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Case Report

Bridge bronchus and pulmonary artery sling: Case report and literature review ☆

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ABSTRACT

We present the case of a 14-year-old adolescent boy with a history of poorly controlled asthma and a final diagnosis of a bridge bronchus associated with sling of the left pulmonary artery. Regarding the case report, we describe the characteristic findings in computerized tomography multidetector of the thorax, its classification, and the most relevant information about this malformation. Congenital malformations of the tracheobronchial tree may occur in the context of asymptomatic or symptomatic respiratory patients. These malformations may be associated with other vascular, tracheal, and syndromes with multiorgan involvement. Although most patients are asymptomatic, some of them will have nonspecific symptoms without a clear etiology or will be diagnosed incidentally during the diagnostic evaluation of other pathologies. It is important to know and recognize the normal anatomy and its variations, since radiology undoubtedly plays a fundamental role in the diagnosis and preoperative assessment of these malformations, which although they have low incidence, must be identified in a timely manner by the specialist in diagnostic images.

Introduction

Tracheobronchial abnormalities have an incidence between 0.1% and 0.6% [5]; within them, the bridge bronchus is considered a rare anomaly, first described in 1976 by Gonzales-Crussi [3]; since then, very few cases have been reported in the literature, being less than 16 worldwide [9].

Bridge bronchus consists of a rare congenital anomaly in which a bronchus to the right lobe arises from the main left bronchus, patients are usually asymptomatic at the time of presentation, with the anomaly being a frequently incidental finding. However, in symptomatic patients, the presence of cough, hemoptysis, and repeated infections of the respiratory tract has been described.

Multidetector computed tomography of the chest is a useful tool to confirm the diagnosis, and the report of the finding is of great relevance in symptomatic patients or in those who might be taken to invasive procedures such as bronchoscopy or endotracheal intubation [10].

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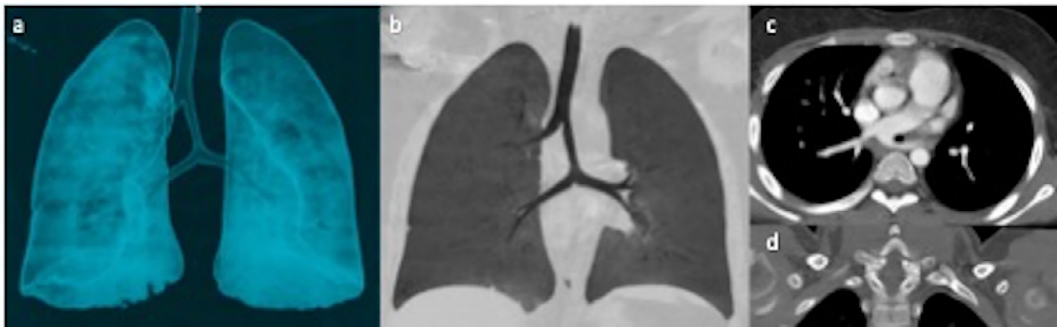

Fig. 1 – Chest angiotomography. (A and B) 3D and MinIP reconstructions of the airway and lungs, where carina (*) of normal location and pseudocarina (•) with origin of the intermediate bronchus in the left main bronchus are identified. (C) Axial plane observing left pulmonary artery (arrow) with origin in the right pulmonary artery (arrowhead) and course to the left, between the trachea (*) and the esophagus (•) and (D) Fusion of the first and second left costal arch (arrow).

Case report

A male patient, 11 years old, was admitted to the emergency department with 3 days of fever and abdominal pain, a history of delayed motor development, hip dysplasia, behavioral disorders, suspected Tourette syndrome, recurrent upper respiratory tract infections, and high-risk asthma with multiple hospitalizations required (1, with intensive care requirement) and poor response despite polymedication (Omalizumab, Salbutamol, Salmeterol, and Fluticasone). The patient was hospitalized with diagnoses of hypovolemic and distributive shock for probable COVID-related MIS (Multisystem Inflammatory Syndrome related to COVID-19[3]). On physical examination, the patient presented multiple minor anomalies such as synophrys, hypertrichosis, bat ears, prominent lobule of auricle, high nasal bridge, prognathism, and crossbite.

Following desaturation episodes and D-dimer elevation, chest CT angiography was performed reporting normally located carina and origin of the intermediate bronchus in the left main bronchus with pseudocarina at the T6-T7 level (Fig. 1). Associated, fusion of the first and second left costal arch, common origin of the brachiocephalic trunk and the left common carotid artery and an aberrant left pulmonary artery (originated on the right pulmonary artery) were reported (Fig. 2).

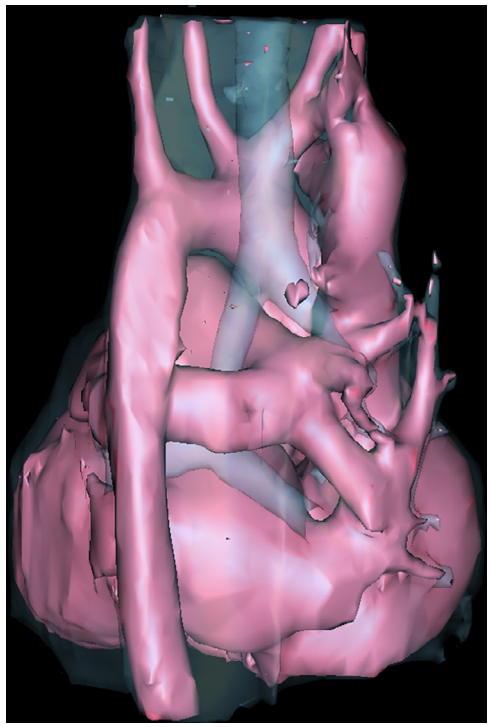

Fig. 2 – 3D angiographic reconstruction. Posterior view, showing common origin of the brachiocephalic trunk and the left common carotid artery (*) and an aberrant left pulmonary artery (arrow).

Discussion

The abnormality consists of the origin of an abnormal right bronchus from the left main bronchus; this bridging bronchus crosses the mediastinum towards the right lower lobe and less frequently, the middle lobe. Because of this, the lungs are connected by a "bridge" bronchus usually located at the T6-T7 level, where a pseudocarina can be observed, distal to the main carina that is normally found in front of the T4-T5 vertebral bodies [2,10].

Associated, there is usually a left pulmonary artery that originates in the right pulmonary artery and crosses to the contralateral hilum, over the right main bronchus, and between the trachea and the esophagus; this finding has been called sling or sling abnormality of the left pulmonary artery [6].

This congenital anomaly originates in the fifth week of gestation during the period of lobar and segmental differentiation; a bridge bronchus may be associated with pulmonary, extrathoracic, cardiac, and vascular malformations, as well as the sling of the pulmonary artery [9].

The respiratory symptoms that may be associated are mainly cough and respiratory distress. In patients with pre-

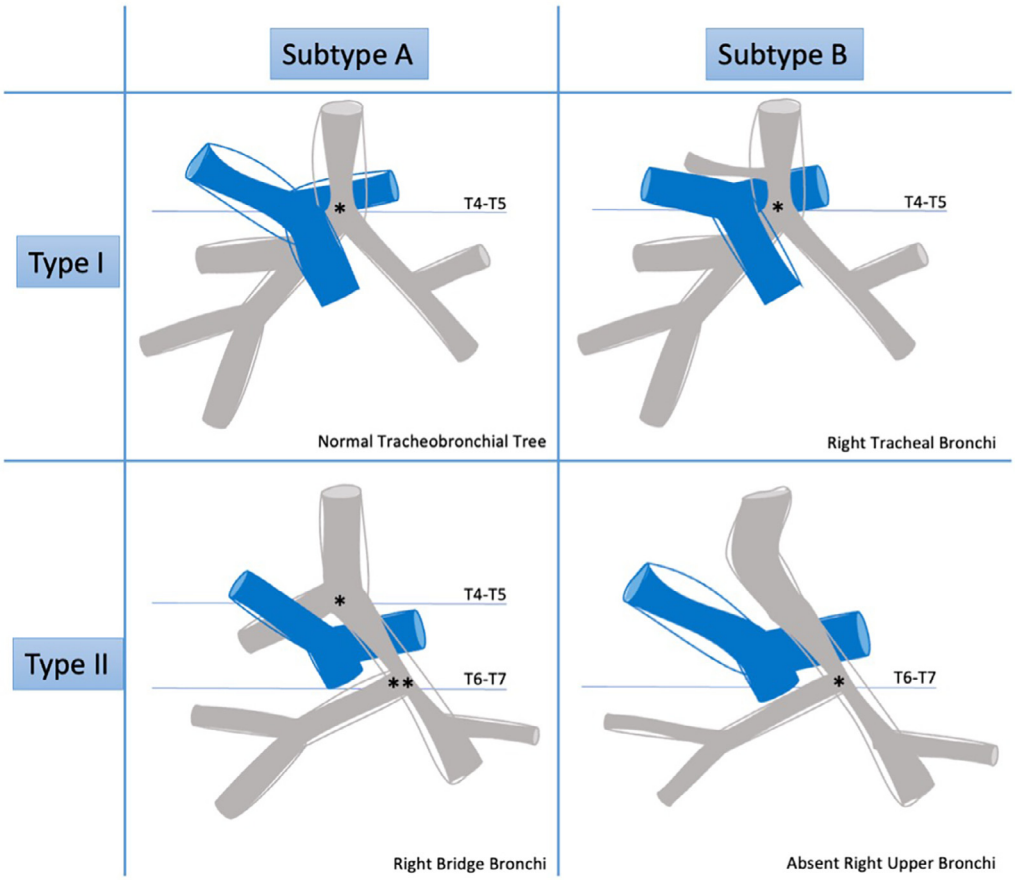

Fig. 3 – Wells classification for left pulmonary artery sling. *Carina. **Pseudocarina. Source: Author.

dominantly pulmonary volume loss in the right upper lobe and other conditions such as congenital skeletal, genitourinary, abdominal, or cardiovascular malformations, the tracheobronchial tree should be evaluated in search of this variant [7], as seen in this patient, who had fused ribs.

Imaging techniques traditionally used to diagnose the bridge bronchus associated with sling of the left pulmonary artery have been chest radiography, barium esophagogram, multidetector computed tomography of the chest, pulmonary angiography, echocardiography, and bronchoscopy [1].

Currently, it is the contrast-enhanced computed tomography of the chest, the ideal imaging technique for diagnosis and presurgical assessment since it adequately demonstrates the vascular and tracheobronchial anatomy, so it allows an accurate evaluation of the anomaly and finally, its diagnosis; additionally, it is possible to generate MinIP reconstructions and even perform the representation of the 3D volume to better delineate the pathology and assist in operative planning.

In 1988, Wells introduced a classification for left pulmonary artery slings [8], classifying them in type I or II according to the supra or infracarinal location of the sling and subsequently, in subtypes A or B according to the presence or absence respectively, of a bronchus for the right upper lobe. The trachea is located at the level of T4-T5 in type I lesions and T6-T7 in type II lesions [4]. In type IA there is a normal configuration of the tracheobronchial tree. In type IB, the right upper lobe is replaced by a tracheal bronchus. In type IIA, there is a bridge bronchus for the right lower lobe. In type IIB, the right upper lobe bronchus is absent (Fig. 3).

The case we present corresponds to a type IIA classification. In those types where sling produces an external compressive effect on the trachea, a decrease in the caliber of the associated airways will be observed consequently, observing this effect typically in type II malformations.

The treatment is conservative in most cases but requires surgical correction in those symptomatic patients with abnormal drainage of the affected bronchi and coexisting pathologies.

Conclusion

Despite the low incidence of this congenital anomaly, it is important for the radiologist to know and recognize the tracheobronchial variations, since their timely diagnosis can contribute to the accurate diagnosis of patients under study for nonspecific symptoms, without other associated diagnoses; and in turn, in the therapeutic approach and the preoperative assessment, which finally, can represent a better prognosis for these patients.

Patient consent

The authors of this article acknowledge that consent has been obtained from the patient's legal representative and authorize its use for publication for academic purposes.

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