

Original Article

Azygos Lobe Detected by Thoracic Computed Tomography and Frequency of Concomitant Variations

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Abstract

Background: The azygos lobe is a rare variation of the right upper lobe of the lung, and prevalence of it in the general population varies widely between 0.1% and 8%. It can be diagnosed easily by thoracic computed tomography. **Objective:** In this study, by thoracic computed tomography, azygos lobe frequency and associated variations were evaluated. **Materials and Methods:** In this study, 5854 thoracic computed tomography with and without contrast applied for patients in the Kars Harakani State Hospital Chest Diseases Polyclinic between January 2014 and January 2018 were screened retrospectively. **Results:** A total of 5854 thoracic computed tomography showed that frequency of azygos lobe was 1.09%. Out of 64 patients with azygos lobe, 36 (56.25%) were male and 28 (43.75%) were female. Bovine artery was found in 8 (12.5%) cases, right-left carotid artery common origin in 3 (4.68%) and aberrant right subclavian artery in 1 (1.56%). **Conclusion:** The detected azygos lobe frequency is similar to literature and the most common accompanying variation is bovine artery.

Key words: Azygos lobe; Variation; Computed tomography

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Introduction

The azygos lobe is a congenital variant and occurs in the intrauterine period with the azygos vein passing through the anterior superior lobe of the right lung and it remains adjacent to apical or posterior segment of the upper lobe of the right lung.¹ The azygos lobe is a rare variation of the right upper lobe of the lung and first described by Heinrich Wrisberg in 1778.² The frequency of azygos lobe in general population varies between 0.1% and 8%.¹ While the frequency of azygos lobe in lung x-ray is very low (0.4%), the diagnosis can be made by high resolution thoracic computed tomography (CT) easily.^{1,3} The aim of this study was to determine the frequency of azygos lobes detected on thoracic CT scans and to evaluate the coexistence of bovine artery, aberrant right subclavian artery, aortic transposition, dextrocardia, and right-

left carotid artery common origin.

Materials and Methods

For this study, approval from Caucasus University Ethics Committee was taken. This study was conducted in Kars Harakani State Hospital Chest Diseases Polyclinic in Turkey. We screened retrospectively 5854 thoracic CT (Toshiba Alexion 16 Slice) with and without contrast done in this hospital between January 2014 and January 2018. Among these, 67 cases of azygos lobe were detected and reevaluated. Three patients were excluded from the study due to image with artefact. The remaining 64 patients constituted the study group.

Spiral thoracic CT was performed in all 64 patients included in the study. In these patients with azygos

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lobe, bovine artery, aberrant right subclavian artery, aortic transposition, dextrocardia and right-left carotid artery common origin presence were analyzed.

Data were analyzed with SPSS for Windows version 23.0. Mean and standard deviation in descriptive statistics of continuous variables were expressed in terms of categorical variables, numbers and percentages.

Results

The frequency of azygos lobe was found 1.09% in total of 5854 thoracic CT. The mean age of the 64 patients included in the study was 52.32 years. Of them 36 (56.25%) were male and 28 (43.75%) were female. Bovine artery was found in eight (12.5%) of the 64 patients, right-left carotid artery common origin in three (4.68%) of them and aberrant right subclavian artery in one (1.56%) of them. Among 64 cases there were no azygos lobes associated with aortic transposition and dextrocardia. Table I shows

other vascular variations accompanying azygos lobes.

Table I: Vascular variations accompanying azygos lobes

Vascular variations	Number	Percentage
Bovine artery	8	12.5
Bovine artery + aberrant right subclavian artery	0	0
Bovine artery + right-left carotid artery common origin	2	3.12
Right-left carotid artery common origin	3	4.68
Right-left carotid artery + aberrant right subclavian artery	1	1.56

Figures show some examples of patients. Figures 1a and 1b show azygos lobe and bovine artery in a 46-year-old woman. Figures 2a and 2b show azygos lobe, aberrant right subclavian artery and right-left carotid artery common origin in a 61-year-old woman.



Fig 1a

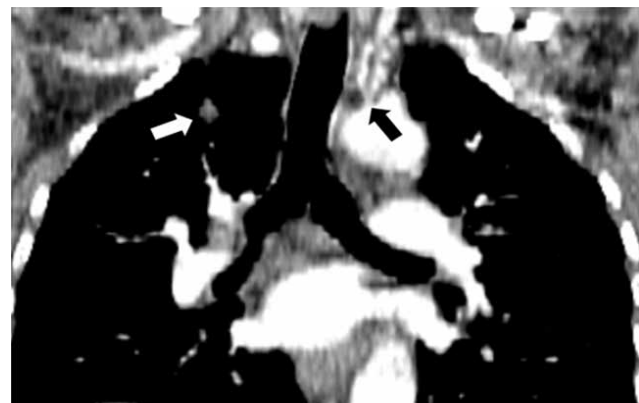


Fig 1b



Fig 2a



Fig 2b

Discussion

The azygos lobe, which is typically localized in the apical region of the lung, is formed by the right lung superficial lobe separation.² Since the azygos lobe is not associated with its own bronchial and specific bronchopulmonary segment, it is not a true separate lobe.² This lobe embryologically is a part of the right lung upper lobe and receives bronchial and arterial support from the right lung apical or superior lobe.² The frequency prevalence of incidentally detected azygos lobes, usually during imaging is 0.4% in chest radiography and it is approximately 1.2% in CT scan with high resolution.

The frequency of azygos lobe was 1.09% in thoracic CT scan in our study. There are limited number of studies in our country (Turkey) related to this subject. Özdemir et al⁴ reported that the frequency of azygos lobe in thoracic CT was 1.54%. The azygos lobe is a rare anatomic variant that is more common in males and can show significant morphological changes that can be transferred with familial heredity.⁴ The azygos lobe in our study was higher in males as expected, and in the study of Özdemir et al⁴ it was higher in females. Rauf et al⁵ detected that azygos lobe frequency is higher in males in South Africa population and it is in rate of 0.6%. The frequency of azygos lobe in patients whose VATS (video-assisted thoracic sympathectomy) planned by Kauffman et al⁶ was 0.37% and it was similar to our study in males.

Today, spiral CT is a highly sensitive and selective technique for acute pulmonary embolism diagnosis and evaluation of vessels and can be performed on any patient who does not have renal impairment or contrast agent allergy.⁷ Spiral CT was performed in all 64 patients diagnosed azygos lobe and included in our study, and the presence of coexisting bovine artery, aberrant right subclavian artery, right-left carotid artery common origin, aortic transposition, and dextrocardia variations were assessed. The most common accompanying variants to azygos lobe were bovine artery (12.5%), right common carotid artery common root (4.68%), bovine artery + right-left common carotid artery common origin presence (3.12%), and right-left carotid artery common origin presence + aberrant right subclavian artery (1.56%).

The normal aortic arcus branching pattern is brachiocephalic, left common carotid artery and

left subclavian artery in 65% cases.⁸ Bovine truncus that originates from left common carotid artery and brachiocephalic artery is seen in 27% cases in cadaver series.⁸ In a similar study conducted by Berko et al⁸, the frequency of azygos lobe was 0.3%, the bovine truncus was 27.4%, and the aberrant right subclavian artery was 1.2%.

Anatomical variations of the aortic arcus are common in the general population and are benign variants, clinically insignificant and asymptomatic.⁹ Bovine aortic arcus commonly originates from the left common carotid artery and brachiocephalic arc in aortic arc, or the less extensive left common carotid artery originating directly from the brachiocephalic artery.⁹ The aberrant right subclavian artery originates typically from distal to left subclavian artery, in the form of a fourth branch from the aortic arcus.⁹ Bovine aortic is the most commonly associated variant of arcus thoracic aortic disease.⁹ In the study of Dumforth et al⁹ conducted on patients with thoracic aortic disease, the association of bovine aortic arch + aberrant right subclavian artery was 0.2% whereas in our study there was no association between these two variations. In the study of Boyaci et al¹⁰ aortic arcus and branching variants were examined, and aberrant right subclavian artery frequency was found 2.2%. In the study of Çelikyay et al¹¹ the bovine type aortic arcus frequency was 21.1%. In the study of Ergun et al¹² the classical aortic branching (truncus brachiocephalicus, left common carotid artery and left subclavian) was the most common (72.2%) while bovine type aortic truncus was the second most common (14.8%). Although the aortic branching variants differ between studies, the bovine aortic arc type variant can be said to be the most common type except for normal branching. Similar to these data, in our study, aortic arcus variant is bovine type aortic arcus associated with the azygos lobe except branching.

Our study, where a large number of CT images were evaluated, is a comprehensive study in our country in terms of the frequency of azygos lobe. But being single-centered is a limitation of the study. In conclusion, the frequency of azygos lobe according to our findings is similar to the frequency rate in the literature and the most common aortic branching variant is bovine type aortic arcus.

Authors' contributions

Conception and design: Gökhan Perincek and Pinar Çeltikçi; Acquisition, analysis and interpretation of data: Sema Avcı and Pinar Çeltikçi; Drafting the article: Sema Avcı, Gökhan Perincek and Pinar Çeltikçi; Revising it critically for important intellectual content: Sema Avcı; Approval of final version of the manuscript: Gökhan Perincek, Sema Avcı and Pinar Çeltikçi.

Conflict of interest

No conflict of interest.

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