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Absence of Fissure in Left Lung: A Case Report

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Abstract
The human lungs, situated in the thoracic cavity, are divided into lobes by fissures. The right lung consists of three lobes, which are separated by both oblique and transverse fissures, while the left lung has two lobes, divided by the oblique fissure. Recognizing these anatomical differences is essential for clinicians, as it aids in procedures such as lobectomy and enhances the accuracy of radiologic interpretations. We present a case of complete absence of the fissure in the left lung of a male cadaver, observed during routine thoracic dissection in the Department of Anatomy, King George's Medical University, Lucknow, UP. The left lung displayed a rare absence of the oblique fissure, resulting in a smooth, convex costal surface. Typically located along the midaxillary line and posterior border, the oblique fissure was notably absent. However, the structures in the hilum and the impressions on the medial surface appeared normal, with no other fissural abnormalities. A clear understanding of lung fissure patterns is essential for radiologists, as it helps in accurately diagnosing lung pathologies without confusion. In cases where a fissure is absent, lobar pneumonia, which is typically confined to a specific lobe, may spread throughout the entire lung. Clinicians and surgeons should be mindful of such anatomical variations when treating patients and assessing the prognosis of lung diseases.

INTRODUCTION

In the fourth week of intrauterine life, the respiratory diverticulum, or lung bud, appears as an outgrowth from the ventral wall of the foregut. It extends caudally and bifurcates into right and left bronchial buds. The right bronchial bud branches into three secondary bronchi, while the left bronchial bud divides into two. Lung development continues through repeated dichotomous branching of the secondary bronchi. As this branching process progresses, bronchopulmonary segments are formed. Initially, these segments are separated by spaces during the fetal period, which later get obliterated. Furthermore, the lines where the principal bronchi divide give rise to the formation of the oblique and horizontal fissures in the fully developed lung[1]. During the embryonic period upto 7 weeks gestation, development of lung starts and continues into early childhood[2]. The two lungs are the primary organs of respiration, located on either side of the mediastinum and encased within the right and left pleural cavities. Each lung has a base that rests on the diaphragm and an apex that extends above the first rib. The lungs have two main surfaces: the costal surface, which faces the ribcage, and the mediastinal surface, which faces the heart. The mediastinal surface contains the comma-shaped hilum of the lung, where structures such as blood vessels and airways enter and exit. Typically, the pulmonary artery is positioned superiorly, the pulmonary veins inferiorly, and the bronchi are situated slightly posteriorly at the hilum[3].

The right lung consists of three lobes: the upper lobe, middle lobe, and inferior lobe, and is divided by two fissures the oblique fissure and the horizontal fissure. The oblique fissure separates the lower lobe from the upper and middle lobes of the right lung, while the horizontal fissure separates the upper lobe from the middle lobe. The left lung, which is smaller than the right, has two lobes separated by an oblique fissure. The oblique fissure of the left lung is slightly more oblique than that of the right lung. Understanding the morphological variations of lung fissures is crucial for surgeons performing pulmonary lobectomies, as it aids in accurately locating the bronchopulmonary segments. Additionally, knowledge of these variations is valuable for radiologists when interpreting MRI or CT scans[4,5].

Case Report:

- Dissection was conducted in the Department of Anatomy at King George's Medical University, Lucknow.
- The procedure followed the guidelines outlined in Cunningham's Practical Manual.
- An unusual anatomical variation was observed in the left lung-absence of the oblique fissure.
- The specimen was documented using a DSLR camera.
- The costal surface was smooth and convex.
- It lacked the typical oblique fissure, which usually runs downward and forward along the midaxillary line, aligning with the 5th intercostal space (refer to fig 1).
- Structures in the hilum were found to be in normal anatomical positions.
- All impressions on the medial surface appeared normal, except for the absence of the oblique fissure (refer to fig 2).
- The posterior border of the lung did not show any indication of the oblique fissure.
- Normally, the oblique fissure divides the posterior border approximately 2.5 cm lateral to the intersection of the T3 and T4 vertebrae.
- The inferior border of the left lung was also devoid of the fissure.
- Typically, the oblique fissure cuts the inferior border around 7.5 cm lateral to the midline, at the 6th costochondral junction.
- All other anatomical features of the left lung were consistent with previously described literature.
- The only anomaly was the complete absence of the oblique fissure in the left lung.

DISCUSSIONS

During the fourth week of intrauterine development, the respiratory diverticulum (lung bud) emerges as an outgrowth from the ventral wall of the foregut. It forms caudally and bifurcates into both the right and left bronchial buds. The right bronchial bud then divides into three secondary bronchi, while the left bronchial bud divides into two secondary bronchi. The development of each lung occurs through repeated dichotomous branching of the secondary bronchi. Bronchopulmonary segments are formed after several generations of branching. Initially, these segments are separated by spaces during the fetal period, which later become obliterated. The division of the principal bronchi along these lines results in the formation of fissures, including the oblique and horizontal fissures, in the fully developed lung[1]. During the embryonic period upto 7 weeks gestation, development of lung starts and continues into early childhood[2].

The two lungs are essential organs of respiration, located on either side of the mediastinum and enclosed within the right and left pleural cavities. Each lung has two distinct surfaces: the costal surface and the mediastinal surface. The mediastinal surface contains the comma-shaped hilum, through which various structures enter and exit the lung[3].

The fissures play a crucial role in ensuring more uniform expansion of the entire lung. In this case, the absence of the oblique fissure in the left lung is a

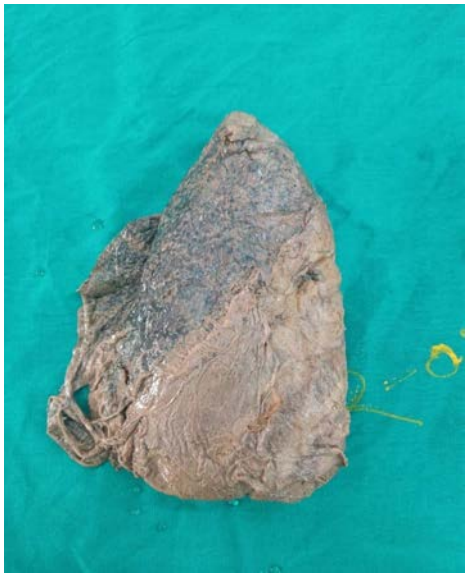

Fig.1:Costal Surface of left lung without oblique fissure

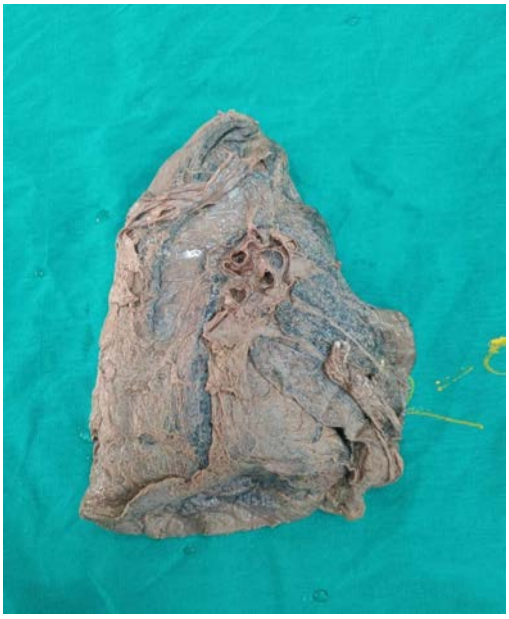

Fig.2: Medial Surface of left lung without oblique fissure

notable and intriguing anomaly. KC Sudikshya et al. observed that, out of 23 right lungs, one had a lobe associated with the azygos vein. In their study of 27 left lungs, 14 exhibited an incomplete oblique fissure, but none showed a complete absence of the oblique fissure[1].

Mpolokeng K.S. *et al*. examined 82 right lungs and found that the horizontal fissure was absent in six lungs (7.3%) and incomplete in 32 lungs (39.0%). The oblique fissure was incomplete in 24 lungs (29.3%). Both the horizontal and oblique fissures were absent in one right lung (1.2%). The left lung, being smaller than the right, consists of two lobes separated by the oblique fissure, which is slightly more oblique than the one in the right lung. Understanding the morphological variations of lung fissures is crucial for surgeons, particularly in identifying the bronchopulmonary segments during pulmonary lobectomy. This knowledge is also invaluable for radiologists when interpreting MRI or CT scans[4,5].

Joshi *et al*. observed that the oblique fissure was incomplete on the sternocostal surface in 18.75% of right lungs and 21% of left lungs, and on the mediastinal surface in 25% of right lungs and 21% of left lungs. Additionally, the oblique fissure was absent in 10.5% of the left lung samples. The horizontal fissure was incomplete in 12.5% of both right and left lungs, and absent in 25% of right lungs, with 50% of those right lungs also lacking the oblique fissure[6].

Halagatti M *et al*. found that, out of 37 right lungs examined, 3 exhibited an absence of the horizontal fissure, while 17 had an incomplete horizontal fissure. Among the left lungs, 9 showed an incomplete oblique fissure[7].

Sharma H *et al*. found that, out of 27 right lungs examined, 3 exhibited an absence of the horizontal fissure, while 17 had an incomplete horizontal fissure. Among the left lungs, 9 showed an incomplete oblique fissure[8].

Murlimanju *et al*. reported that, out of 27 lungs examined, 2 left lung (14.28%) had an absence of oblique fissure[9].

The fissures play a crucial role in allowing the lobes of the lung to move relative to each other, facilitating the expansion and movement of the inferior lobes during respiration. As a result, the fissures contribute to the uniform expansion of the entire lung during the respiratory process.

CONCLUSION

Anatomical knowledge of lung fissures is essential for identifying potential confounding radiographic findings, such as the spread of disease through atypical pathways or the extension of fluid into incomplete fissures. Clinicians and surgeons managing lung diseases should be aware of the implications of absent fissures when assessing treatment options and prognosis. Understanding the structure of lung fissures and lobes is crucial for performing surgeries and interpreting radiological images accurately. In cases of absent fissures, radiographic findings may exhibit atypical patterns, such as unusual pleural effusions or altered collapse patterns in the presence of endobronchial lesions. While lobar pneumonia typically affects a specific lobe, the absence of a fissure can cause the infection to spread throughout the entire lung. Although incomplete and accessory fissures are common anatomical variations, the absence of a fissure is a rare anomaly, making awareness of such variations critical when planning lobar resections. This

is particularly important, as the absence of a fissure increases the risk of air leakage in cases involving lobar fusion.

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