

Morphological Variations of The Fissures & Lobes in Cadaveric Human Lungs in Gujarat State



Medical science

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ABSTRACT

The lungs are a pair of essential organs of respiration. Right lung presents three lobes - upper, middle and lower - separated by oblique & horizontal fissures. Left lung present two lobes - upper & lower - separated by oblique fissure. Fifty pairs of cadaveric lungs were used for the study. Six right lungs showed absent horizontal fissures, three showed incomplete horizontal fissures. Four right lungs and six left lungs show incomplete oblique fissures. Two left lung showed accessory fissure. The knowledge of anatomical variations of lung fissure is essential for clinicians & radiologist for recognizing various images of related abnormalities because an anomalous fissure can be mistaken for a lung lesion or an atypical appearance of pleural effusion. Awareness regarding anatomical variations is essential for surgeons in pre-operative planning and strategy for performing pulmonary lobectomies & segmental resection.

Introduction

Lobar anatomy and broncho-pulmonary segments can be appreciated better with knowledge of variations in fissures of the lungs. The right lung is divided into superior, middle and inferior lobes by an oblique and a horizontal fissure. The left lung is divided into a superior and an inferior lobe by an oblique fissure which extends from the costal to the medial surfaces of the lung both above and below the hilum.

The oblique fissure crosses the inferior border of the lung approximately 7.5 cm behind its anterior end. On the posterior border it is either level with the spine of the fourth thoracic vertebra or slightly lower. It descends across the fifth intercostal space and follows the sixth rib to the sixth costochondral junction. The horizontal fissure, which is seen only in right lung passes from the oblique fissure and runs horizontally forwards to the anterior border of the lung, level with the sternal end of the fourth costal cartilage, then passes backwards to the hilum on the mediastinal surface. (Standring S: 2008)

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 S, Manjunath KY, Balasubramanyam V: 2004)

The fissures facilitate the movement of the lobes in relation to one another, which accommodates the greater distention and movement of the lower lobes during respiration. Thus, they help in a more uniform expansion of the whole lung, hence facilitates more air intake. (Rosse C, Gaddum-Rosse P: 1997)

The knowledge of anatomical variations of lobes of the lung is important for identifying precise location, extent and morphology of broncho-pulmonary segments. Many times the radiologists may misinterpret them on an X-ray or a CT scan. Anatomical knowledge of such variations is useful to the radiologists and surgeons to help in making correct diagnosis and for planning lobectomies and segmental resections. (Nene AR, Gajendra KS, Sarma MVR. 2011)

This study aims to find variations in the morphology of lung fissures and lobes in the Indian population and comparing the findings with previous studies to derive a conclusion.

Material & Methods:

Fifty (50) pairs of lungs were obtained from formalin-fixed ca-

davers used for undergraduate dissection classes were used for this study. Details of morphology of lobes and fissures i.e. complete or incomplete, presence of any variant fissure, accessory fissures were recorded.

Results:

Right Lungs

The horizontal fissure was absent in six right-sided lungs and hence middle lobe was not appreciated. The horizontal fissure was incomplete in three lungs and oblique fissure was incomplete in four lungs and hence the lobation was imperfect.

Left Lungs

The oblique fissure was incomplete in six left sided lungs and two of the left lung showed an accessory fissure.

Discussion

Each lung is developed from the lung bud which arises from the distal end of the laryngo-tracheal tube. Distally tube bifurcates into two bronchi

Figure1. Right lung showing an absent horizontal fissure, incomplete oblique fissure



Figure2. Right lung showing incomplete horizontal fissure



Figure3. Left lung showing incomplete oblique fissure



Figure4. Left lung showing accessory fissure



surrounded by clusters of endodermal cells. (Stranding S: 2008) Lung development involves the formation of multiple broncho-pulmonary buds which usually fuse completely in the later part of development except at sites of fissure formation, resulting in the formation of lobes and fissures. Absence or incompleteness of a fissure could be due to obliteration of these fissures either completely or partially. (Larsen WJ: 1993)The presence of fissures in the normal lungs enhances uniform expansion, and their position could be used as reliable landmark in specifying lesions within the thorax, in general and within the lungs in particular. (Kent EM, Blades B.: 1942) authors

(Table 1) have reported varying percentages of incidence of the incompleteness of the fissures. When compared with the studies by Lukose R, Paul S, Sunitha, et al (1999) and Meenakshi S,

et al (2004) lower incidence of variations was observed in all the parameters used in the present study. In the study of Lukose et al (1999) incomplete and absent horizontal fissure was reported in 21%, and 10.5%, respectively. Incomplete oblique fissure was present in 21% of left-sided lungs. When compared with the studies by Nene AR et al (2011) nearly similar variations were observed. In the study of Nene AR et al incomplete and absent horizontal fissure was seen in 8%, and 14% of cases, respectively. Incomplete oblique fissure was seen in 12% of left lungs. In the present study incomplete and absent horizontal fissure was seen in 6% and 12% of cases respectively whereas incomplete oblique fissure was seen in 12% of left lungs.

Table I
Comparison of different studies indicating the variations of major and minor fissures

	Fissure parameter		Present study	Meenakshi et al.	Lukose et al.	Nene AR
Right lung	Oblique fissure	Absent	-	-	-	2%
		Incomplete	8%	36.6%	-	6%
	Horizontal fissure	Absent	12%	16.6%	10.5%	14%
		Incomplete	6%	63.3%	21%	8%
Left lung	Oblique fissure	Absent	-	-	-	0
		Incomplete	12%	46.6%	21%	12%

Table II
Incidence of major and minor fissures of lungs according to Craig and Walker's (1997) criteria

Lung	Fissure	Grade I	Grade II	Grade III	Grade IV
Right lung	Horizontal	78%	6%	4%	12%
	Oblique	82%	10%	8%	0%
Left lung	Oblique	68%	16%	12%	0%

In order to provide a framework for description of operative technique and to allow meaningful comparison between different surgical series, Craig SR, Walker WS (1997) propose a fissural classification based on both the degree of completeness of the fissures and the location of the pulmonary artery at the base of the oblique fissure. Completeness of a fissure is graded in four stages: grade 1--complete fissure with entirely separate lobes; grade 2--complete visceral cleft but parenchymal fusion at the base of the fissure; grade 3--visceral cleft evident for part of the fissure; grade 4--complete fusion of the lobes with no evident fissural line. Incidence of major and minor fissures of lungs according to

The identification of the completeness of the fissures is important prior to lobectomy, because individuals with incomplete fissures are more prone to develop postoperative air leaks, and may require further procedures such as stapling and pericardial sleeves. (Stranding S: 2008)

Accessory fissures of the lung are commonly observed in lung specimens, but are often unappreciated or misinterpreted on radiographs and CT scans. They usually occur at the boundaries between broncho-pulmonary segments. Accessory fissures can be mistakenly confused with areas of linear atelectasis, pleural scars, or walls of bullae. [3] From a radiological point of view, an accessory or anomalous fissure is important as it can be mistaken for a lung lesion. (Godwin JD, Tarver RD: 1985)

In patients with endobronchial lesion, an accessory fissure might alter the usual pattern of lung collapse and pose difficulty in diagnosing a lesion and its extent by giving an unusual appearance. An incomplete major fissure causes the odd appearance of fluid tracking within the fissure. Incomplete fissures may also alter the spread of disease within the lung. Pneumonia in particular lobe is often limited to that lobe alone by the fissures. In patients with incomplete fissures, pneumonia may spread to adjacent lobes through the incomplete fissures. Odd lobar involvement with carcinoma of the lung may be explained on a similar basis. (Tarver RD: 1995)

The knowledge of anatomy of fissures of lung may help clarifying confusing radiographic findings like extension of fluid into an incomplete major fissure or spread of various diseases through different pathways. (Dandy WE: 1978)

Conclusion

The results of present study and their comparison with the previous works show that there is a wide range of difference in occurrence of major, minor and accessory fissures between and among different populations. This implies that a variety of

genetic and environmental factors might affect development of these fissures. Knowledge of such variations might explain bizarre presentation of certain clinical cases pertaining to lung pathologies. Also knowing the frequency of occurrence of a variant fissure in a particular population might help the radiologist and clinician to make correct diagnosis. Similarly, it might help the surgeon to plan, execute and modify a surgical procedure depending on the merit of the case. This will help to reduce the morbidity and mortality associated with lung surgeries.

REFERENCE

1. Aldur MM, Denk CC, Celik HH, Tascioglu AB. An accessory fissure in the lower lobe of the right lung. *Morphologie*. 1997; 81: 5-7. [Cited by; Nene AR 2010] | 2. Craig SR, Walker WS. A proposed anatomical classification of the pulmonary fissures. *J R Coll Surg Edinb*. 1997; 42(4):233-34. | 1. Dandy WE. Incomplete pulmonary interlobar fissure sign. *Radiology* 1978; 128:21-5. | 2. Godwin JD, Tarver RD. Accessory fissures of the lung. *AJR Am J Roentgenol* 1985; 144: 39-47. | 3. Kent EM, Blades B. The surgical anatomy of the pulmonary lobes. *J Thorac Surg*. 1942; 12:18-30. | 4. Larsen WJ. *Human Embryology*. New York, Churchill Livingstone. 1993; 111-130. [Cited by: Nene AR, Gajendra KS, Sarma MVR 2011] | 5. Lukose R, Paul S, Sunitha, et al. Morphology of the lungs: Variations in the lobes and fissures. *Biomedicine* 1999; 19: 227-32. | 6. Meenakshi S, Manjunath KY, Balasubramanyam V. Morphological Variations of the Lung Fissures and lobes. *The Indian J. of Chest Diseases & Allied Sciences*, 2004; 46: 179-82 | 7. Nene AR, Gajendra KS, Sarma MVR. Lung lobes and fissures: a morphological study. *Anatomy* 2011; 5:30-38. | 8. Nene AR, Gajendra KS, Sarma MVR. A variant oblique fissure of left lung. *International journal of anatomical variation*, 2010; 3: 125-127 | 9. Rosse C, Gaddum-Rosse P Hollinshed's textbook of anatomy. Philadelphia: Lipincott-Raven; 1997: 441-61[Cited by Meenakshi S-2004] | 10. Standring S. *Thorax*. In: *Gray's Anatomy*. 39th ed. Edinburgh: Churchill Livingstone, New York, 2005; pp. 1068-9. | 11. Tarver RD. How common are incomplete pulmonary fissures, and what is their clinical significance? *ARJ Am J Roentgenol*.1995;164:761[Cited by: Nene AR, Gajendra KS, Sarma MVR 2011] |