Case Report

The abnormal systemic artery to the left lower lobe (ASALLL): a report of two cases

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\textbf{ABSTRACT}

In this study, we report 2 cases of abnormal systemic artery to left lower lobe (ASALLL) with hemoptysis. In case 1, a 15-year-old boy experienced intermittent hemoptysis for over a year. After diagnosis of ASALLL by chest-enhanced computerized tomography (CT), interventional embolization was performed to treat the abnormal arteries, and the patient was cured and discharged. Case 2 is a 36-year-old man with chest pain and hemoptysis recurring for many years and aggravating for 5 days. ASALLL was diagnosed by chest-enhancement CT examination. After thoracoscopic resection of the left lower lobe, the patient was discharged. These cases show that the clinical manifestations of ASALLL are mainly recurrent hemoptysis symptoms. For patients with hemoptysis, the disease should be found and not limited to symptomatic treatment. Chest-enhanced CT scanning can diagnose ASALLL, and interventional embolization or surgical treatment can be selected for treatment.

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Introduction

Abnormal systemic artery to the left lower lobe (ASALLL) is a rare congenital pulmonary condition caused by abnormal blood supply. This disease is more common in men, and the most common symptom is hemoptysis. Chest computed tomography (CT) and CT angiography are generally the most useful diagnostic tests. Main treatments include arterial embolization and lobectomy.

Case report

Case 1

A 15-year-old male presented with intermittent hemoptysis for over a year. Contrast-enhanced chest CT scan examination showed flaky ground glass density in the basal segment of the left lower lobe. The left lower lobe vein was enlarged and thickened with a clear boundary. A large vascular shadow was

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Fig. 1 – In Case 1, CT transverse mediastinal section (A-C), lung section (D) shows that the left lower lobe vein is enlarged, thickened, and has a clear boundary. A large vascular shadow is observed between the thoracic aorta and left lower pulmonary vein (A-C). The basal segment of the left lower lobe showed a ground glass density image (D). The CT coronal MPR (E) and DAS angiography (F) indicated the arterial blood supply from the thoracic aorta.

observed between the thoracic aorta and the left lower pulmonary vein (Fig. 1). Digital subtraction angiography showed a large malformed artery that emerged from the thoracic aorta at the level of the 10th thoracic vertebrae. The blood vessel, which was approximately 12 mm in diameter, had a distorted origin. This vessel supplied blood to the lower third part of the left lung. Pulmonary vein reflux was observed without clear arterial venous fistula formation (Fig. 1).

Arterial embolization under interventional guidance was conducted. After surgery, fever and hemoptysis occurred, and ischemic necrosis was conducted. After anti-infection and hemostasis treatment, gradual improvement was observed, and the patient was discharged.

Case 2

A 36-year-old male presented with repeated chest pain and hemoptysis for many years. The symptoms were aggravated 5 days before his admission. In 2016, a chest CT scan showed reduced left lower lobe lung transparency (Fig. 2C). No obvious abnormality was observed in the X-ray (Figs. 2A and B). The patient was hospitalized and treated for a “pulmonary infection.”

On December 4, 2018, the enhanced chest CT scan examination showed decreased transparency in the local left lower lobe, and the internal bronchial vascular bundle was significantly dilated and thickened. Multiple ground glass density shadows were observed (Fig. 3A). In the enhanced arterial phase, the thoracic aorta on the T9 vertebral body was directed to a thickened blood supply artery on the left lower lobe, and more drainage veins were introduced into the left atrium through the left lower pulmonary vein (Figs. 3D–F and Fig. 4).

The patient underwent thoracoscopic lobectomy on the left lower lobe. The surgical exploration revealed an artery with a diameter of approximately 1.5 cm originating from the descending aorta into the left lower lobe to release the
variant artery. This anomalous artery was released and closed by sutures. The pathology showed that the blood vessels in the lung tissue of the left lower lobe were dilated and congested (Fig. 5).

**Discussion**

ASALLL refers to a rare congenital anomaly in the left lower lobe of the lung caused by abnormal blood supply from the body, leading to an irregular pulmonary supply with a normal distribution of the bronchus [1], while the basal segment of the pulmonary artery is absent or narrow. In 1946, Pryce [2] used “isolation” to describe congenital anomalies characterized by the abnormal supply of arteries in the lungs and atresia or hypoplasia of the pulmonary arteries. Isolation was defined as “dislocated (ectopic) bronchopulmonary mass or cyst” [2]. With abnormal systemic blood supply, during embryonic development, pulmonary dysplasia causes impediment in the blood supply to a part of the lung tissue, and the branch of the aorta replaces the artery to supply the tissue. ASALLL was previously classified as type I pulmonary isolation (PS). The term “isolation” remains controversial because the bronchial connections remain intact, whereas abnormal systemic arterial destruction in the PS communicates with the tracheobronchial tree. The incidence of ASALLL is very low [3] and usually has the following characteristics distinguished from PS: abnormal arteries often originate from the descending aorta, bronchial distribution is normal, no interlobular artery exists, the left lower pulmonary vein is dilated, and ground glass opacity occurs [4]. CT revealed areas of groundglass density, mostly indicating abnormal perfusion, which is associated with excessive blood vessels and/or intra-alveolar hemorrhage. CT-enhanced examination has a high diagnostic value for this disease. The reconstructed images of thin-layer

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**Fig. 2** – In Case 2, DR showed no obvious abnormality (A, B). CT transverse lung section (C) and mediastinal section (D). Local lung transparency reduced in the left lower lobe. The internal bronchial vascular bundle is enlarged and thickened, and the inner multiple ground glass density shadows were observed (C).
Fig. 3 – In Case 2, CT transverse lung section (A) shows that the transparency of the local left lower lobe is reduced, and the internal bronchial vascular bundle was significantly dilated and thickened. Multiple ground glass density shadows were observed. Mediastinal section (B-F) showed the thoracic aorta was moved to a thickened blood supply artery in the left lower lobe. The left lower lobe vein was enlarged, thickened, and has a clear boundary.

enhanced scanning multiplanar reconstruction, which is an important diagnostic method for this disease, can show complete appearance of the artery with abnormal blood supply in the isolated lung tissue. The most common symptom is hemoptysis, and patients have no cough and fever [5]. The reason for hemoptysis may be that higher systemic circulation pressure in the abnormal perfusion segment of the left lower lobe leads to intra-alveolar hemorrhage [6]. For patients with clinical hemoptysis, the cause should be identified as accurately as possible and the intervention should not be limited to symptomatic treatment. Imaging examination found that the abnormal arterial supply to the left lower lobe should consider ASALLL, and differential diagnosis of PS should be noted.

Fig. 4 – In Case 2, VR showed the thoracic aorta was moved to a thickened blood supply artery in the left lower lobe.
Fig. 5 – In Case 2, the lung tissue was examined under light microscopy (A HE × 100) with a small amount of inflammatory cell infiltration (B HE × 400).

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