Thoracoscopic right upper lobectomy in a patient with bronchial and pulmonary vein anomalies

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Tracheal bronchus (TB) is a rare anomaly in which a bronchus branches off directly from the trachea or a main bronchus. In the patients with TB, pulmonary vein (PV) variations are common. Recognizing these anomalies preoperatively is critical to ensure a safe operational procedure in patients with lung cancer.

CASE DESCRIPTION

The computed tomography (CT) screening of a 79-year-old woman revealed a pulmonary shadow. Contrast-enhanced CT disclosed a 32-mm solid ground-glass opacity lesion in the right upper lobe. The apical segmental bronchus of the right lung (B1) and the posterior-anterior segmental bronchus of the right lung (B2+3) branched independently from the right main bronchus. The branches of the PV (V1+3) ran between the right main pulmonary artery (PA) and the right main bronchus. An aberrant V2 descended dorsally to the right main bronchus and emptied into the left atrium.

Reconstructed 3-dimensional CT (3D-CT) using simulation software revealed the same variation as observed on CT imaging. The patient was diagnosed with clinical stage IB (T2aN0M0) lung adenocarcinoma, so we performed right upper lobectomy with mediastinal lymph node dissection via 4-port video-assisted thoracoscopic surgery (VATS).

The surgical procedure was performed via a 3- to 4-cm utility incision on the posterior axillary line in the fifth intercostal space using endoscopic instruments and traditional instruments for sharp dissection. Two silicone rubber protectors were applied to maintain the 2 wounds in the open position. The superior trunk of the PA and A3 were transected separately using an endostapler. Next, V1+3 was transected by an endostapler. Two branches of A2b were divided after ligation. The B1 and B2+3 bronchus was transected separately using an endostapler. The aberrant V2 was divided in conjunction with a posterior fissure. The postoperative course was uneventful.
The patient provided informed consent for the publication of the study data.

**DISCUSSION**

Preoperative evaluation of anatomic anomalies is critical for pulmonary resection. TB is a rare bronchial variation with a reported incidence of .1% to 5.0%.

Furthermore, TB is sometimes associated with PV variations. Reconstruction 3D-CT is one way to identify the anomalous vessel formation. Tajima et al. reported a case of TB with a PV anomaly in the right upper lobe, wherein the aberrant V2 descended dorsally to the right main bronchus and emptied into the left atrium. Yurugi et al. reported a superior PV (V1+2+3) running dorsal to the trunk of PA and returning...
to the left atrium, which they were not aware of before the operation, and they recommended careful preoperative evaluation for patients with TB. Two more case reports are available on a similar PV anomaly in TB patients, which were detected using 3D-CT preoperatively, and VATS right upper lobectomies were performed safely.\(^4,5\) In the present study, the anomalous PV was almost identical to that described above (Figure 2, A). In addition, our case had an aberrant V2, which was divided by fissure stapling (Figure 2, B). Although there is no report on the safety related to the synchronous stapling of the segmental PV and the lung parenchyma, we have not encountered any clinical complications after synchronous stapling.

To our knowledge, this is the first report of VATS right upper lobectomy performed in for a patient with both TB and this type of PV anomaly. During VATS, sufficient palpation to the pulmonary vessels is difficult to accomplish. Moreover, the PA vessel wall is more fragile than the PV vessel wall; therefore, confusing the pulmonary vessels may cause massive hemorrhage during dissection by VATS.

In conclusion, several types of PV variants in TB patients have been observed. Therefore, careful preoperative evaluation using 3D-CT imaging is important for a safe VATS.

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![VIDEO 1](https://www.jtcvs.org/article/S2666-2507(20)30395-3/fulltext)

In this video, the left side of the monitor is the patient’s cranial side. After opening the anterior pleura, at first, the main trunk of the pulmonary artery (PA) was exposed. The superior branch of the pulmonary vein (V1+3) was running behind the PA. The superior branch of the PA was divided by an endostapler. The middle lobe lung was partially resected to keep a surgical margin, and the residual minor fissure was divided by an endostapler. After dividing the A3 and A2b, the V1+3 was encircled and divided by an endostapler from the cranial side of the main PA. The apical segmental bronchus of the right lung (B1) was exposed and divided. Then the posterior-anterior segmental bronchus (B2+3) was divided in the same manner. The aberrant V2 was divided in conjunction with the posterior fissure by the endostapler. Video available at: https://www.jtcvs.org/article/S2666-2507(20)30395-3/fulltext.

![FIGURE 2](https://www.jtcvs.org/article/S2666-2507(20)30395-3/fulltext)

Intraoperative thoracoscopic views. The left side of the figure is the cranial side of the patient. (A) The main trunk of the pulmonary artery (PA) is taped. The white arrow shows the superior branch of the pulmonary vein (V1+3) running behind the PA. (B) The asterisk shows the aberrant V2 running in the superior segment of the lower lobe. The B1 and B2+3 have already divided. RUL, Right upper lobe; RLL, right lower lobe.