

Squamous Cell Lung Cancer Associated With an Anomaly of the Right Upper Lobe Bronchus

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ABSTRACT **Background.** Anomalous right upper and middle lobe bronchi originating from a common bronchus is a rare condition. We report a case of lung cancer associated with this anomaly. **Case.** A 67-year-old woman complained of productive cough and chest pain. A diagnosis of pneumonia was made in the right lung. Despite antibiotics, the shadow in the right lower lung field did not disappear. Therefore she underwent computed tomographic (CT) scan which revealed a mass in the right middle lobe. She was referred to our hospital on the suspicion of lung cancer. Bronchoscopy revealed right upper and middle lobe bronchi originating from a common bronchus. Squamous cell carcinoma was confirmed by curetting cytology of the right middle lobe bronchus. Bilobectomy of the right upper and middle lobes and lymphadenectomy was performed through a thoracotomy. After giving rise anteriorly to a large stem, the truncus superior (TS), the remaining stem of the right pulmonary artery, descended dorsally under the arch of the azygos vein. As the TS was thick, these two stems together presented a double-barreled appearance at surgery. The configuration of the dorsal stem after the branching off of the TS was similar to that seen in the left lung. No minor fissure between the upper and middle lobes was observed, and the posterior part of the major fissure was undeveloped. There was no abnormality in the pulmonary veins. The postoperative course of the patient was uneventful, and she was discharged on the fifth postoperative day. The pathologic diagnosis was stage IA squamous cell carcinoma. **Conclusion.** The bronchial anomaly was a mirror image of the left upper lobe bronchus. We were able to image the anatomic ramifications of the right pulmonary arteries by CT and 3D-CT scans. Pulmonary arteriography would have been optimal before surgery. (*JJLC*. 2005;45:367-372)

KEY WORDS Congenital bronchial anomaly, Mirror image of the left lung, Squamous cell lung cancer

INTRODUCTION

Bronchial anomalies occur in approximately 2% of the general adult population.^{1,2} There are few reports of an anomaly in which the right upper and middle lobe bronchi originate from a common bronchus.^{1,2} From a clinical viewpoint, presupposing anatomic variation of the pulmonary arteries is important. We analyzed the precise anatomy of the anomalous lung mainly by computed tomography (CT) and operative findings.

CASE REPORT

A 67-year-old woman with productive cough and chest pain had an infiltrative shadow in the right lower lung field on roentgenogram; a diagnosis of pneumonia was

made. She was treated with antibiotics for 3 weeks, but the shadow did not disappear. CT revealed a mass in the right middle lobe, so she was referred to our hospital for further investigation. She did not smoke, but her husband did.

Physical examination disclosed no abnormal findings. Laboratory data on admission were all within normal limits. Chest roentgenogram showed an abnormal shadow in the right lower lung field (Figure 1) and chest CT demonstrated an invasive mass around the right B⁴a (Figure 2). Bronchoscopy (Figure 3) and virtual bronchoscopy (Figure 4) showed that the orifice of the right upper bronchus was not observed in its usual position; the right upper and middle lobe bronchi originated from a common bronchus at the distal side of the right main bronchus. CT im-

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Figure 1. Chest roentgenogram showing an abnormal shadow in the right lower lung field.

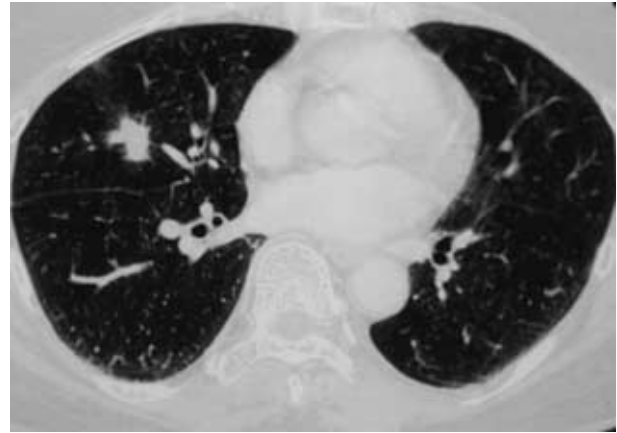


Figure 2. CT demonstrating a mass with unclear margins along the right B^{4a} bronchus.

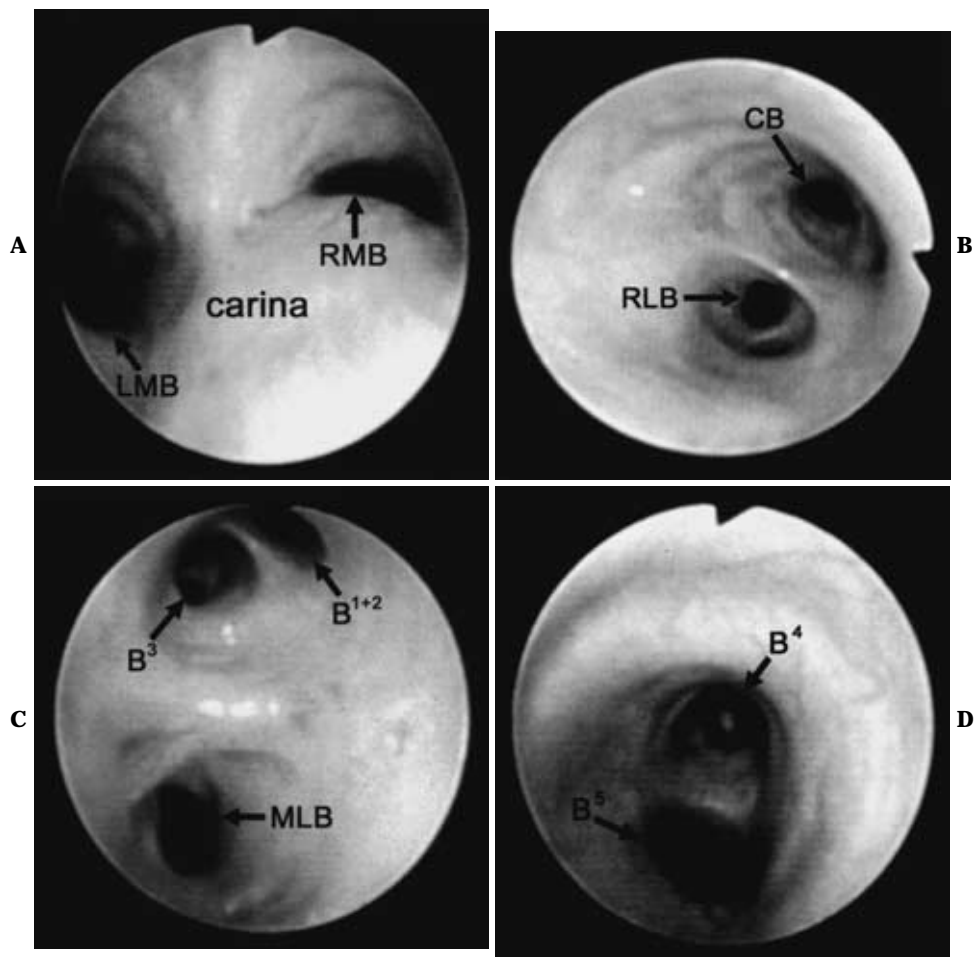


Figure 3. Fiberoptic bronchoscopy showing origin of the right upper and middle lobe bronchi from a common bronchus (CB), extending from the distal end of the right main bronchus. LMB, left main bronchus; RMB, right main bronchus; RLB, right lower bronchus.

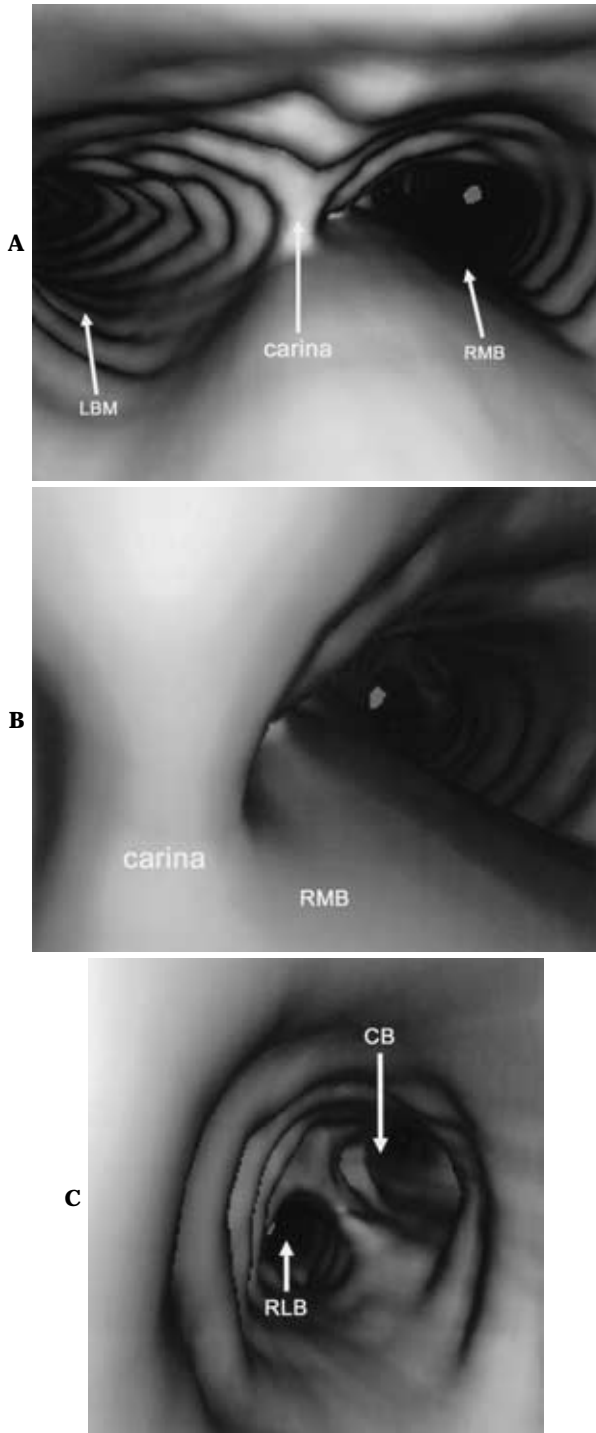


Figure 4. Virtual bronchoscopy showing no orifice of the right upper bronchus at its usual location. LMB, left main bronchus; RMB, right main bronchus; RLB, right lower bronchus; CB, common bronchus.

aging demonstrated that the right common bronchus supplying the upper and middle lobes branched from the right main bronchus at a counterclockwise angle of 25°;

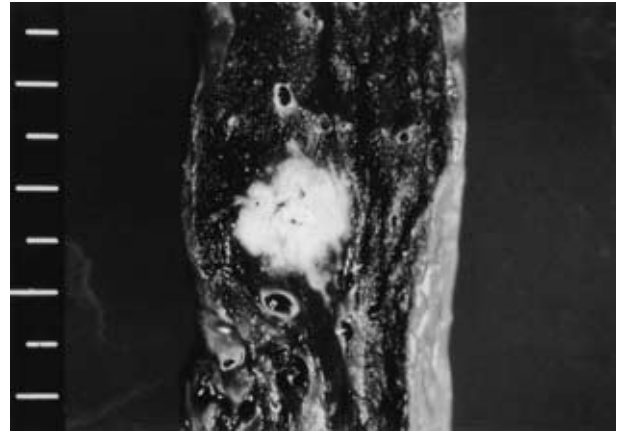


Figure 5. The tumor measured 13 × 10 mm over its cut surface.

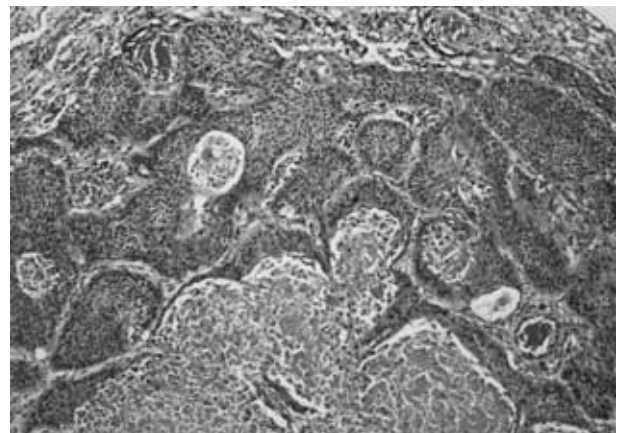


Figure 6. Histologic examination showed moderately differentiated squamous cell carcinoma (hematoxylin and eosin, × 25)

while the left upper bronchus branched from the left main bronchus at a clockwise angle of 25° based on an orientation viewing the patient in the supine position. Cytologic examination of the right B⁴a bronchial curetting was positive for malignant cells, suggesting squamous cell carcinoma.

Operative findings: The patient was placed in the left lateral decubitus position with general anesthesia and single lung ventilation; the right thoracic cavity was entered through a French-door thoracotomy.³ There was no adhesion between the right lung and pleura. There was no minor fissure separation between the right upper and middle pulmonary lobes. The major fissure was undeveloped. The right pulmonary artery was easily discerned without dissection of the mediastinal pleura when

the right upper lobe was compressed caudally. The truncus superior (TS) of the right pulmonary artery was located ventrally, while the rest of the stem descended dorsally under the arch of the azygos vein. The TS was thick, with the two stems presenting a double-barreled appearance to the surgeon. The anatomy of the dorsal stem was similar to that seen in the left lung. The right pulmonary veins were normal. The right upper and middle lobe veins were ligated and severed. No branch of the pulmonary artery entered the middle lobe from the dorsal stem. We confirmed that the middle lobe pulmonary artery originated from the TS. The TS was sutured and cut with a stapler. The common bronchus was closed and severed with a stapler.

Mediastinal and hilar lymphadenectomy was performed. Tumor size at the cut surface of the lung was 13×10 mm (Figure 5). Histologic examination showed moderately differentiated squamous cell carcinoma (Figure 6); no disease was found in the resected lymph nodes.

The chest drain was removed on the second postoperative day, and the patient was discharged on the fifth postoperative day without complication.

DISCUSSION

Congenital anomalies of the bronchus include stenosis, obstruction, supernumerary branching, abnormal junction, irregular branching, mirror-image branching, diverticulum, and abnormal communication.^{3,4} Atwell⁵ reported 27 patients with major anomalies, including the pulmonary lobes and main bronchus, among 1200 bronchograms. Twenty-four of 27 had anomalies on the right side. Supernumerary bronchi originating from the right wall of the trachea and the right main bronchus are mostly distributed to the right upper lobe.⁶⁻⁹ These anomalies are not thought to have an effect on the growth of lung cancer.¹

As described above, CT imaging demonstrated symmetry of the angle formed between the axes of the right common bronchus and the right main bronchus with the angle formed between the axes of the left upper bronchus and the left main bronchus. These findings support the hypothesis of a mirror image.

The anomaly in this case, where the minor fissure was absent and the right upper and middle lobe bronchi originated from a common bronchus, is similar to that in polysplenia syndrome,^{2,10} but cases of polysplenia syn-

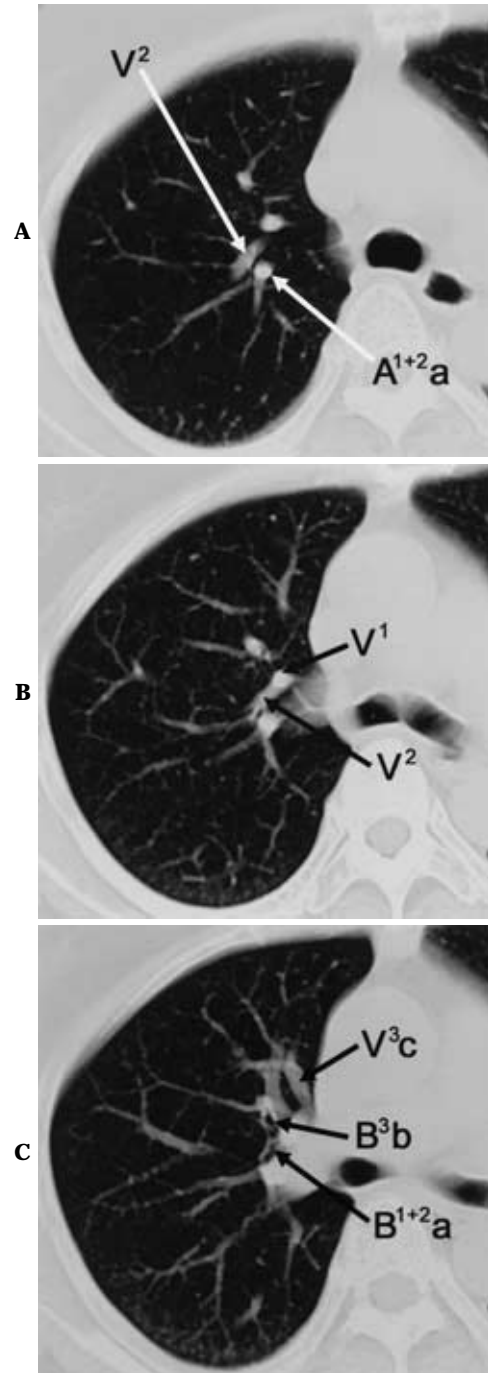


Figure 7. The right superior pulmonary vein was of the semi-central vein type with V^1 and V^2 joining above and medial to B^{3b} .

drome almost never survive childhood. Only one adult case¹ in which the right bronchial tree was a mirror image of the left has ever been reported.

The vascular anatomy in the present case was precisely analyzed with high resolution CT scans. The right superior pulmonary veins were the semi-central vein type

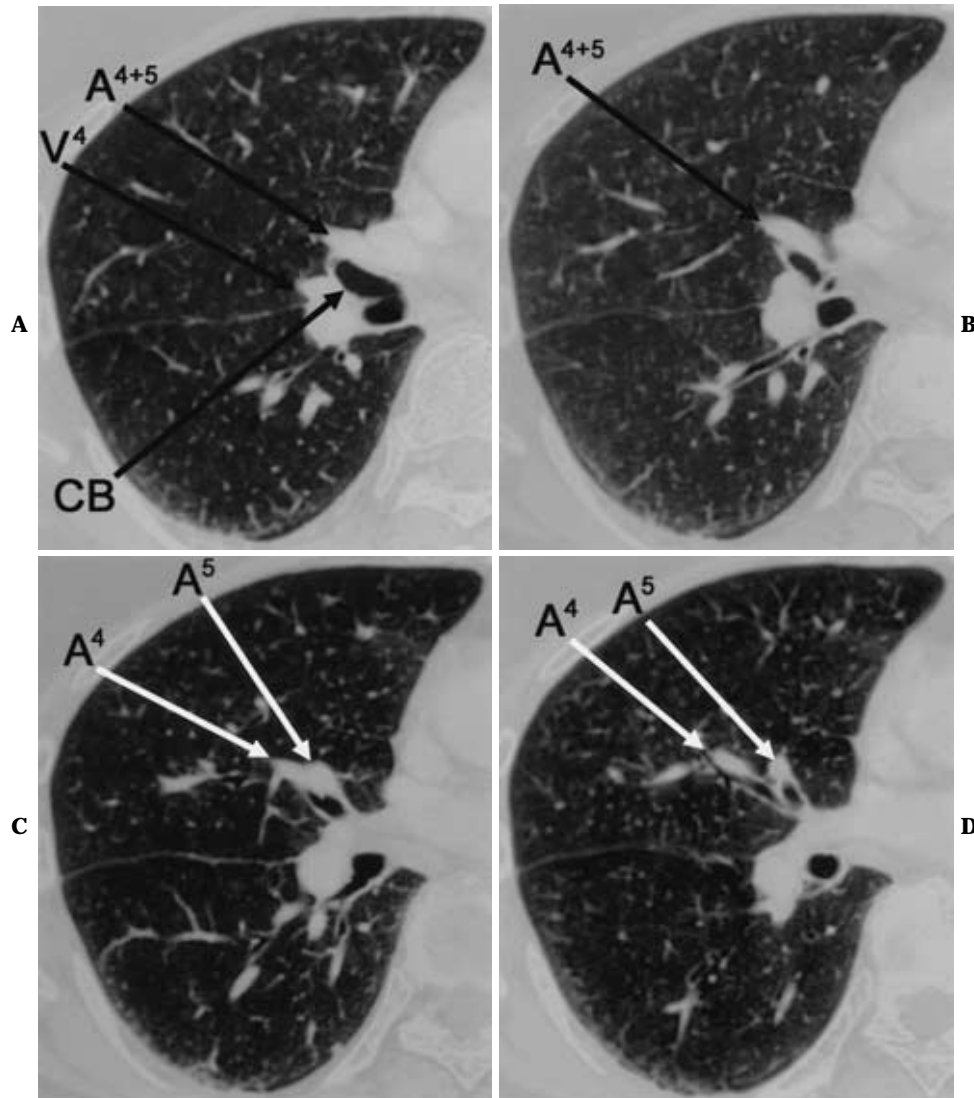


Figure 8. Applying the rules of nomenclature used for the lingular arteries, the right middle lobe pulmonary artery was equivalent to the mediastinal type. CB, common bronchus.

with V¹ and V² joined above and inside B^{3b} (Figure 7). Applying the rules of nomenclature of the lingular arteries, the right middle lobe pulmonary artery was equivalent to the mediastinal type of lingular arteries, which branch from the upper pulmonary artery and enter the lingular segment along the cephalad walls of the lingular bronchi(Figure 8) Although we tried to identify the right pulmonary vessels on three-dimensional (3-D) CT, the middle lobe pulmonary arteries, A⁴ and A⁵, could not be identified as branching from the TS. This may be due to our inexperience in image reconstruction.

In this case, the unseparated right middle lobe corresponded to the lingular segment of the left upper lobe. As left upper lobectomy has been regarded as the standard

operation for cancer of the lingular segment, we performed bilobectomy including the right upper and middle lobes. Had the patient's pulmonary function been impaired, we would have attempted a middle lobectomy. However, uncertainty about the vascular anatomy of an anomalous lung would make segmentectomy or a lobectomy hazardous. Normal respiratory function together with the uncertain anatomy of the anomalous lung strongly indicated bilobectomy.

The present patient is unusual in another aspect as well: men have been reported to account for 83.6% of patients with squamous cell lung cancer, with women representing only 16.4%.¹¹

CONCLUSION

The lesion of this lung cancer patient was in an anomaly of the right lung; the right upper and middle lobe bronchi originated from a common bronchus similar to the left upper lobe bronchus. This anomalous mirror image of the left lung is the second case report known. The anatomy of pulmonary arteries should be imaged preoperatively by 3D-CT in the future.

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