



ORIGINAL RESEARCH PAPER

Radiology

STUDY OF MORPHOLOGICAL VARIATIONS IN FISSURES AND LOBES IN CADAVERIC ADULT HUMAN LUNGS

KEY WORDS: Lungs, horizontal fissure, oblique fissure, accessory fissure, lobes

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ABSTRACT

Introduction: Lungs are vital organ of respiration situated within the thoracic cavity, heart being present in the centre. Fissures present on these lungs divide them into lobes and enhance uniform expansion. These fissures may be complete, incomplete or absent. These fissures are important landmarks for identification of normal pulmonary anatomy and evaluation of diseases. Knowledge of anatomical variations is required by radiologists and cardiothoracic surgeons for independent and accurate interpretation of imaging technologies. **Aims and objective:** To study the morphological variations in the fissures and lobes in human cadaveric lungs and compare them with previous studies. **Materials and Method:** 104 cadaveric lungs obtained from formalin fixed adult cadavers removed during routine dissection were used. The lung specimens were observed for the following: 1. Presence of fissures 2. Variation in fissures: Complete, Incomplete, Absent 3. Accessory fissures, if any The anatomical classification proposed by Craig and Walker was followed to determine the presence of completeness of fissures. **Result:** 3 right lungs showed absence of horizontal fissures and 35 showed incomplete horizontal fissures, 20 showed complete oblique fissures and 17 showed incomplete oblique fissures and 4 showed accessory fissures. On the left side 27 showed incomplete and 10 showed complete oblique fissures while 2 showed incomplete and 35 showed absence of horizontal fissures. **Conclusion:** Knowledge of such variations might explain the bizarre presentation of certain classical clinical cases pertaining to lung pathologies. Frequency of occurrence of a variant fissure in a particular population might help the radiologist and clinicians to diagnose, plan, execute and modify surgical procedures. The study also shows that parenchymal fusion of various extents is a very common entity of oblique fissure of lung. This implies that a variety of genetic and environmental factors might affect development of these fissures.

INTRODUCTION:

There are two pair of lungs in the thoracic cavity. Right lung is broader and heavier. Right lung is divided into three lobes namely, upper, middle and lower lobe, in the presence of horizontal and oblique fissures. Lower lobe and other two lobes are separated by oblique fissure. Oblique fissure runs inferiorly and 7.5cm behind anterior end. Upper and middle lobes are separated by horizontal fissure. It cuts the anterior border at inner end of fourth costal cartilage. Finding accessory lobe is difficult in radiography and hence it is missed or misinterpreted.¹

The lungs are divided into complete and incomplete lobes by complete or incomplete fissures. The lobes are held together only at hilum when fissures are complete. While performing the segmental resection of infected bronchopulmonary segments, understanding of variations in fissural and lobar pattern is of clinical importance to the surgeons. It is also very important for radiologists to have knowledge about the lobes.²

An accessory fissure is a cleft of various depth which is lined by visceral pleura. They occur at the borders of bronchopulmonary segments.³

The bottom of fissure contains the terminal part of the azygos vein, in the free margin of a mesentery which is derived from the mediastinal pleura, and forms "lobe of the azygos vein." This may be misinterpreted as lung lesions.⁴

OBJECTIVES:

To examine lung specimens with respect to the morphology of fissures and lobes,

- To grade the fissures according to Craig and Walker criteria
- To observe for accessory fissures
- To compare with previous studies.

MATERIALS AND METHODS:

- 104 cadaveric lungs will be used for the study in which 54 are right lungs and 50 are left lungs
- Obtained from formalin fixed adult cadavers removed during routine dissection from different medical colleges in Bangalore with prior permission
- The lung specimen were observed for the following:
 - Grading of fissures
 - Presence of fissures
 - Variation in fissures: Complete, Incomplete, Absent
 - Accessory fissures, if any

The anatomical classification proposed by Craig and Walker was followed to determine the presence of completeness of fissures.

Grades	Craig and Walker Criteria of completeness of a fissure
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 fissure line

Need of Study:

- These fissures are important landmarks for proper identification of normal pulmonary anatomy and evaluation of diseases.
- Knowledge of anatomical variations is required by radiologists and cardiothoracic surgeons for independent and accurate interpretation of imaging technologies.
- Surgeons approach to ligate the vessels and bronchi through the depth of the fissures.
- Postoperative air leakage is common in incomplete fissure.
- Accessory fissure are often unappreciated or misinter-

preted with areas of pleural scars or walls of bullae .

Inclusion Criteria:

- Lungs without any pathological changes .
- Undamaged lungs .
- Prior permission from other medical colleges.

Exclusion Criteria:

Damaged and diseased lungs were excluded.

Statistical Analysis:

- The study is based on descriptive statistics where the proportion of various grades of fissures will be taken into consideration.

LIMITATIONS:

- Study period was short.
- Sample size was subjected to availability of lungs in the anatomy department of different medical colleges .

RESULTS:

3 right lungs showed absence of horizontal fissures and 35 showed incomplete horizontal fissures, 20 showed complete oblique fissures and 17 showed incomplete oblique fissures and 4 showed accessory fissures. On the left side 27 showed incomplete and 10 showed complete oblique fissures while 2 showed incomplete and 35 showed absence of horizontal fissures.

Right Lung:

Table 1 Grading of Right Lung

Grade	Oblique	Horizontal		
Grade 1	23	5	28	Oblique=42.6 Horizontal=9.26
Grade 2	23	14	37	Oblique=42.6 Horizontal=25.9
Grade 3	8	27	35	Oblique=14.8 Horizontal=50
Grade 4		8	8	Oblique=0 Horizontal=14.8

Left Lung:

Table 2 Grading of Left Lung

Grades	Oblique	Horizontal	Percentages
Grade 1	19		38
Grade 2	20		40
Grade 3	11		22
Grade 4			

Table 3 Study and Comparison of Fissures in Right and Left Lung with other Studies

			Present study	Lattupalli hema	Meenakshi et al.	Lukose et al.
Right lung	Oblique	Absent	0	0		
		Incomplete	57.4	10	36.6	
	Horizontal	Absent	14.8	10	16.6	10.5
		Incomplete	75.9	8	63.6	21
Left lung	Oblique	Absent	0	2		
		Incomplete	62	8	46.6	21

DISCUSSION:

Table 4 Comparison of Present Study with Previous Studies.

Authors and year	Method of study	Absent /incomplete horizontal fissure of right lung	Incomplete oblique fissure of right lung	Incomplete oblique fissure of left lung
Medlar, 1947 ⁵	Cadaver and specimen	62.3	25.6	10.6-18

Lukose et al, 1999 ⁶	Cadaver and specimen	31.5		21
Meenakshi et al, 2004 ⁷	Cadaver and specimen	63.3	36.6	46.6
Nene ar et al, 2011 ⁸	Cadaver and specimen	68	70	30
Lattupatti hema, 2014 ⁹	Cadaver and specimen	18	10	8
Present study	Cadaver and specimen	90.7	54.7	62

- 2 right lungs and 4 left lungs showed the presence of accessory fissures
- Enakshi Gosh¹⁰ studies (2013) in 82 specimen 46 right and 36 left
- One lung showed absence of oblique fissure and 22 right lungs had no horizontal fissures.
- Among the left lungs studied incomplete oblique fissure were seen in 29 lungs

CONCLUSION:

- Knowledge of such variations might explain the bizarre presentation of certain classical clinical cases pertaining to lung pathologies.
- Frequency of occurrence of a variant fissure in a particular population might help the radiologist and clinical to diagnose, plan, execute and modify surgical procedures
- The study also shows that parenchymal fusion of various extents is a very common entity of oblique fissure of lung.
- This implies that a variety of genetic and environmental factors might affect development of these fissures.

Figures:

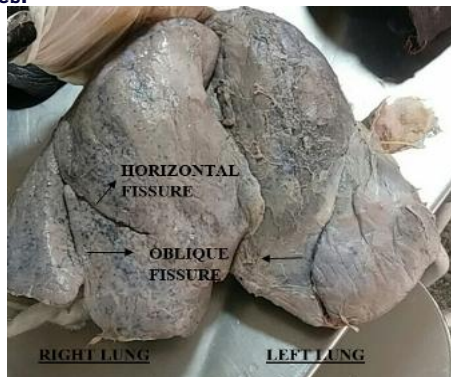


Figure 1 Lung Fissures



Figure 2 Right Lungs



Figure 3 Left Lungs



Figure 4 Right Lung Showing Absence of Horizontal Fissure

Grading Of Fissure: grade 1 Fissure



Figure 5 Grade 1 Fissure



Figure 6 Grade 2 Fissure



Figure 7 Grade 3 Fissure



Figure 8 Lung Showing Accessory Fissure



Figure 9 Lung Showing Accessory Fissure

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