


# The azygos lobe, an incidental finding in computer tomography

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*The azygos lobe is an anatomical variant of the upper lobe, which occurs most often in the right lung. Atypical course of the azygos vein is formed during embryogenesis, while the precursor of this vein migrates through the lung and creates the azygos fissure. Despite its rare occurrence, this variation is well described. This article presents a case of 62-year-old male with the azygos lobe, which was found accidentally in the computer tomography. The knowledge about the azygos vein is significant for surgeons, because it might reduce iatrogenic damage and help them avoid unexpected bleeding during thoracic surgery. The azygos vein might be confused with pathological conditions. It might also be associated with lung cancers, pneumothorax and congenital abnormalities. Despite the fact that the azygos lobe is well known variant, dissemination of knowledge about it is still inadequate. (Folia Morphol 2024; 83, 2: 478–481)*

**Keywords:** azygos lobe, azygos fissure, azygos vein, anatomical variation

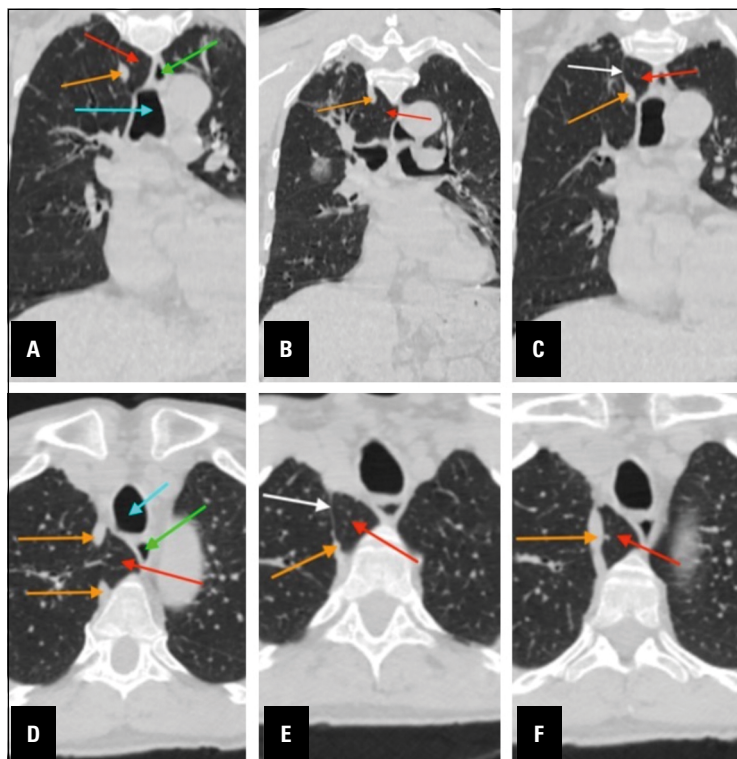
## INTRODUCTION

The azygos system has a significant number of anatomical variations and the knowledge about them is important for surgeons and radiologists. They are usually asymptomatic and detected in most cases during routine examinations. One of these variations is the azygos lobe, a rare anatomical variant of the upper lobe [12]. It is the most common in the right lung, but cases of the azygos lobe in the left lung have also been reported [1, 10]. The prevalence of this lobe ranges from 0.4% to 1.54% and is higher among males. It is worth mentioning, that the prevalence also depends on examination, and is described to be 0.4% on plain chest x-rays, 1% in cadaveric specimen and 1.54% on CT [13, 21]. It is presumed, that the cause of the azygos fissure is genetic and depends upon an autosomal dominant gene [10]. The azygos vein is formed between 4<sup>th</sup> and 6<sup>th</sup> week of embryonic development, as a result of the subcardinal vein's

transformation [8, 11]. If there are no anatomical variations, the azygos vein arises from the right ascending lumbar vein, enters the thorax, arches over the root of the right lung, and drains towards the superior vena cava [14]. But sometimes, during embryogenesis, one of the precursors of the azygos vein, that is a right posterior cardinal vein migrates into the apex of the lung, and forms the azygos lobe [9]. This lobe is separated from the right upper lobe by the azygos fissure, which contains the azygos vein surrounded by the mesoazygos [16]. It is worth noting, that according to many authors, "azygos lobe" is a misnomer, because this part of the lung does not have its own bronchus or vessels [16, 21]. In the literature, there are three types of azygos fissures described — a, b and c [11]. Our case corresponds to type c, where the fissure is vertical, cuts of a tongue of the lobe from the mediastinal part and the pedicle is attached at the superior margin of the root of the lung. Whereas

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**Figure 1.** Computer tomography. **A–C.** Coronal view; **D, E.** Axial view. Red arrow — azygos lobe, orange arrow — azygos vein, white arrow — azygos fissure, blue arrow — trachea, green arrow — oesophagus.

type a is a fissure more or less horizontal, which cuts lateral surface of the lung between the apex and a point located 2 inches below. In type b the fissure is practically vertical and divides the apex of the lung into two lateral halves [10, 11].

### CASE REPORT

A 62-year-old male with adenocarcinoma of the oesophagus was admitted to the Thoracic Surgery Department of Warmia and Mazury Centre of Pulmonary Diseases in Olsztyn for surgical treatment. In preparation for the procedure computer tomography was performed. The examination showed atypical course of the arch of the azygos vein. The arch of the azygos vein divides the upper lobe of the right lung, and forms the azygos lobe. The azygos fissure formed in this case, run vertically and separated the part of lobe from the mediastinal surface, while the pedicle of this additional lobe was still attached to the root of the lung (Fig. 1).

### DISCUSSION

Knowledge of the anatomical structures and their variations should be crucial for physicians, especially

surgeons and radiologists. The azygos lobe is a well described, but rare anatomical variant of the upper lung lobe. In most cases, this structure is found incidentally during imaging examinations [7]. Proper description of this variability is important before any surgical interventions in the thorax. A different course of the azygos vein, including even the left azygos vein [19], and the existence of the azygos lobe make thoracoscopic surgery more difficult. The probability of bleeding is much higher in those cases, particularly during sympathectomies [2, 15].

This variation causes diagnostic difficulties for many clinicians, due to its similarity to various diseases. It can be confused with a lung abscess, a bulla, a pulmonary nodule, or a mass [1, 9]. Despite the fact that many cases of the azygos lobe are described, the knowledge about it among the clinicians is still insufficient. In a study evaluating physicians' knowledge about the azygos lobe, results were different depending on the medical specialty. None of the 173 intern doctors and 26 surgery residents correctly identified this variation. However, 57.1% of the radiology residents chose the proper answer [2]. Another study, involving 50 children with azygos lobes, reports that

40% of them were not diagnosed by the first imaging examination [20].

Knowledge of the azygos lobe is also important because of the variety of lung cancers associated with this structure. In the literature, there are described cases of primary lung cancer in the azygos lobe, both small cell carcinoma and non-small cell carcinoma, and their surgical treatment [3, 17]. It is worth noting, that in the previous studies, authors reported that the azygos lobe carcinoma is not associated with regional lymph node involvement [7], which has been repeatedly confirmed [5, 18]. Although lung cancers occur in the azygos lobe, they are not very common. Fukuhara et al. drew attention to one hypothesis, concerning a relatively rare cancers in the azygos lobe. It is possible that worse ventilation of this lobe, related to constriction by the azygos vein leads to limited oxygenation, carcinogens deposition and thus restricting carcinogenesis [6]. Variations in the anatomy of the lungs may result in bronchial changes. Ndiaye et al. suggest, that the azygos vein passing through the azygos fissure, leads to deformation of the anterior apical subsegmental bronchus (B1b). Hence, atelectasis and bronchiectasis may be noticed more often rather in other parts of the right upper lobe, than in the azygos lobe [11], contrary to previous opinion, that deformation of the bronchus, caused by the azygos fissure, may predispose the azygos lobe to air trapping and further consequences [4]. It also means, that the azygos lobe plays significant role in the ventilation of the right upper lobe. This fact should always be considered before surgical intervention in the thorax [11]. Other authors noticed, that the azygos lobe associated with spontaneous pneumothorax has been reported rarely; thus, this variation might have a protective effect against the formation of bullae or blebs [4]. Furthermore, the azygos fissure, or pleural folds, might limit the spreading of infection to the azygos lobe from other parts of the lung [1].

The azygos lobe seems to be clinically significant for one more reason. In a research about prevalence of the azygos lobe, attention was drawn to the results suggesting an association between the azygos lobe and cardiopulmonary malformation and/or genetic factors. This anatomical variation appears more frequently in individuals with Turner's syndrome, bronchogenic cysts, and congenital heart diseases [21]. That is not the only study which reports that probably association. Wang et al. described that azygos lobe among children might be complicated with other

congenital abnormalities, such as tracheal bronchus, tracheal stenosis, congenital heart disease, cystic adenomatoid malformation, and Down syndrome [20].

## CONCLUSIONS

Even though the azygos lobe is a rare variation, the knowledge about it is unusually precious for all physicians, but especially for surgeons and radiologists. Dissemination of knowledge about the azygos lobe is still insufficient. Correct recognition of this structure might prevent iatrogenic damage of the azygos vein and reduce the risk of bleeding. Further research is needed to explain possible association between the azygos lobe and other abnormalities, and thereby increase the knowledge about pathophysiology and anatomy.

**Conflict of interest:** None declared.

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