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REVIEW ARTICLE

THE BRONCHIAL ATRESIA AND PULMONARY SEQUESTRATION ON COMPUTED TOMOGRAPHY: PICTORIAL ESSAY OF THE MAIN IMAGING FINDINGS

Evanildes Barros Muniz MD[1,*], Gabrielle de Moura FerreiraMD[2], Vitória de Queiroz Vasconcelos MD[3], Franciane Melo Meireles MD[4], Túlio César Rêgo Gomes MD[5], Daniel Gurgel Fernandes Távora MD[6], Francisco Barbosa de Araújo Neto MD[7] and Arthur de Oliveira Lima MD[8]

[1]Evanildes Barros Muniz, MD, Radiology Resident, Department of Radiology of the Cancer Institute of Ceara, Fortaleza-CE, Brazil; [2]Gabrielle de Moura Ferreira, MD, Resident, Department of Radiology of the Cancer Institute of Ceara, Fortaleza-CE, Brazil; [3]Vitória de Queiroz Vasconcelos, MD, Resident, Department of Radiology of the Cancer Institute of Ceara, Fortaleza-CE, Brazil; [4]Franciane Melo Meireles, MD, Radiology Resident, Department of Radiology of the Fortaleza General Hospital, Fortaleza-CE, Brazil; [5]Tulio César Rêgo Gomes, MD, Radiologist, Department of Radiology of The Oeste+Saúde Clinic, Pau dos Ferros-RN, Brazil; [6]Daniel Gurgel Fernandes Távora, MD, Radiologist, Department of Radiology of the Fortaleza General Hospital, Fortaleza-CE, Brazil; [7]Francisco Barbosa de Araújo Neto, MD, Radiologist, Department of Radiology of the Fortaleza General Hospital, Fortaleza-CE, Brazil; [8]Arthur de Oliveira Lima, MD, Radiologist, Department of Radiology of the Cancer Institute of Ceara, Fortaleza-CE, Brazil

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***Corresponding author:**
Evanildes Barros Muniz

ABSTRACT

Bronchial atresia and pulmonary sequestration, encompassing both intralobar and extralobar types, are rare congenital lung anomalies. The low specificity of clinical symptoms and the lack of extensive clinical studies alongside absent diagnostic and treatment guidelines contribute to the diagnostic challenges. Diagnosis is frequently incidental, discovered through chest computed tomography (CT). Thus, imaging is crucial for accurate diagnosis. Early identification can enhance clinical management of bronchial atresia and optimize surgical treatment for pulmonary sequestration, even in asymptomatic patients.

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INTRODUCTION

Bronchial atresia and pulmonary sequestration represent rare congenital lung malformations. Bronchial atresia is defined by focal obliteration of a bronchus, typically segmental, though it can be lobar or subsegmental, resulting in adjacent segmental or lobar hyperinflation. In the atretic bronchus, due to the lack of communication with the central bronchial tree, secretion accumulation occurs, leading to the formation of a mucocele (1).

Pulmonary sequestration is characterized by the anomalous formation of segmental lung tissue without communication with the tracheobronchial tree, and receives its blood supply from an aberrant systemic artery, typically from the descending thoracic aorta. This malformation is categorized into two forms based on the presence of a separate pleural from an aberrant systemic artery, typically from the descending thoracic aorta. This malformation is categorized into two forms based on the presence of a separate pleural envelope: intralobar and extralobar (2-3).

Intralobar pulmonary sequestration: Occurs when the sequestered tissue is enveloped by the visceral pleura of a normal lung lobe (2-3). This form represents approximately

75% of cases and is most frequently observed in the left lower lobe.

Extralobar pulmonary sequestration: Is identified when the sequestered area is covered by its own pleural membrane, constituting 25% of cases of this malformation (2-3).

Purpose of the Study: This study aims to provide a didactic overview of bronchial atresia and pulmonary sequestration, emphasizing the key characteristics that radiologists should identify in these conditions.

MATERIALS AND METHODS

We present a pictorial essay summarizing the principal tomographic findings associated with bronchial atresia and pulmonary sequestration, illustrated through two cases from our service.

DISCUSSION

Bronchial atresia can be diagnosed at any age, though it is more common in young adults. Many patients may be asymptomatic or present with nonspecific symptoms such as cough and dyspnea, with diagnosis often based on incidental radiological findings.

Chest computed tomography (CT) is a preferred method for investigation due to its sensitivity in detecting typical features of the disease, including mucocele and hypertransparency of the distal lung parenchyma supplied by the atretic segment due to hypovascularization (oligoemia), and in excluding hilar masses. Bronchial atresia can affect any lobe but is most frequently found in the apicoposterior segment of the left upper lobe, followed by the right upper lobe (4).

CT findings are typically characteristic. Management is generally conservative, but segmental resection may be considered in certain cases to exclude the rare possibility of underlying malignancy (5). Similarly, diagnosing pulmonary sequestration can be challenging as symptoms like recurrent airway infections and nonspecific complaints such as cough, dyspnea, and hemoptysis may overlap with other conditions like pneumonia and tuberculosis. In investigating suspected pulmonary sequestration, imaging aims to achieve two goals: excluding other pathologies and characterizing the anomalous arterial supply (6-8).

The diagnosis of pulmonary sequestration is confirmed through multidetector chest CT with contrast enhancement. Rendering aortography and magnetic resonance imaging of the chest and abdomen unnecessary, as CT provides adequate visualization of the arterial supply and lung parenchyma changes (7-8). The radiological appearance typically includes homogeneous opacity, predominantly in the lower lobes, especially in the posterior basal segment of the left lower lobe, as demonstrated in our images.

Differential diagnoses to consider include congenital pulmonary airway malformations, neuroblastoma, and bronchogenic cysts. Unlike bronchial atresia, the classic treatment for pulmonary sequestration is surgical resection of the affected lobe or segment, though endovascular techniques are also available.

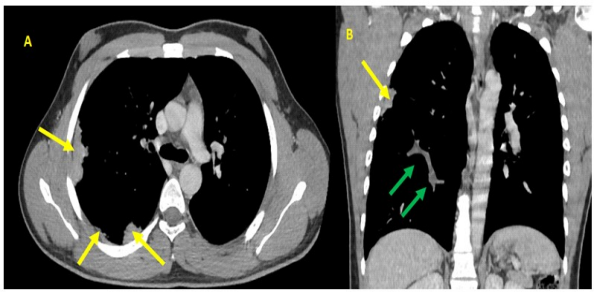

Figure 1. Computed tomography in the axial (A) and coronal (B) planes. The image shows subpleural nodular formations with soft tissue density (yellow arrows) associated with tubular structures of the same density (green arrows). Findings compatible with mucocele.

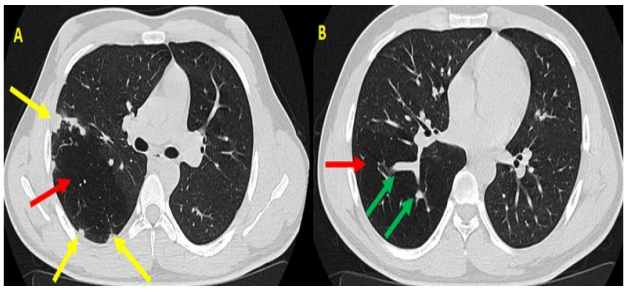

Figure 2. Computed tomography in the axial plane in lung window. The image shows subpleural nodular formations with soft tissue density (yellow arrows), a branching opacity in the central portion of the involved segments, which represents dilated mucus-filled bronchi - mucocele (green arrow) associated with hypertransparency of the lung parenchyma, which is supplied by the atretic segment due to hypovascularization (red arrows).

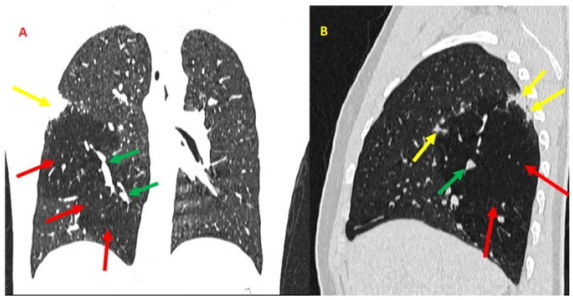

Figure 3. Computed tomography in the coronal (A) and sagittal (B) planes. The image shows subpleural nodular formations with soft tissue density (yellow arrows) associated with tubular structures of the same density (green arrows) suggestive of mucocele and hypertransparency of the adjacent lung parenchyma (red arrow).

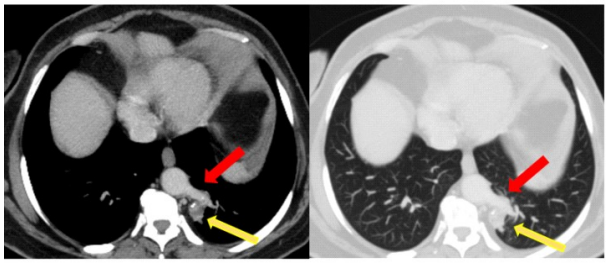

Figure 4: Computed tomography in the axial plane. The image shows an anomalous branch of the descending thoracic aorta (red arrows) and consolidative opacity with focal calcifications (yellow arrows) interspersed in the posterior basal segment of the left lower lobe, suggestive of intralobar pulmonary sequestration.

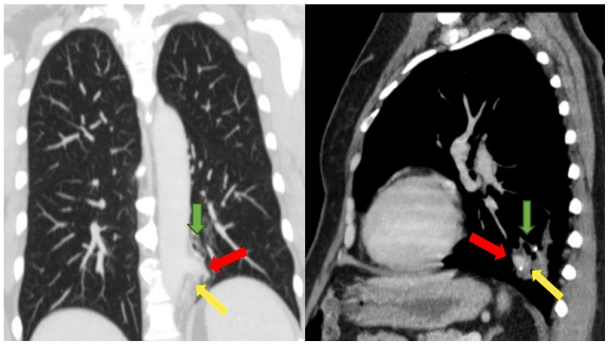

Figure 5. Computed tomography in the coronal (A) and sagittal (B) planes. The image shows an anomalous branch of the descending thoracic aorta (red arrows) and consolidative opacity with focal calcifications (yellow arrow) interspersed in the posterior basal segment of the left lower lobe, suggestive of intralobar pulmonary sequestration. There is also bronchiectasis (green arrows).

CONCLUSION

Given the rarity of these conditions and their frequent incidental diagnosis, it is crucial for radiologists to be familiar with the imaging findings on computed tomography.

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