

Pulmonary fissures and lobar variations in relation to surgical & Radiological implications

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Abstract: Lungs are separated into lobes by fissures, with three lobes on the right and two on the left. The fissures facilitate the uniform expansion of the whole lung. The anatomical knowledge of the fissures and the lobes of the lung is important for accurate interpretation of bronchopulmonary segments on X-rays and CT scans. 40 pairs of lungs removed from cadavers were utilized for the study of the pattern of lobulations by careful dissection. Observations were made for the absence or presence of fissures and when present whether it is complete or incomplete. The findings are also confirmed with the help of the X-rays.

On the right side four lungs showed the absence of horizontal fissure, twelve lungs showed incomplete horizontal fissure and in fourteen lung specimens inferior lobe showed an accessory lobe. In seven lungs accessory fissures were seen. On the left side in fourteen specimens extra lobe was present in between the two lobes, in four lungs incomplete oblique fissure was present and in eight lungs accessory fissures were seen.

Anatomical knowledge of the presence of accessory lobes and fissures in the lung may be important for performing lobectomies, surgical resections involving individual segments and to radiologists for accurate interpretation of radiological images

Key Words- Lobes; Oblique fissure; Transverse fissure

I. Introduction:-

The lungs are pair of essential respiratory organs in the humans. They are separated into lobes by fissures, with three lobes on the right and two on the left. The oblique fissure cuts the vertebral border of both the lungs at the level of 4th or 5th thoracic spine. Traced downwards on the medial surface it ends above the hilum; traced downwards on the costal surface it continues across the diaphragmatic surface and turns upward on to the medial surface to end just below the lower end of the hilum. Rosse and Gaddum-Rosse¹. Horizontal fissure, seen only in the right lung begins laterally at the oblique fissure and runs almost transversely across the costal surface to the anterior margin and around this margin back to the hilum to separate a wedge-shaped middle lobe from the upper lobe Last². It passes at the level of midaxillary line to the anterior border of the lung at the level of sternal end of 4th costal cartilage Standing³. Knowledge of their position is necessary for the appreciation of lobar anatomy and thus for locating the bronchopulmonary segments which is significant both anatomically and clinically. The fissures may be complete, when the lobes remain held together only at the hilum by the bronchi and pulmonary vessels, or they may be incomplete when there are areas of parenchymal fusion between the lobes, or, they may be absent altogether Meenakshi *et al.*⁴.

1.1 Embryology: During the development, as the lung grows, the spaces that separate individual bronchopulmonary buds become obliterated except along two planes, evident in the fully developed lungs as oblique and horizontal fissures Larsen⁵. Absence or incomplete fissures could be due to the obliteration of these fissures either completely or partially. Accessory fissure could be the result of non-obliteration of spaces which normally are obliterated Meenakshi *et al.*⁴

II. Materials and Methods: -

40 pairs of lungs removed from cadavers were used to study the variations in fissures (complete or incomplete) and lobes (less than the normal number of lobes or for the presence of extra lobes).

III. Results:-

On the right side four lungs showed the absence of horizontal fissure and had only two lobes (Fig:1). Twelve lungs showed incomplete horizontal fissure (Fig:2) and in fourteen lung specimens inferior lobe showed an accessory lobe(Fig:3). In seven lungs accessory fissures were seen (Fig:4). On the left side in fourteen specimens extra lobe was present in between the two lobes(Fig:5), in four lungs incomplete oblique fissure was present(Fig:6) and in six lungs below the lingula a separate lobe like partition of the lung was seen (Fig:7). In eight lungs accessory fissures were seen (Fig: 8). In two lungs a separate projection was seen below the lingula (Fig:9).

IV. Discussion: -

If the pulmonary development is defective, it will give rise to variations in lobes and fissures of lung Modgil *et al.*⁶. Absence or incomplete oblique or horizontal fissures could be due to obliteration of these fissures either completely or partially Meenakshi *et al.*⁴

Medlar⁷ in his examination of 1200 pairs of lungs found that the horizontal fissure was absent in 45.2% and incomplete in 17.1% of the right-sided lungs. According to Lukose *et al.*⁸ incomplete and absence of horizontal fissure was reported in 21% and 10.5% respectively. Bergman RA⁹ reported incomplete and absence of horizontal fissure in 67% and 21% respectively in right sided lungs. Meenakshi *et al.*⁴ reported that the horizontal fissure was absent in 16.6% and was incomplete in 63.3% of right lungs. According to Prakash¹⁰ the horizontal fissure on right lung was absent in 7.1% and incomplete in 50% of the lung specimens. In our present study the horizontal fissure was absent in 10% of lungs and incomplete in 30% of the lung specimens.

Several authors have reported varying percentages of incidence of the incompleteness of the oblique fissure in the right lungs but in our study we never found any variation regarding that fissure. According to Prakash¹⁰ in right lungs one accessory lobe in the inferior aspect was observed in 27.2% of the lungs, whereas supernumery fissures which were most common in right lower lobe were detected in 35% of lung specimens. In the present study in right lungs one accessory lobe in the inferior aspect was observed (35%) and supernumery fissures were present in 17.5% of lungs.

Medlar⁷, Lukose⁸ and Bergman RA⁹ in their examination on the left sided lungs found incomplete oblique fissure in 10.6%, 21% and 30% respectively. In the present study the incomplete oblique fissure was observed in 10% of the cases. Sometimes, especially in infants, accessory fissures of varying depths can be seen in abnormal locations of the lung, delimiting anomalous lobes which correspond to the normal bronchopulmonary segments and in a radiological point of view, an accessory fissure is important as it can be mistaken for a lung lesion Rosse C & Aldur MM¹¹. In the present study accessory fissures were present in 17.5% and 20% in right and left sided lungs respectively.

V. Figures



Fig :1 Absence of Transverse (or) Horizontal fissure in right lung



Fig: 2 Arrow showing incomplete transverse fissure in the right lung



Fig: 3 In right lung inferior lobe showing an accessory lobe.



Fig: 4 In right lung inferior lobe showing accessory fissure.



Fig: 5 Extra lobe in between the two lobes in the left lung



Fig: 6 Incomplete oblique fissure in the left lung



Fig:7 In the left lung accessory fissure was seen



Fig:8 Radiological view of the Fig :7



Fig: 9 below the lingula an extra projection in the left lung

VI. Conclusion:-

The anatomy of the fissures is used as reliable landmarks in planning the pulmonary resection whereas incomplete fissures may contribute to post-operative air leakage. Incomplete fissures may alter the usual patterns of collapse of the lung seen in with endobronchial lesions and may also give rise to atypical appearance of pleural effusions thus complicating the identification of various pathologic conditions. Pneumonia and carcinoma in a particular lobe is often limited to that lobe alone by the fissures and may spread to adjacent lobes through the incomplete fissures Tarver RD¹². The knowledge of anatomy of fissures of lung may help to clarify confusing radiographic findings like extension of fluid into an incomplete major fissure or spread of various diseases through different pathways Dandy WE Jr¹³. Considering the clinical and surgical importance of such variations, the anatomical knowledge of variations in the fissures and lobes in the lungs may be important for Pulmonologists, Radiologists, Surgeons and Clinicians.

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