




A South African male cadaver with an azygos lobe on the right lung: Case report

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Background. The azygos lobe is a rare anatomical variation of the right lung. This lobe is formed during embryological development but is not a true lobe, since it does not have a separate secondary bronchus. The prevalence of the azygos lobe in South African (SA) cadaveric populations has been reported as 0.5%.

Objectives. In this case report, we describe the presence of an azygos lobe in an 81-year-old white SA male who had died of pneumonia. This variation has important clinical significance and can be associated with other congenital abnormalities.

Conclusion. Knowledge of anatomical variations of the lung, such as the azygos lobe, is of great importance to prevent misdiagnosis, or complications during surgical interventions.

Keywords. Lung abnormality, congenital, cadaver, pneumonia, embryology.

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Welni Maritz (5th-year MB ChB) and Annika Scheepers (4th-year MB ChB) are undergraduate medical students at the University of Pretoria. Both have demonstrated a strong interest in research and, under the supervision of Dr Lané Prigge, Senior Lecturer in the Department of Anatomy, they compiled this case report based on an unusual observation made during the educational dissections conducted by the 2nd-year MB ChB students. Lané Prigge made the discovery of the azygos lobe and was approached by the student authors, who asked to be involved in the research and the writing of the manuscript. This was purely out of interest and was not part of the requirements for their degrees.

The azygos lobe, located on the superior lobe of the right lung, is a rare anatomical anomaly that was first reported by Wrisberg in 1778. The exact embryological development of this lobe is unknown; however, the most plausible hypothesis is that the right posterior cardinal vein, which is the precursor of the azygos vein, does not migrate completely along its usual path. Sadikot *et al.*^[1] and Yurasakpong *et al.*^[2] reported that the right posterior cardinal vein migrates through the apex of the right lung, instead of medial to it, while Tran *et al.*^[3] reported that the vein passes through the upper lobe of the right lung, instead of over the apex. Regardless of the exact embryological process, the result is an azygos vein, usually accompanied by the two pleural layers, that creates the fissure known as the azygos fissure.^[2,3] It passes through the superior lobe of the right lung instead of arching over the right main bronchus. Since the azygos lobe does not have a separate secondary bronchus or blood supply, this lobe is not a true anatomical or accessory lobe.^[1,3]

Identification of an azygos lobe is usually accidental, through radiographic imaging such as chest radiographs,^[2] computed tomography^[4] or magnetic resonance imaging scans,^[5-8] through cadaveric dissections,^[2,9] or as an incidental

finding during surgery.^[10] The prevalence of the azygos lobe varies among different populations, as indicated by a random-effects meta-analysis conducted by Yurasakpong *et al.*^[2] reporting a 0.30% prevalence. In a South African (SA) population of 704 cadavers, only four cases were identified during student dissections over a 10-year period.^[11] The overall prevalence was 0.57% (a total of 4 cases), and it was more common in males than in females (3:1), which is consistent with previous reports in other populations.^[2]

Case presentation

During routine cadaveric dissections by the undergraduate medical students in the Department of Anatomy of the University of Pretoria, an azygos lobe on the right lung was identified (Fig. 1). It was found in a white SA male cadaver, with the reported cause of death at the age of 81 years being pneumonia. No other anatomical abnormalities, or any possible pathologies as a consequence of this variation, were identified. Upon discovery, the azygos vein was observed within the azygos fissure, along with reflections of both the parietal and visceral pleural layers. However, the azygos vein was not removed with the lung during the *ex vivo* investigation.

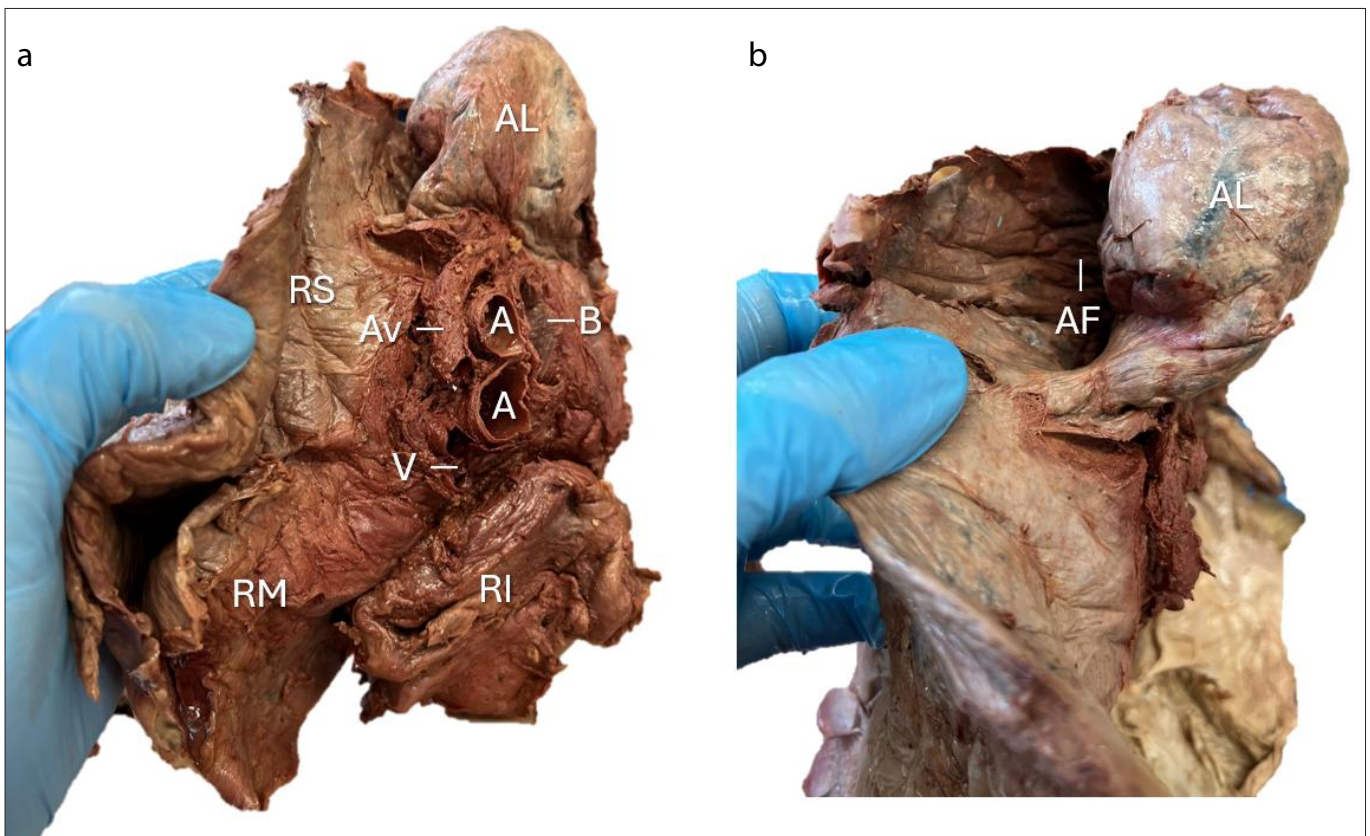


Fig 1. Medial view (a) and supero-anterior view (b) of the right lung, indicating the azygos lobe (AL) separated from the right superior lobe (RS) by the empty azygos fissure (AF). (A = pulmonary artery; Av = azygos vein; B = primary bronchus; RI = right inferior lobe; RM = right middle lobe; V = pulmonary vein.)

Discussion and conclusion

This case report describes the anatomical variation of an azygos lobe, found incidentally during the educational dissection of an elderly white male. Azygos lobes are usually asymptomatic and are typically found incidentally.^[2,10] Nonetheless, awareness of this anomaly has clinical significance, and clinicians should be aware of the possible prevalence during surgical intervention, or when interpreting chest radiographs,^[12] in order to avoid confusion, misdiagnosis or surgical complications.

On X-rays, the azygos lobe appears as a comma- or horseshoe-shaped opacity,^[13] and can distort the surrounding structures or mimic pathologies such as abscesses or masses.^[12] According to Caceres *et al.*,^[13] it is important to distinguish this structural anomaly from pathologies, especially in the context of pulmonary diseases such as pneumonia. Pneumothorax, along with the resulting alterations in intrathoracic pressure, can lead to displacement of the azygos vein. This displacement may create the appearance of an 'empty' azygos fissure, increasing the risk of missing the presence of an azygos lobe.^[14,15]

In addition, it is important to be aware of possible azygos lobes when planning a surgical intervention, and preoperative diagnosis is imperative.^[16] If not anticipated, distortion of regional anatomy may complicate surgery, potentially leading to vascular injury and blood loss.^[17] Video-assisted sympathectomy can be impeded by the azygos lobe due to increased difficulty in identifying the sympathetic trunk.^[18] According to El-Dawlaty and Al-Dohayan,^[19] additional considerations that should be considered when operating on a patient with an azygos lobe include increased risk of bleeding and shock, as well as pulmonary and anaesthetic implications.

Reported complications that have been attributed to an azygos lobe include recurrent haemoptysis^[20] and spontaneous pneumothorax,^[21] as well as azygos vein aneurysm.^[22] Akhtar *et al.*^[23] reported that azygos vein aneurysms appear as a paratracheal shadow on a chest radiograph. Gürün and Akdulum^[24] reviewed radiographic reports of 15 patients known to have an azygos lobe, and found that 10 had additional lung-related conditions, such as pneumonia or atelectasis. It is, however, believed that these were accidental findings resulting from the clinical need for imaging, since no other reports confirm such an association. Nonetheless, it is interesting to note that the cause of death for the whole-body donor reported in this study was pneumonia.

Interestingly, in some cases, having an azygos lobe can be considered beneficial. There have been several reports of complete resection of small-cell lung cancer when the cancer is limited to the azygos lobe.^[25-27] There is also evidence that the azygos fissure and associated pleural folds can contribute to preventing the spread of infection from the azygos lobe to other parts of the right lung.^[12]

According to Wang *et al.*,^[28] there is an association between the presence of an azygos lobe and other congenital cardiopulmonary defects. Azygos lobes are nine times more common in individuals with congenital abnormalities, including, but not limited to, Turner syndrome, congenital heart disease with anomalous tracheobronchial arborisations, bronchogenic cysts, hyperhidrosis and congenital hearing defects.^[2] A possible genetic predisposition is supported by reports of azygos lobes in several family members.^[29,30] It is therefore the opinion of the authors of this report that knowledge on the azygos lobe and its potential

implications is imperative to prevent unforeseen complications that could arise during surgical intervention procedures.

Ethical considerations. The authors hereby confirm that every effort was made to comply with all local and international ethical guidelines and laws concerning the use of human cadaveric donors in anatomical research. Ethics approval was obtained (Ref. no: UP FHS REC 597/2024).

Declaration. This work is original and has not been submitted, in whole or in part, for the fulfilment of any degree or qualification.

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Author contributions. WM: writing of the manuscript and final editing; AS: research for the manuscript and final editing; LP: conceptualisation of the case report, writing of the manuscript and final editing. All authors read and approved the final manuscript.

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Conflicts of interest. None.

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