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Case Report

Incomplete oblique fissure with absence of lingula, cardiac notch in left lung: A case report

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ABSTRACT

Background: Lungs, are partitioned into distinct lobes by fissures. These anatomical fissures play a crucial role in ensuring the consistent expansion of each lobe during the process of respiration. The left lung, comprises of two main lobes: the upper lobe and the lower lobe, delineated by an oblique fissure.
Case Report: We present a case of an incomplete oblique fissure, accompanied by the absence of both the lingula and the cardiac notch in the left lung of a male cadaver. This anatomical variation was discovered during a routine thoracic dissection. No structural alterations were noted at the hilum of the left lung. The Fissures and hilum on the right lung were normal.
Conclusion: Understanding morphological variations in fissures and lobes is useful when identifying lung lesions, planning invasive respiratory operations, and analyzing diagnostic imaging. It emphasizes the practical consequences of anatomical variation in the context of respiratory operations and imaging interpretations, highlighting the importance of incorporating it into medical teaching and practice.

1. Introduction

The lungs are the essential organs of respiration. Each lung is conical in shape and presents an apex, base, three surfaces namely medial, costal, and diaphragmatic surface and three borders posterior, anterior and inferior. Left lung is divided into two lobes by oblique fissure. [1] The oblique fissure of the left lung begins from the posterosuperior aspect of the hilum just above gap between the left pulmonary artery and left principal bronchus runs upwards, cuts the posterior border at level of 4^{th} and 5^{th} thoracic spine, it runs downwards and forwards over the costal surface, continues across the diaphragmatic surface and turns upward on to the medial surface to end just below the lower end of the hilum. [2]

The anterior border of left lung is thin and presents a cardiac notch below the 4^{th} costal cartilage where the heart and pericardium are not covered by lung. The lingula is a tongue-like projection from the anterior border of the left lung in the lower end. [1]

The oblique fissure of the left lung is usually more vertical. It is indicated approximately by the medial border of the scapula when the arm is fully abducted above the shoulder. [3] Complete fissures occur when the lobes are connected at the hilum by the bronchi and pulmonary vessels. In incomplete fissures, lobes are connected by pulmonary tissue. Sometimes fissures may be absent altogather. [4]

The knowledge of various anatomical variations of lobes and fissures in the lung is important for radiologists, clinicians while diagnosing and planning any procedures. It is also important to create awareness about these variants among medical students during anatomy teaching.

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2. Case Report

During a routine dissection of thoracic region of 45-year-old male cadaver, we encountered a left lung which displayed an incomplete oblique fissure with absent cardiac notch and lingula. The incomplete oblique fissure was solely seen on the mediastinal surface of left lung, above the hilum. It originated, 3 cm above the hilum and ended 2 cm behind the apex.(Figure 2)

The fissure was entirely absent on the outer (costal) surface, resulting in the lobes being indiscernible and the surface appearing smooth and convex (Figure 1). Parenchymal fusion of oblique fissure on the costal surface was represented by an hypopigmented line. A faint indication of the fissure was noticed at the junction of the anterior and inferior borders on both the costal and inferior surface of the lung. The anterior border was straight, lacking a cardiac notch and lingula. The bronchial tree of this lung specimen was not dissected. Structures within the hilum and impressions on mediastinal surface were normal. No variations were observed in the right lung.

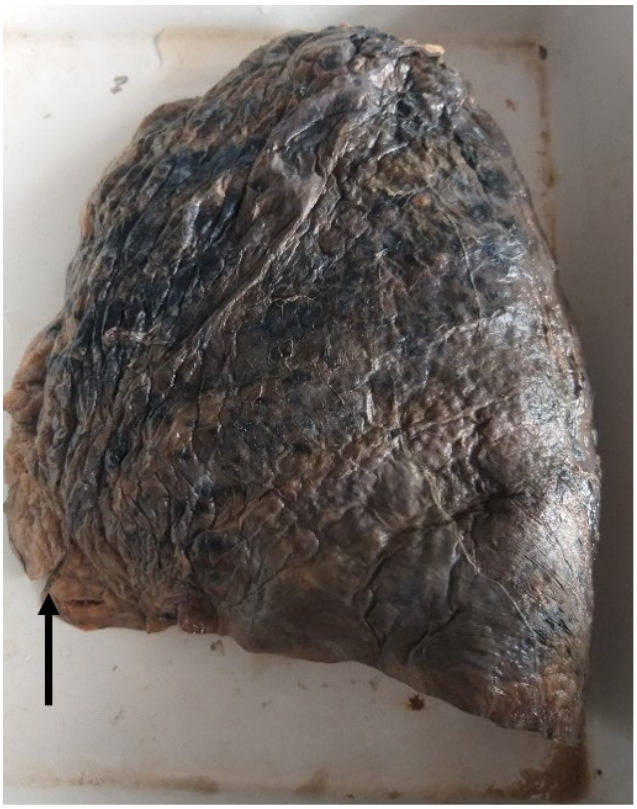

Figure 1: Costal surface of left lung

Figure 2: Mediastinal surface of left lung

3. Discussion

The lungs develop as a respiratory diverticulum from the ventral wall of the foregut in the 4^{th} week of intrauterine life. The lung bud bifurcates into two primary bronchial bud, right and left. During further development, the bronchopulmonary segments are separated by fissures or spaces. Most of these spaces or fissures obliterate except those lying along the line of division of principal bronchi giving rise to major(oblique) and minor (horizontal) fissures in fully developed lung.[5] The defect in pulmonary development gives rise to variations in lobes and fissures of lung.[6] Absent or incomplete fissures in the lungs occur due to complete or partial obliteration of these spaces in foetal life.[7] Travor RD stated that Incomplete pulmonary fissures (partial fusion between lobes) are common; more than half of pulmonary fissures are incomplete.[8] Craig and Walker (1997) proposed a classification on the degree of fissure completeness (Table 1).[9]

Table 1: Grading the fissures (Craig and walker classification)

Grades	Fissures in order of their completeness
Grade I	Lobes of the lung are separated completely by the fissure
Grade II	Visceral cleft which is complete but with fusion at fissure's base
Grade III	Incomplete visceral cleft
Grade IV	Fusion of lobes is the complete and total absence of fissure

Various researchers[4,7,10–14] in different studies on lungs have reported various anomalies in fissures and lobes of

both the lungs. Table 2 shows the comparison of the results of studies done by different authors on the left lung. It is observed in the Left lung, that the incidence of incomplete oblique fissure varied from 2.5%- 51.85% whereas the incidence of absence of oblique fissure varies from 0%-10%.

Table 2: Comparison of the variations in fissures of left lung by different authors

Study	Left lung Oblique fissure	
	Incomplete (%)	Absent (%)
Medler (1947)[7]	10.6	7.3
Meenakshi et al. (2004)[4]	46.6	0
Prakash et al. (2010)[13]	35.7	10.7
B.V. Murlimanju, et al (2012)[10]	7.1	0
Quadros et al. (2014)[11]	2.5	0
Magadum et al. (2015)[12]	42.5	7.5
Sudikshya KC, et al (2018)[14]	51.85	0

Among the incomplete oblique fissure of left lung reported, most of them extended on the costal surface. A case of incomplete oblique fissure which extended $2/3^{rd}$ on the costal surface was reported by Ishwar B. Bagoji et al.[15] The absence of a cardiac notch was reported by Sharma et al.[16] Amit BM et al. reported the absence of lingula and cardiac notch.[17] However, the case we report is different from those reported in earlier in the literature that, the oblique fissure was incomplete, seen only the mediastinal surface and completely absent on the costal surface with absence of cardiac notch, and lingula. In the absence of cardiac notch, the anterior margin of the left lung covers the heart. This overlap can pose challenges during examinations and procedures such as ultrasound, percussion, and auscultation. Absence of lingula indicates the absence of the lingular bronchus[17] and its associated bronchopulmonary segments. Lung fissures help in a uniform expansion of the whole lung, and they also form the boundaries for the lobes of the lungs. They also are used as landmark in specifying lesions of thorax and lungs. Complete fissures serve as a barrier, restricting the dissemination of diseases such as pneumonia and cancer. In patients with incomplete fissures, pneumonia or carcinoma may spread to adjacent lobes.[8] Lymphatics of the lung drain centripetally from the pleura toward the hilum. An incomplete major oblique fissure will alter the visceral pleura and eventually disrupt the normal drainage pattern of lymphatics.[18] An incomplete fissure can be mistaken for a lung lesion or an atypical appearance of pleural effusion in X-ray.[8] The identification of the completeness of the fissures is important prior to the lobectomy, because individuals with incomplete fissures are more prone to develop post-operative air leak, and may require further procedures such as stapling and pericardial sleeves. These air leaks can be avoided by the surgeon by properly clamping the fused pulmonary lobe segments.[19] The variation in fissures imply the possibility of environmental and genetic influence on the development of lung.

4. Conclusion

In conclusion, we report a case of unique incomplete fissure of left lung with absence of cardiac notch and lingula. The limitation of the study is that the bronchial tree was not dissected. Knowledge of these variation explain the various presentation of clinical cases pertaining to lung pathologies. Anatomical knowledge of the fissures, lobes and bronchopulmonary segment of the lungs are important for radiologists, anatomists, oncologists, pulmonologists, cardiothoracic surgeons as well as for physicians for correctly diagnosing, planning and execution of surgeries. It is important to create awareness about the variations in the fissures and lobes of the lung and its clinical implication among medical students.

5. Source of Funding

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6. Conflict of Interest

None.

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