ANATOMICAL VARIATIONS OF THE BRONCHIAL ARTERIES

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ANATOMICAL VARIATIONS OF THE BRONCHIAL ARTERIES (Abstract): To understand the anatomical variations of the bronchial arteries, is compulsory to be known common issues they pose. Bronchial arteries shows anatomical variations regarding the origin, model and branching trajectory. It showed four classic designs branching bronchial artery, of which the most common is two bronchial arteries in the left lung and one to the right, which takes the form of an intercos-tal bronchial trunk. Anatomical variations of bronchial arteries are fairly common, and their knowledge is important especially in bronchial artery embolization and in management of massive hemoptysis. It can not be neglected intra-arterial introducing of chemotherapeutic agents in cancers of the lung. Besides technical and surgical issues, atypical variants of bronchial arteries can give clinical signs, in term of atypical lung pathology. We considered 12 cases of patients operated in the Emergency Hospital of Thoracic Surgery and Pneumology from Iasi and six anatomical parts of the Institute of Anatomy at the U. M. F. “Gr.T. Popa”, Iasi. Anatomical variations of the bronchial arteries were found in 5 cases of operated patients. Anatomical pieces were the benchmark for bronchial artery classic anatomy description and orientation. In conclusion, detection of bronchial artery anatomical variation allows correct and safety treatment methods, if careful planning and associated pathologies are accurate visualized before surgery. Key words: BRONCHIAL ARTERY, THORACIC SURGERY, ANATOMICAL VARIATIONS, LUNG DISSECTION

INTRODUCTION

The vascular supply of the lungs consist of two different vascular system: pulmonary and bronchial vessels. The pulmonary arteries carry deoxygenated blood, and supply 99% of the blood flow to the lungs and participate in gas exchange at the alveolar capillary membrane. The bronchial arteries carry oxygenated blood to the lungs at a pressure six times that of the pulmonary arteries. The bronchial arteries provide nourishment to the supporting structures of the lungs, including the pulmonary arteries, but generally do not participate in gas exchange. They are connected to the pulmonary arteries through several microvascular anastomoses at the level of the alveoli and respiratory bronchi-oles (1, 2).

Normally, the bronchial arteries at origin have a diameter not exceeding 2 mm. lung segmental level, gradually decreasing diameter up to a maximum of 0.5 mm. Bronchial blood flow in arteries varies between 1% and 30% of total cardiac output. Due to their reduced diameter and wall well-developed muscle, arteries dilate during bronchial pulmonary ischemia or other inflammatory / tumoral thorax diseases, on account of muscle hypertrophy.

Knowing and understanding the anatomical variations of the bronchial arteries plays a crucial role in chest surgery and radiological vascular interventions. The right bronchial artery (RBA) normally arises from the third posterior intercostal artery, from the left bronchial artery (LBA), when the LBA, usually two, arise directly from the thoracic aorta, at the level between the fourth and sixth thoracic vertebra.

Territory of distribution exceeds the scope of pulmonary bronchial artery giving branches that distribute most organs of superior mediastinum (trachea, esophagus) and some of the viscera inferior mediastinum (main bronchus, esophagus interazygo-aortic). Blood into these
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arteries is directed to the visceral pleura and wall of the thoracic aorta, and pulmonary veins, lymphatics and mediastinal nerves.

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The best way to view the bronchial arteries is the CT investigation, where these structures are seen as having a linear and nodular appearance and sinuous trajectory.

MATERIALS AND METHODS

The material used for this study consists of twelve cases of patients who underwent surgery at the Emergency Hospital of Thoracic Surgery and Pneumology from Iasi and six anatomical specimens belonging to the Institute of Anatomy from U.M.F. Iasi.

RESULTS

Classic path of bronchial arteries is on the walls of the esophagus. A less common variant of bronchial arteries, such as in our cases, shows variations in appearance, size and trajectory from the most common variants. Thus, two new variants found, have not paraesophagean trajectory, but almost at right angles to the body. One of variants, a supernumerary left bronchial artery has a trajectory intimately close to the apical left bronchus.

All variants of bronchial arteries have visualized common characteristics:

- are abnormally wide (diameter greater than 2mm)
- mediastinal part is tortuous
- at CT have a nodular appearance and can be mistaken for lymph nodes, pulmonary venous thromboembolic phenomena, endobronchial lesions or esophageal pathology

There were found anatomical variations of the bronchial arteries in five cases at the operated patients. The anatomical specimens (fig. 1, 2, 3) constituted reference positions for the classic anatomy of the bronchial arteries.

At one of our patients, the RBA followed a route behind the vagus nerve at its upper half, passing in front of it and in front of the right main bronchus at its lower half, till the lower edge of the right main bronchus.

There it formed an almost right angle turning to the right before dividing into two branches for the right superior and right inferior lobar bronchi, respectively.

At another patient, we observed one left bronchial artery arising from the anteromedial wall of descending thoracic aorta below the T6 level, dorsal to the esophagus.

Regarding the mediastinal course, the left bronchial artery ran along the left side of the esophagus, dorsal to the trachea and the main bronchi. In such cases, special care must be taken in order to avoid damaging the artery during esophageal dissection.

Afterwards, we determined that the number of the right bronchial arteries was significantly greater than that of the left ones, and the right bronchial arteries had larger diameters than the left ones.

DISCUSSIONS

The majority of aberrant bronchial arteries originated from the descending aorta. Ectopic origin seemed to play an important role in BA embolisation and management of the lobectomy (3,4,5).

Failure to recognise anatomical variations during angiography of bronchial circulation would have induced a partial control of lobec-
tomy, nontarget embolisation, and unsuccessful outcome (6,7).

While studying the anatomical pieces, we found two right bronchial arteries coming from the right subclavian artery and one left bronchial artery arising from the thoracic aorta.

Instead, no left bronchial artery originated from the subclavian artery or from the common trunk of both bronchial arteries (8,9).

Among the most common causes dilatation of the bronchic arteries, we can include:

• congenital obstruction of the pulmonary artery: tetralogy of Fallot, pulmonary artery agenesis of the proximal segment, the origin of the left coronary artery from the pulmonary artery - Alcapa syndrome.
• extrinsic pulmonary artery obstruction: chronic thrombo-embolic disease and Takayasu arteritis.
• Pulmonary Inflammation bronchial swelling, acute or chronic infections or lung tumors
• Pulmonary hipertension: abnormal development of bronchial arteries, massive hemoptysis, postoperatory, arteriosclerosis.

CONCLUSIONS
Bronchial arteries (BA) are small vessels supplying the trachea, bronchi, pulmonary alveolar tissue, bronchopulmonary lymph nodes, pericardium, and oesophagus. The frequency of the ectopic origin is higher of the RBA than for the LBA. The presence of bronchial arteries of anomalous origin should always be considered to prevent a catastrophic outcome. Suspicion and detection of any possible anatomical variation of BA is significant when performing lobectomy, in order to avoid heavy bleeding.

BIBLIOGRAPHY

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