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Case Report
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Morphological Variation of the Left Lung: Presence of an Accessory Lobe

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ABSTRACT

Introduction: the lungs are organs that supply gas exchange, existing in both sides of the human body. The left lung has an oblique fissure separating the superior lobe from the inferior lobe, whereas the right lung has horizontal and oblique fissures separating it into superior, middle and inferior lobes. Anatomical variations may occur in the lungs and the left lung can have three lobes and the right lung can have four or only two lobes. The aim of this study was to report a case of a cadaver with an anatomic variation of the left lung with an accessory lobe.

Case report: during a routine Anatomy dissection of a female adult cadaver, a three-lobed left lung was found. The left lung had an upper lobe, a middle lobe and a lower lobe. The upper and middle lobes were separated by a complete horizontal fissure. The middle and lower lobes were separated by a complete fissure with an oblique appearance (inferior to superior direction).

Conclusion: pneumatologists and surgeons must be aware of the lung anatomical variations. This knowledge can make the surgeon more prepared for adverse situations and may decrease the occurrence of intraoperative difficulties and post-surgery complications when performing lung transplantation or surgical management of lung pathology, lobectomies and segmental resection and for interpreting computed tomography scans.

Keywords: Anatomic variation; Macroscopic human anatomy; Accessory lung; Clinical Anatomy; Lung Transplantation.

Introduction

The lungs are organs that supply gas exchange, and they exist in both sides of the human body (Kc *et al*., 2018). They are situated in the thoracic cavity, specifically in the left and right pulmonary cavities. Both pulmonary cavities are overlayed by a pleural membrane which reflects onto and cover the external lung surface that exist in the thoracic cavity (Moore *et al*., 2017).

The lungs have proximity with adjacent structures of the thoracic cavity and lung surfaces are denominated according to closeness, consisting of costal surface, related to the costal pleura that divides it from muscles, cartilages and the ribs; mediastinal surface, correlated to middle mediastinum and diaphragmatic surface, located at the base of the lungs (Moore *et al*., 2017). They have bronchopulmonary segments considered anatomic subdivisions of the lungs composed by pulmonary arteries, veins, lymphatic system and bronchus (Kc *et al*., 2018). These segments have fissures dividing them.

The left lung has an oblique fissure separating the superior lobe from the inferior lobe, whereas the right lung has horizontal and oblique fissures separating it into superior, middle and inferior lobes. Right horizontal fissure separates the right superior lobe from right middle and right inferior lobes and right oblique fissure separates inferior lobe from middle and superior lobes from the same side. Left oblique fissure is more vertical compared to right oblique fissure (Moore *et al*., 2017; Kc *et al*., 2018).

Anatomical variations may occur in the lungs, and, in case of fissures variations, the left lung can have three lobes and the right lung can have four or only two lobes (Unver Dogan *et al*., 2015). Murlimanju *et al*. (2012) stated that the anatomical variations of fissures and lobes were more common in the right lung and, according to Jacob *et al*. (2019), a three-lobed left lung is a rare variant.

The knowledge of lung anatomical variations such as accessory lobes and accessory fissures are important for clinicians and makes the thoracic surgeons more prepared when performing lung transplantation or surgical management of lung pathology, lobectomies and segmental resection, as well as in the preoperative and postoperative moments, long-term care planning and also for interpreting computed tomography scans and to attain correct radiological diagnosis (Gesase, 2006; Prakash *et al*., 2010; Murlimanju *et al*., 2012; Kc *et al*., 2018; Jacob *et al*., 2019).

Thus, the study aimed to report an anatomical variation of the left lung with an accessory lobe from a Brazilian human cadaver.

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Case Report

During a routine Anatomy dissection of an adult (around 40 years old), female cadaver, fixed in 10% formalin, in the Anatomy Laboratory from Araçatuba Dental School, Paulista State University (UNESP), was found an accessory pulmonary lobe in a left lung.

A dissection was performed by removing the anterior thoracic wall (Figure 1). The pleura was removed to visualize the lungs. The right lung showed typical anatomy. In the left lung, a numerical variation was found in relation to the number of lobes. It was recognized the three lobes of the left lung (Figure 2).

The left lung had an upper lobe, a middle lobe and a lower lobe. The upper and middle lobes were separated by a complete horizontal fissure. The middle and lower lobes were separated by a complete fissure with an oblique appearance (inferior to superior direction). It is assumed that the middle lobe is considered accessory in this case. Dimensionally, the middle lobe has the largest volume and area. It contains the cardiac notch (Figure 2).

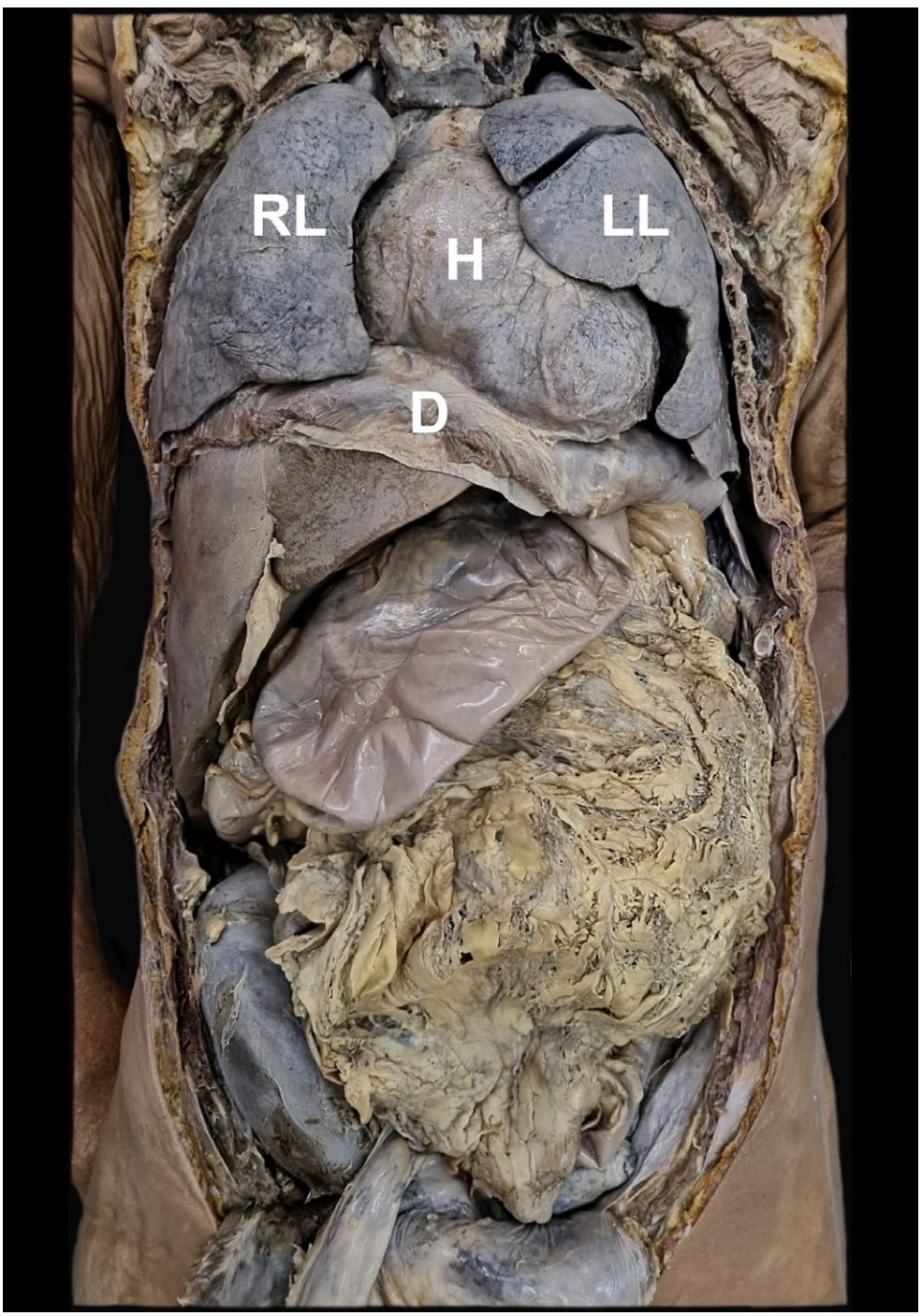

Figure 1. Dissection of the female cadaver. The anterior thoracic wall and the pleura were removed to visualize the lungs. RL: right lung. LL: left lung. H: heart. D: diaphragm muscle.

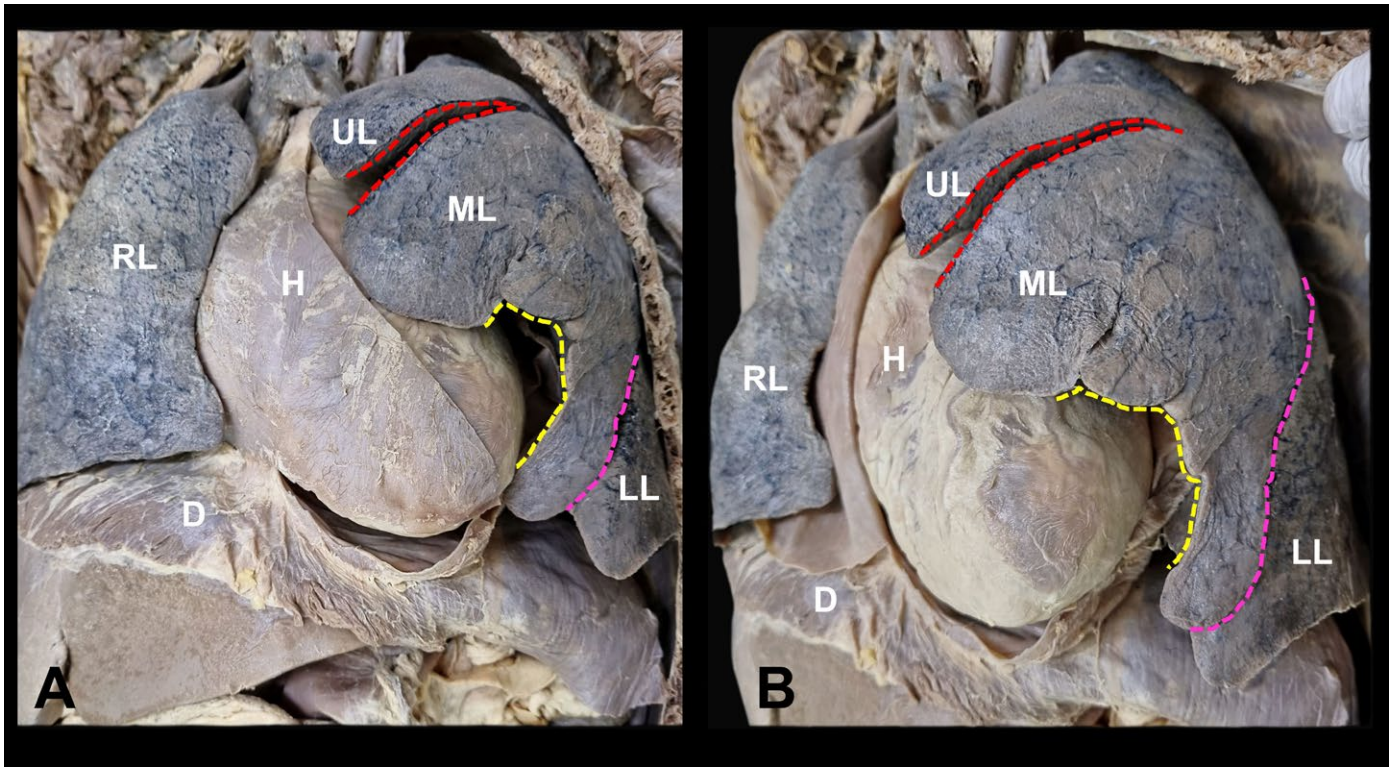

Figure 2. Dissection of the female cadaver. The right lung presented typical anatomy. The left lung presented three lobes. A: anterior view of the thoracic cavity. B: anterolateral view of the thoracic cavity. RL: right lung. UL: upper lobe of the left lung. ML: middle lobe of the left lung. LL: lower lobe of the left lung. H: heart. D: diaphragm muscle. Yellow dashed line: cardiac notch. Red dashed line: horizontal fissure separating the upper lobe from the middle lobe of the left lung. Pink dashed line: oblique fissure separating the middle lobe from the lower lobe of the left lung.

Discussion

The present case report shows an anatomical variation of a true three-lobed left lung found in a Brazilian cadaver, in which an accessory fissure completely separated the accessory middle lobe. The presence of lung anatomical variations can make the surgical procedures more difficult and riskier to surgeons and patients due to their unexpected recognition which can alter surgical planning. Meanwhile, knowledge of the different anatomical variations can make the surgeon more prepared for adverse situations and, thus, may decrease the occurrence of intraoperative difficulties and post-surgery complications.

A study from Unver Dogan *et al.* (2015) analyzed 420 lungs during routine forensic autopsies of 210 Anatolian individuals. Of the 210 analyzed left lungs, two of them had three lobes because of complete accessory fissures. Those lungs were dissected and, according to the authors, despite having lobe number changing, the numbers of lobar bronchi were consistent to the number of lung lobes, and the quantity of segmental bronchi did not change (Unver Dogan *et al.*, 2015), which corroborates with Jacob *et al.* (2019) who reported that the bronchopulmonary segment and arterial anatomy are frequently normal.

The present case report is from a Brazilian cadaver. Anatomical variations may be related to differences between populations, being considered individual characters of a given population group. The literature shows different prevalence values of this variation in the studies carried out to date. Two studies performed in Indian population found a prevalence of 3.6% (Murlimanju *et al.*, 2012) and 8.77% (Prakash *et al.*, 2010) of left lung accessory lobe. Gesase (2006) found a prevalence of 2.94% of three-lobed left lungs in Tanzania. To our knowledge, this is the first report of a true three-lobed left lung found in the Brazilian population. Therefore, this indicates that further studies are needed in Brazil about the lung's variations, and it is necessary to research thoroughly other methods, including computed tomography scans and other existent local data with more samples to verify the existence of lung lobes and fissures variations.

Jacob *et al.* (2019) reported a case of a true three-lobed left lung found during a left lung transplant, which had a complete fissure separating the lingula and upper division. The authors reported that the anatomical variation was not identified prior to surgery, but fortunately it did not prevent the transplant from being performed and the patient recovered without complications. Also, the authors highlighted that it was the first report of a transplant of a three-lobed left lung. This knowledge enlightens the fact that regardless of lung lobe number variation, it is possible to execute transplants successfully. With three-lobed lung variation found in Brazil, it is expected that this procedure also could be done by local hospitals.

Thus, comprehending this variation is worthwhile to all health workers due to its medical procedure's significance.

Understanding the typical anatomy and anatomical variations of major fissures and lung lobes is necessary for accurate analysis of radiographic images containing their different appearances and to correctly diagnose diseases. Also, pneumatologists and surgeons must be aware of the lung anatomical variations. When recognized before pulmonary lobectomy and segmentectomy, anatomical variations may change preoperative plans (Unver Dogan *et al*., 2015). Still, this knowledge can prevent confusion when performing lung transplantation and the organ is received by the surgeon's team, which can mistake right and left lungs during the procedure (Jacob *et al*., 2019).

In conclusion, the anatomical variation reported is important to guide thoracic surgeons, pneumatologists and radiologists in their different clinical procedures, and to differentiate variations from typical anatomy and from injurious abnormalities of fissures, lobes and other lung structures.

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potentially increase scientific knowledge and can improve patient care. Therefore, these donors and their families deserve our highest respect (Iwanaga *et al*., 2020).

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