

Anomalous Right Lung with Accessory Lobe and Absent Horizontal Fissure: A Case Report

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ABSTRACT

Background: The lungs exhibit lobar organization defined by fissures which play a vital role in pulmonary function, radiological assessment, and thoracic surgery. However, variations in the number and orientation of fissures and lobes are common and clinically significant.

Objective: To report a rare anatomical variation of the right lung with an accessory lobe located posterior to the hilum and absence of the horizontal fissure, observed during routine cadaveric dissection.

Methods: During routine cadaveric dissection of 10% formalin fixed male cadaver an absence of horizontal fissure and presence accessory lobe was noted over the right lung. Findings were recorded, and the specimen photographs were taken.

Results: The right lung demonstrated an accessory lobe located on the mediastinal surface, extending posterior to the hilum and onto the diaphragmatic surface. The horizontal fissure was absent. The left lung was normal.

Conclusion: Knowledge of such pulmonary anomalies is critical for accurate radiological interpretation and surgical planning, especially in thoracic procedures like lobectomy. This case underlines the anatomical variability in pulmonary fissures and highlights the importance of detailed anatomical understanding.

Keywords: Right lung, Accessory lobe, Horizontal fissure, Mediastinal surface, Diaphragmatic surface.

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Introduction

The lungs are the principal organ of respiration and plays vital role in gaseous exchange by oxygenating blood and expelling carbon dioxide (CO₂). The lungs are situated within the thoracic cavity and are enclosed within pleural sac. Morphologically lungs are conical in shape with apex extend up to the root of neck and base resting on diaphragm. Right lung is smaller and broader as liver is present beneath it. The left lung is narrow and longer due to cardiac impression.(1)

Anatomically, oblique and horizontal fissure divide the right lung into three lobes, i.e., superior, middle, and inferior, whereas the single oblique fissure divides the left lung into two lobes, i.e., superior and inferior(2). Corresponding to the

planes of invagination between bronchopulmonary segments, these fissures provide uniform expansion, lobular movement during the respiration, also serving as important anatomical landmarks for radiological interpretation and surgical resection. (3,4)

These fissures have functional and pathological significance. They act as a natural barrier, limiting the spread of infection, neoplasm, or inflammatory process within the lung. (5) The complete fissure allows free movement of lobes while the incomplete or absent fissure may restrict the ventilation and complicate the surgical interventions such as lobectomy or segmentectomy. (6, 7)

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Anomalies in the number, position, or completeness of pulmonary fissures and lobes are common, which often result from the embryological development variation. The most common absent or incomplete fissure, which is reported in the anatomical and radiological studies, is the horizontal fissure of the right lung. (8) However, the presence of any accessory fissure or lobes, which is formed due to incomplete fusion or abnormal division of bronchopulmonary buds, are rare, but they are clinically relevant anatomic variations. (9,10)

These anomalies can be of significant diagnostic challenge, particularly in radiology, where they may mimic or obscure pathologies like consolidation, atelectasis, pleural effusion, or bullae on chest X-ray or CT scan. (11,12) If failed to identify the fissural or lobular variation lead to the incomplete resection, persistent air leakage or iatrogenic injury in the thoracic surgery. (13)

This is a case report which document a rare anatomical variation observed during the routine cadaveric dissection, a right lung with an accessory lobe located on the mediastinal surface behind the hilum extending from the diaphragmatic surface and absence of the horizontal fissure. This case underlines the detailed anatomical knowledge especially for clinicians involved in thoracic imaging, pulmonology, and cardiothoracic surgery.

Materials and Method

During routine dissection of right lung in a male cadaver morphological variation was found in the lobar and fissural anatomy of the.

The systematic examination was done for the gross external surface of right lung, costal, mediastinal and diaphragmatic anomalies were noted. Observation was made regarding the position and orientation of the fissures, boundary of each lobe and deviation from the standard anatomy described in the classic text such as Gray's Anatomy were noted.

Photographs were taken using camera. The images helped in the comparison with the previously reported anatomical variant in the literature.

Observation

A. Absence of horizontal fissure

1. The horizontal fissure separating the superior and middle lobes was completely absent.

2. Accordingly, the superior and middle lobe appeared as a single continuous lobar mass without any surface identification or fissural line.

B. Presence of accessory lobe

1. On the mediastinal surface situated posterior to the hilum, a well-defined accessory lobe was observed.

2. The lobe extended inferior over the diaphragmatic surface, indicating an abnormal development or incomplete fusion of bronchopulmonary segments.

C. Hilum and surrounding structures

1. The bronchioles and other blood vessels entering the hilum were singular and having normal arrangement, and also no duplication or displacement was seen.

D. Parenchymal integrity

1. The lung parenchyma was firm, uniformly coloured, and well-preserved.

2. No gross pathological lesions, adhesions or signs of previous inflammation or trauma were observed. These features—absence of the horizontal fissure and presence of a posterior mediastinal accessory lobe extending toward the diaphragmatic surface—represent a rare congenital variation in right lung anatomy.

Discussion

Anatomical variations in the lobar and fissural pattern of the lungs are not uncommon and often arise from deviation during embryonic development. The present case shows a rare congenital anomaly of right lung where the horizontal fissure was absent and accessory lobe was present on the mediastinal surface, which extend post to the hilum and over the diaphragmatic surface. This is typically asymptomatic anomalies, but is significant in the clinical, surgical, and radiological implications.

EMBRYOLOGICAL BASIS OF THE ANOMALY

Embryologically, lung development starts from fourth week of gestation with the formation of the respiratory diverticulum from foregut. Then branches into bronchial buds further differentiate into bronchopulmonary segments. Lung fissures are formed by the invagination of the visceral pleura between these bronchopulmonary segments. Normally the spaces between these segments are obliterated except where the oblique and horizontal fissure persists in the adult lung. (1,2)

When any additional fissure persists partially or completely, separately a bronchopulmonary segment which merges during the development give rise to an accessory lobe, whereas the

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complete obliteration of the potential space between segments result the absence of fissure.

In this reported case, there was an absence of horizontal fissure which indicate a complete fusion of the upper and the middle lobe, whereas the accessory lobe formation indicates a persistent segmental cleft that failed to resolve during lung morphogenesis. (3,4)

Clinical and Surgical Significance

Congenital anatomical variations may lead to significant complication of if unrecognized.

1. Radiological Challenges:- In a plain X-ray, CT scan, accessory fissure or lobes can appear as linear opacities or unusual soft tissue shadow and can mimic as pleural scars, atelectasis, bulla, pneumothorax, or pleural masses(5,6).The absence of horizontal fissure can obscure the localization of lesion in middle lobe, due to which misinterpretation can occur.

2. Bronchoscopic and Interventional Implications:- Variation in lobar anatomy can cause complications in bronchoscopic navigation and can interfere with procedures like bronchoalveolar lavage, transbronchial biopsy, or segmental bronchoscopy, especially in cases where standard bronchial anatomy is assumed(7). Accessory fissure can limit or modify the spread of infection within the lung. Conditions like pneumonia or tuberculosis may remain confined to specific accessory lobe, which produce atypical pattern on imaging. So, this may influence the diagnosis, staging, and treatment planning (14, 15)

3. Surgical complications: - Pulmonary resection procedures like lobectomy rely on fissural planes for anatomical dissection. An absent fissure may necessitate fissureless techniques and can increase the risk of prolonged air leaks, bleeding, or incomplete resections(8,9). Residual disease can occur due to unrecognized accessory lobe, especially in surgical procedures for TB or carcinoma. Knowledge of these variations can help the surgeon to plan safe thoracic surgery.

4. Functional consideration: - Fissures help in uniform expansion of lobes during respiration, but if incomplete or absent fissure are present, then restricted lobar mobility may occur, which potentially affect pulmonary function. However, most individuals with such variation remain clinically asymptomatic unless investigated for unrelated pathology. (10)

Comparison with Previous Studies

The absence of the horizontal fissure is the most commonly documented pulmonary variations. Several Indian and international studies have reported the same case ranging from 20% to 35% in cadaveric series (11,12).Presence of an accessory lobe on posterior mediastinal expect is rare. Godwin and Tarver in 1985 described such fissure as radiological curiosities that require differentiation from disease state (5). As per Mopolokeri et. al. 2022, an accessory lobe was reported in only 1.2% cases, commonly as a jugular lobe in the upper right lobe. Posterior mediastinal accessory lobes as documented in this case are exceptional, hence making this a valuable case addition to anatomical literature.

Conclusion

Anatomical variation of lung such as absence of horizontal fissure and presence of an accessory lobe, though rare, are of considerable clinical significance. This case highlights a unique configuration of right lung in which horizontal fissure is completely absent and an accessory lobe is also present. These anomalies may be present asymptomatic, but may lead to diagnostic confusion on imaging and interfere with the bronchoscopic orientation and can also complicate thoracic surgical procedure if unrecognized preoperatively. So, a thorough understanding of pulmonary anatomical variation is essential for radiologists, pulmonologists, anatomists, and thoracic surgeons. It underscores the value of cadaveric dissection in uncovering and documenting rare anatomical presentations which may not easily appear in living individuals.

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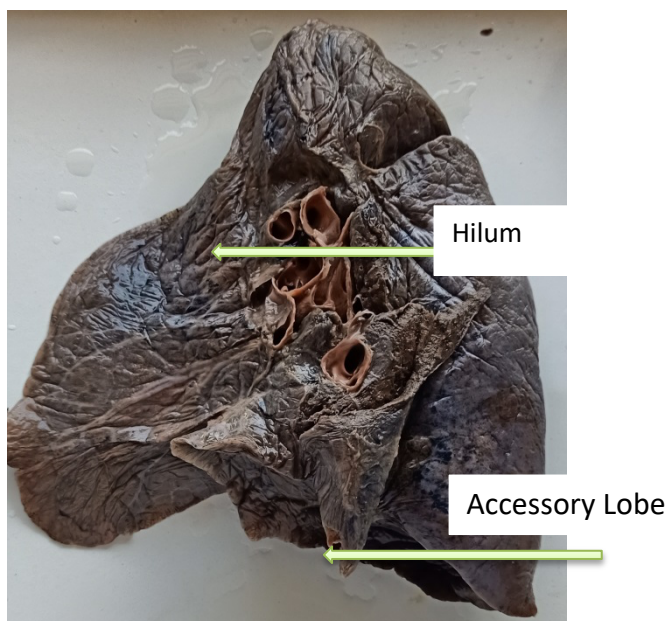


Figure 1: Mediastinal view of the right lung showing an accessory lobe (indicated by arrow) located inferior to the hilum and extending over the diaphragmatic surface

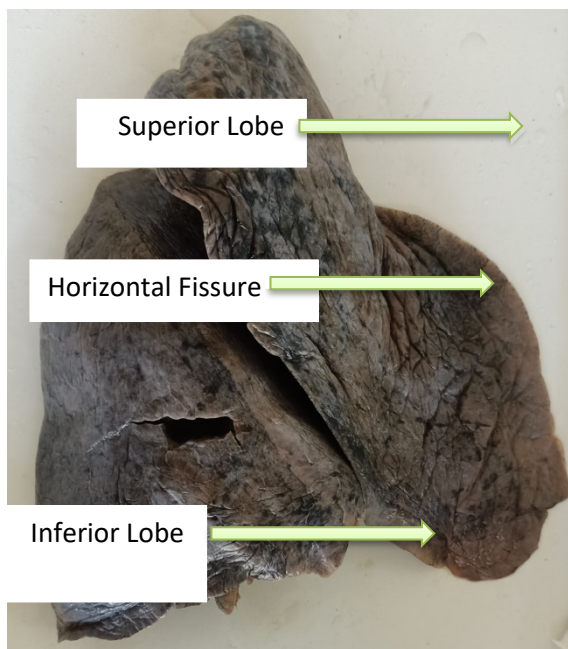


Figure 2: Costal surface displaying the absence of the horizontal fissure. The superior and middle lobes are fused, with no external fissural demarcation.

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