

A rare anaesthetic challenge in a one-lung ventilated paediatric patient with right upper lobe tracheal bronchus

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Abstract

A tracheal bronchus is a rare congenital anomaly, suggesting abnormal bronchial development. The prevalence of tracheal bronchus in children who undergo bronchoscopy is estimated to be between 0.2% and 3%. When associated with recurrent infection, lobes of the lung must be removed to avoid further lung injury. In such cases, perioperative one-lung ventilation and airway management remain a huge challenge for anaesthesiologists. The case of this rare airway anatomic abnormality in a paediatric patient with two bronchial openings into the right upper lobe, and with a history of recurrent pneumonia, is reported. In addition to a normal opening, a distinct opening in the upper lobe of the right lung was observed, that originated directly from the trachea, superior to the carina. The entire right lung was deflated by left-lung ventilation using a single lumen tracheal tube, and the patient underwent right upper lobe resection. No anaesthesia complications were observed during recovery. In this case, timely identification of the tracheal bronchus and successful collapse of the right lung were key points in the anaesthesia management of this patient.

Keywords

Tracheal bronchus, pulmonary lobectomy, thoracoscopy

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Introduction

A tracheal bronchus is an abnormal, accessory, or ectopic bronchus that appears due to abnormal development of the right embryo, and supplies part of, or the entire

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upper right lobe almost entirely from the right side of the tracheal wall superior to the carina.¹⁻³ According to paediatric bronchoscopy data, the prevalence of tracheal bronchus is estimated to be between 0.2% and 3%.^{4,5}

The presence of a tracheal bronchus is reported to be correlated with various respiratory symptoms, and it has been highlighted that in children with recurrent or persistent pneumonia or atelectasis, the possibility of a tracheal bronchus should be considered first.⁶ Lobectomy is necessary when the tracheal bronchus is associated with recurrent infection. Currently, there is no suitable double-lumen tube for use in children, and a bronchial blocker does not simultaneously block the two openings of the right upper lobe.⁶ Therefore, collapse of the right lung for surgery remains a huge challenge for anaesthesiologists. The purpose of the present report is to describe the case of a patient with a right upper lobe tracheal bronchus, and the method of one-lung ventilation during anaesthesia through thoracoscopic lobectomy.

Case report

All patient details were deidentified for this report, therefore informed consent was not

required. A 5-year-old male patient with a history of recurrent pneumonia (weight, 19 kg and height, 108 cm), presented at the Department of Anaesthesiology, Weifang People's Hospital, Weifang, China, in March 2020. Cardiac function and other physiological aspects were normal. Chest computed tomography (CT; Siemens, Munich, Germany) showed two openings in the right upper lobe, with one of the openings positioned at 1.8 cm above the tracheal carina (Figure 1). The patient was diagnosed with a tracheal bronchus related to a history of recurrent pneumonia. Right upper lobe resection was performed under general anaesthesia. After entering the operating room, the patient was anaesthetized with oxygen and inhaled sevoflurane (8%). Peripheral oxygen saturation (SpO₂) was 100%, heart rate was 115 beats per min (bpm), and blood pressure was 110/53 mmHg, and all were monitored following loss of consciousness. Electrocardiogram parameters were normal. Intravenous anaesthesia induction comprised 60 mg fentanyl, 15 mg rocuronium, and 40 mg propofol. Under the guidance of a fiberoptic bronchoscope, a 5.0-mm tracheal tube was inserted into the left main bronchus for one-lung ventilation, and the position of



Figure 1. Representative computed tomography images showing two openings in the right upper lobe: left image, three-dimensional reconstruction; right image, minimum density projection.

the tube was determined again by auscultation of the lung. After laying the patient on the left side, the catheter position was determined once more using the fiberoptic bronchoscope. The entire right lung collapsed under thoracoscopy due to ventilation of the left lung only using a single lumen tracheal tube. Airway pressure (17 mmHg) was normal. During the operation, respiratory and haemodynamic conditions remained stable (SpO₂, 98–100%; end-tidal CO₂, 38–45 mmHg; blood pressure, 80–100/46–66 mmHg; and heart rate, 83–111 bpm). No anaesthesia complications occurred during the recovery period. The patient was discharged from hospital 10 days after surgery, and there has been no recurrence of pneumonia to date.

Discussion

As early as 1785, Sandiford described a tracheal bronchus as an upper right bronchus that originated from the trachea.⁷ The most common types of tracheal bronchus are multi-hair style and displacement type, with obvious right-side tendency. Many patients are asymptomatic and a tracheal bronchus is occasionally found on a chest CT scan. According to published scientific studies and case reports, a tracheal bronchus may be associated with respiratory symptoms, such as recurrent pneumonia and/or persistent atelectasis in children.^{6,8–11}

Lung isolation techniques are often used for chest surgery to provide better visibility of the surgical field, and one-lung ventilation is usually achieved using a dual-lumen tracheal tube or a bronchial occluder.¹² Usually, a left double-lumen tube can be used to isolate the right lung, or a bronchial blocker can be placed in the left main bronchus. However, there is no such small double-lumen tube for use in 5-year-old children. Moreover, due to the existence of a tracheal bronchus, placement of a bronchial blocker on the right side would

not result in collapse of the right upper lobe. On account of the left and right main bronchial angles, it is difficult to insert a single-lumen tracheal catheter into the left side. However, under the guidance of a fiberoptic bronchoscope, a 5-mm tracheal tube was successfully inserted into the left main bronchus for one-lung ventilation in the present case. In paediatric thoracic surgery anaesthesia, even without a tracheal bronchus, contralateral trunk intubation is often used at Weifang People's Hospital for pulmonary isolation, such as thoracoscopic lobectomy in congenital pulmonary airway malformation. In the present case, the opening of the right upper lobe bronchus was positioned at 1.8 cm above the tracheal carina, and placement of a bronchial occluder would not have resulted in collapse of the right upper, middle and lower lobes at the same time. Therefore, this is a rare case of successful collapse of the right upper lobe performed with one-lung ventilation of the left lung using a single lumen tracheal tube.

Conclusion

In conclusion, advanced imaging methods may help diagnose this rare bronchial anomaly, and guide the implementation of intubation and ventilation. Careful preoperative evaluation of imaging data and the use of fiberoptic bronchoscopy are key to successful treatment using general anaesthesia in patients with a tracheal bronchus.

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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