal tube was inserted under fiberoptic bronchoscopy, with care taken to prevent damage to the hemangiomas. An endobronchial blocker was inserted for one-lung ventilation. The operation was performed uneventfully, and the tracheal tube was replaced postoperatively with a laryngeal mask airway while the patient was under deep anesthesia and neuromuscular blockade. The mask was removed after confirming lack of bleeding from the hemangiomas. No hypoxia or other complications occurred during or after the operation.

Keywords Tracheal tumor · Hemangioma · One-lung ventilation · Endobronchial blocker

Introduction

Primary tumors of the trachea are rare, and affected individuals are often asymptomatic despite the high level of

malignancy [1]. These tumors are commonly discovered during a health checkup or diagnosed when a patient experiences coughing, hemoptysis, or breathing difficulties [2, 3]. Although several reports describe anesthesia for patients with airway stenosis due to tracheal tumors [4–6], there have been few reports describing anesthesia in patients with a tracheal hemangioma characterized by bleeding tendency [7–10]. Here we report anesthesia in a patient with primary tracheal hemangiomas who underwent lung lobectomy, with one-lung ventilation.

Case report

A 61-year-old woman (height 158 cm; weight 51 kg; body mass index 20.4 kg/m²) whose past medical history was significant for interferon therapy for hepatitis C underwent detailed examinations for lung cancer. She was asymptomatic, oxygen saturation on room air was 98%, and the lungs were clear to auscultation bilaterally. Both chest roentgenogram and computed tomography were negative except for an abnormal shadow in the left lung field. Pulmonary function tests showed forced vital capacity was 120% of the predicted value, and the ratio of forced expiratory volume in 1 s to the forced vital capacity was 61%, indicating obstructive pattern. Nonpulsating swelling lesions with newly formed blood vessels were observed on the surface of the upper tracheal mucosa by fiberoptic bronchoscopy, and a diagnosis of hemangiomas was made based on its appearance. As blood supply from the pulmonary artery to the hemangiomas was not detected by angiography, treatment was not required, and only left upper lobectomy for lung cancer was scheduled.

Premedication was not administered. A thoracic epidural catheter was inserted at the T6–7 interspace prior to

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induction of general anesthesia with propofol 100 mg and fentanyl 150 µg, followed by rocuronium 50 mg. Fiberoptic bronchoscope mounted with a 7.0-mm tracheal tube (Parker Flex-Tip, Parker Medical, Highland Ranch, CO, USA) was introduced into the trachea, and careful examination revealed reddish colored lesions on the mucosa of the right lateral and dorsal wall of the trachea, each 8 × 9 mm, from the cricoid cartilage to the second tracheal cartilage. Notably, newly formed blood vessels were observed on the right lateral wall lesion (Fig. 1a). In addition, a papillary lesion with newly formed blood vessels from the ventral to the right lateral wall at the level of the fifth tracheal cartilage, 12 × 8 mm in size, was noted (Fig. 1b). No abnormalities were seen in the tracheal mucosa distal to the sixth tracheal cartilage, indicating that the cuff of the tracheal tube was able to be inflated without compressing the tumors.

The tracheal tube was then advanced under bronchoscopy so that the tip of the tube was approximately 1 cm proximal to the carina and the cuff of the tube is located between the caudal end of the tumors and the tracheal carina. After confirming no bleeding from the tracheal wall or from the tumors, the tracheal tube was fixed (25 cm at the incisors). A 7-Fr endobronchial blocker (Arndt Endobronchial Blocker; Cook Medical Inc., Bloomington, IN, USA) was then inserted into the left bronchus for one-lung ventilation, so that the proximal part of the blocker balloon was just beyond the tracheal carina.

Anesthesia was continued with propofol 200–300 mg/h for maintaining bispectral index (VISTA version 3.00; Aspect Medical Systems, Newton, MA, USA) between 45–55, and rocuronium 20 mg/h, with a continuous infusion of 0.375% ropivacaine 4 ml/h from the epidural catheter. No volatile anesthetics were used. Besides standard intraoperative monitoring, a continuous arterial pressure/cardiac output monitor (FloTrac™ sensor and Vigileo™ monitor; Edwards Lifesciences LLC, Irvine,

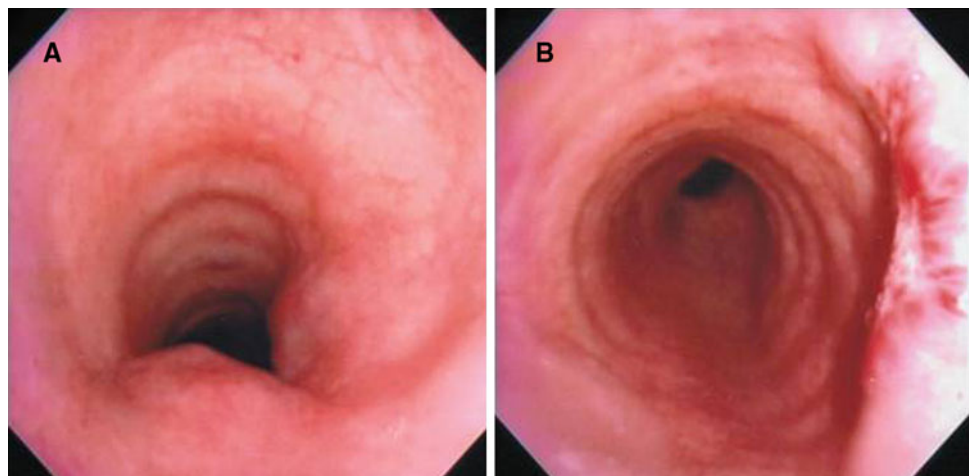
CA, USA) was used. Inspired oxygen concentration was 60% during one-lung (right) ventilation, and oxygen saturation (SpO₂) was maintained 97%. Mean arterial blood pressure was maintained >60 mmHg by intermittent administrations of ephedrine 5 mg and phenylephrine 50 µg. No remarkable changes in cardiac index or stroke-volume variation were seen during anesthesia.

After operation, under deep anesthesia and neuromuscular blockade, we confirmed no bleeding inside the trachea using fiberoptic bronchoscope and removed the endobronchial blocker. The tracheal tube was replaced with a size 3 laryngeal mask airway (LMA ProSeal™; The Laryngeal Mask Company, St. Helier, Jersey, UK). The absence of bleeding in the trachea was again reconfirmed. The laryngeal mask was removed after recovery of spontaneous respiration and consciousness. Operation time was 2 h 45 min, and anesthesia time was 3 h 51 min (one-lung ventilation time, 2 h 39 min). Following operation, respiratory status and circulatory dynamics were stable, and the postoperative course was uneventful.

Discussion

Primary tracheal tumors are rare, and the annual incidence is 2.7 per 1 million persons [2, 3]. In adults, 90% of primary tracheal tumors are malignant, with poor prognosis; squamous cell carcinoma and adenoid cystic carcinoma originating from the tracheal epithelium account for approximately two thirds of all cases [1]. Unlike carcinomas, hemangiomas in adults usually arise from the upper airway, including the laryngopharynx, nose, and tongue, and seldom arise from the subglottic trachea [11], with only a small number of cases reported to date [7–10]. Unlike child cases, the first symptoms are often coughing and hemoptysis [8–10], and there are rarely abnormal findings shown by chest roentgenogram; diagnosis in

Fig. 1 Bronchoscopic views of the upper tracheal lesions. **a** Lesion on the mucosa of the right lateral and dorsal wall from the cricoid cartilage to the second tracheal cartilage. **b** Lesion on the mucosa of the ventral to the right lateral wall at the fifth tracheal cartilage



nearly all cases is made based on computed tomography, bronchoscopy, and biopsy. Endoscopic resection effectively alleviated such symptoms in some patients [8, 9], although a patient with massive bleeding after biopsy who required hemostasis by embolization has also been reported [10]. In the patient reported here, as no subjective symptoms or blood supply from the pulmonary artery existed, treatment was not required, and no definitive diagnosis based on histopathological testing was made.

One precautions in anesthesia required in patients with tracheal tumor is the difficulty in placing the tracheal tube due to tracheal stenosis or tumor location relative to the cuff of the tracheal tube [6, 12, 13]. Asai [12] reported a case of saber-sheath trachea, with a diffuse stenosis of intrathoracic trachea detected during preanesthetic examination. In that patient, an exchange catheter and a reinforced tracheal tube were successfully used in combination with a laryngeal mask airway during anesthesia for neurosurgery in the prone position. Another precaution is possible tumor damage by the tracheal tube or cuff, resulting in intratracheal bleeding and ventilation difficulty. Although awake intubation has been performed in some cases for preventing airway obstruction by induction of general anesthesia and loss of consciousness [5, 6], possible complications, such as injury to the tumor, tracheal wall, or upper airway resulting in bleeding, edema, hoarseness, or dysphagia, cannot be completely eliminated [14]. Awake laryngoscopy is recommended only in patients with symptoms such as hoarseness, as reported by Moorthy [15], based on experience in 801 patients with laryngeal tumors.

In our case, there was almost no airway stenosis or difficulty in breathing. Requirement of one-lung ventilation with an endobronchial blocker also prompted us to perform tracheal intubation after induction of general anesthesia and neuromuscular blockade. We used a regular tracheal tube with a smaller outside diameter than a double-lumen tube to prevent tumor damage. Adequate space between the caudal end of the tumors and the carina through which to place the tracheal tube so the cuff would not compress the tumors was also the reason for our using a tracheal tube and endobronchial blocker. In case there is spontaneous bleeding from the tumors, bronchoscopy triggers bleeding, or the patient has a bleeding tendency due to decreased platelet count or coagulopathy, a tracheal tube insertion and cuff inflation would induce bleeding. In such a case, laryngeal mask airway in combination with an endobronchial blocker, as described previously [16], should be used.

Besides reliable airway maintenance, one of the advantages of tracheal intubation was that the tracheal tube cuff located distal to the tumors would prevent possible bleeding from the tumors from entering the distal airway. In case ventilation becomes difficult due to massive bleeding in the trachea, control of bleeding with a

fiberoptic bronchoscope or rigid bronchoscope would be required. Furthermore, tracheotomy would be another possible option. We chose total intravenously administered anesthesia in preparation for these events, which is also suggested by other authors [1]. In any event, we envisaged such potential circumstances before the operation. Also, discussions with the surgeon were essential. Preparation of a percutaneous cardiopulmonary system as a safety measure in the event of ventilatory failure was also necessary.

In summary, we performed general anesthesia for lung lobectomy in an adult patient with tracheal hemangiomas. Induction and maintenance of anesthesia was achieved using intravenously administered agents, and one-lung ventilation was performed using a regular tracheal tube with an endobronchial blocker after confirming the absence of bleeding from the tumors. After operation, the tracheal tube was replaced with a laryngeal mask airway, which was removed after reconfirming the absence of bleeding. The postoperative course was uneventful.

Conflict of interest None.

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