Implications of endotracheal tube placement in a patient with a true tracheal bronchus

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ABSTRACT

We report a rare anatomic abnormality, a true tracheal bronchus, where the right upper bronchus originates directly from the supracarinal trachea. This unusual anatomic variant can be problematic for the anesthesiologist if it is unrecognized. It can lead to hypoventilation of the right upper bronchus or cause confusion in placement of a double-lumen endotracheal tube if the carina is misidentified, as demonstrated in our case report. Successful isolation of the right lung requires understanding and rapid recognition of the anomaly.

KEYWORDS Double-lumen endotracheal tube placement; intraoperative bronchoscopy; thoracic surgery; tracheal anomalies; true tracheal bronchus

With an incidence of 0.2%, a true tracheal bronchus (i.e., pig bronchus or bronchus suis) is a congenital anomaly whereby the right upper bronchus originates directly from the trachea, typically within 2 to 6 cm proximal to the carina. First described by Sandifort in 1785, this anatomical variant, which is normally clinically silent, can present certain complications to placement of single- and double-lumen endotracheal tubes (SLTs, DLTs) as well as bronchial blocker devices.^{1,2} This case report discusses the incidental finding and airway management implications of a true tracheal bronchus in a patient undergoing video-assisted thoracoscopy.

CASE DESCRIPTION

A 54-year-old man underwent diagnostic cervical mediastinoscopy, right video-assisted thoracoscopy with mediastinal lymph node dissection, and pleural fluid sampling/pleural biopsy to diagnose malignancy. General anesthesia was induced with propofol, rocuronium, and fentanyl and a 37 French DLT was positioned in the presumed left main bronchus. A fiberoptic bronchoscope was advanced through the tracheal lumen to confirm placement (*Figure 1a*). Upon inspection of the suspected right main bronchus, terminal bronchioles were visualized, unexpectedly confirming the location to be the right upper lobe. The bronchoscope and

DLT were retracted 3 cm, revealing a tracheal trifurcation (*Figure 1b*). This trifurcation represented the left main stem bronchus and the bronchus intermedius, but the third lumen was indeed the right upper lobe bronchus displaced onto the trachea. Once the true tracheal bronchus was recognized, the bronchial tube of the DLT was repositioned into the confirmed left main stem bronchus and the tracheal cuff was positioned above the tracheal takeoff of the right upper bronchus. Upon additional inspection, the left bronchial tree was normal, the right middle and right lower bronchial trees both had normal anatomy, and the right upper lobe bronchi revealed three normal lobar branches, confirming the presence of a true tracheal bronchus (*Figure 2*). The properly positioned DLT provided appropriate right lung isolation without complications during the video-assisted thoracoscopy.

DISCUSSION

Fiberoptic bronchoscopy is crucial in the diagnosis of true tracheal bronchus early in the anesthetic management. Once identified, significant intraoperative implications are confronted when managing this anomaly and complications can be avoided. It is prudent to consider the potential pitfalls of the SLT and DLT and the endobronchial blocker system in patients with a true tracheal bronchus.

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Figure 1. (a) Initial view after insertion of a double-lumen endotracheal tube. (b) Endotracheal tube retraction visualizes tracheal trifurcation.

Figure 2. Computed tomography of the chest showing true tracheal bronchus anatomy.

An SLT cuff that inadvertently occludes an undiagnosed true tracheal bronchus would not likely be detected by auscultation and could result in atelectasis, shunting, hypoxemia, and postobstructive pneumonia. Inadvertent endobronchial intubation of an undiagnosed tracheal bronchus would be expected to result in hypoxemia and atelectasis of the remaining lobes, with potential for increases in the end-tidal carbon dioxide values and airway pressures.

The DLT can be used to effectively isolate the right lung once the anomaly is recognized. To ensure that the cuff of the DLT is proximal to the cutoff of the true bronchial bronchus, attention to the distance of the cuff from the true carina is critical. It is also essential to verify that the

endobronchial tube portion of the DLT is within the left main bronchus.

The use of an endobronchial blocker device is an additional management tool once the anomaly is recognized. However, several case reports have made cogent arguments in favor of using a DLT as opposed to the variety of endobronchial blocking devices in the case of true tracheal bronchus. DLT enables administration of continuous positive airway pressure to the operative lung and provides a conduit for suctioning and visualization without interruption of oxygenation and ventilation.^{3,4}

During routine care, the anesthesiologist may be faced with intraoperative complications secondary to undiagnosed tracheal bronchus. Bronchoscopic confirmation for endotracheal tube positioning is a valuable asset when faced with anatomical variations of the bronchial tree. This case report emphasizes the importance of familiarity with the anatomy and anesthetic implications of a true tracheal bronchus.

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