

Study of the Variations in Lobes and Fissures of the Lung- A Cadaveric Study

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Abstract

Aim of the study: Aim is to study the variations in the lobes and fissures of lung and its applied importance in clinical or surgical fields. **Materials and Methods:** In the dissection hall of BRIMS Bidar, Karnataka 49 lungs were taken from the cadavers (formalin fixed) and the details were photographed and recorded. **Results:** 100% of the lungs from female cadavers and 61.90% of the lungs from the male cadavers were found without any variations and anomalies. Where as 9.52% of the lungs of the right side had the absent horizontal fissure pattern and 16.67% of them were with horizontal fissure that was incomplete on the right side in males. Also 11.90% of the male cadavers had the tubular heart. **Conclusion:** Lungs develop from the endodermal foregut. The presence of the anomalous fissure pattern and any other anomaly is as a result of the defect in the development of lung during the embryonic life. It is important to study the morphology of the lungs thoroughly before planning for surgical resections of lung and lobectomies so as to avoid the spread of the infection as a result of an anomalous fissure pattern.

Keywords: Horizontal fissure, anomalous fissure, Lung Lobes, lobectomy.

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Introduction

One of the most important organs of the body are the lungs, which are the primary organs of respiration. These paired organs being the right Lung and the left lung are situated in the thoracic cavity[1]. The lung on the left side is divided by an interlobular fissure(oblique) into two lobes, an upper and a lower Lobe and the right lung is divided by two interlobular fissures(oblique and horizontal) into three lobes-superior, middle, and inferior, by two interlobular fissures(oblique and horizontal). The oblique fissure of the right lung corresponds closely with that of the left lung[2]. The pulmonary fissures are necessary for the uniform expansion of lungs. These fissures may vary and divide the lobe into further smaller divisions and fissures those are complete have continuity of the lobes at their bottom[3]. This study we have conducted with an aim to study the normal anatomical variations in the lung and assess its clinical and surgical implication to help and contribute to the field of pulmonology and thoracic surgeries as it is very significant to understand the variations in the morphology of the lung such as the number of lobes, fissures etc.

Materials and Methods

This study was conducted on 41 cadavers of the Dissection hall of Bidar Institute of Medical Sciences during August 2014 to April 2020 and on 8 cadavers of the Dissection hall of Gulbarga Institute of Medical Sciences, Gulbarga during 2019-2020. The cadavers were approximately in between the ages 45 and 70 years. The study was conducted on the right and left lung of 49 cadavers that included 42 male and 7 female cadavers. During the dissection of the thoracic

region, the thoracic cage was carefully cut partially and removed. Both the lungs were examined in situ, and then they were taken out and placed in an examination tray. Both lungs were carefully examined, Photographed and the details of fissures and lobes were written. The variations were highly considered and the data was accordingly recorded, tabulated and analyzed statistically.

Institutional Ethical Clearance was obtained for the present study from the ethical clearance committee.

Results

49 pairs of lung were taken and studied (49 right and 49 left) from 42 male cadavers and 7 female cadavers. The data was analyzed statistically and the percentage was also calculated. The following are the results with photographs and tabulations. 100% of the left lungs in both males and females were completely normal morphologically. 100% of females and 61.90% of males had the normal morphology of right lungs. The right lung had an absence of horizontal fissure in 9.52% and 16.67% of male cadavers had a horizontal fissure that was found incomplete. Also 11.90% of the male cadavers had the tubular heart. There were no accessory lobes or fissures found during the study. Table-1 and Table-2 represent the above-mentioned results and the statistical analyses done. Figures 1, 2 and 3 represent the Horizontal fissure that was found absent in the right lung. Figures 4 and 5 represent the right lung found in situ. Figure 6 represent the lung with incomplete right pulmonary horizontal fissure respectively.

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Table 1:Results obtained

Statistical Analyses	Fissures on lung of Right side	Lobes on lung of Right side	Fissures on lung of Left side	Lobes on lung of left side
Mean	1.69	2.69	1.00	2.00
SD	0.62	0.62	0.00	0.00
Abnormal (%)	14.29	14.29	0.00	0.00
Normal (%)	77.55	77.55	100.00	100.00
Absent (%)	0	0	0	0

Table 2:Parameters

	Female	Male
No Anomaly (%)	100.00	61.90
IRPHF* (%)	0.00	16.67
ARPHF* (%)	0.00	9.52
Tubular Heart (%)	0.00	11.90
Total (%)	100.00	100.00

*IRPHF- Incomplete Right Pulmonary Horizontal Fissure

*ARPHF- Absent Right Pulmonary Horizontal Fissure



Fig 1,2,3:Right Lungs with absent Horizontal Fissure

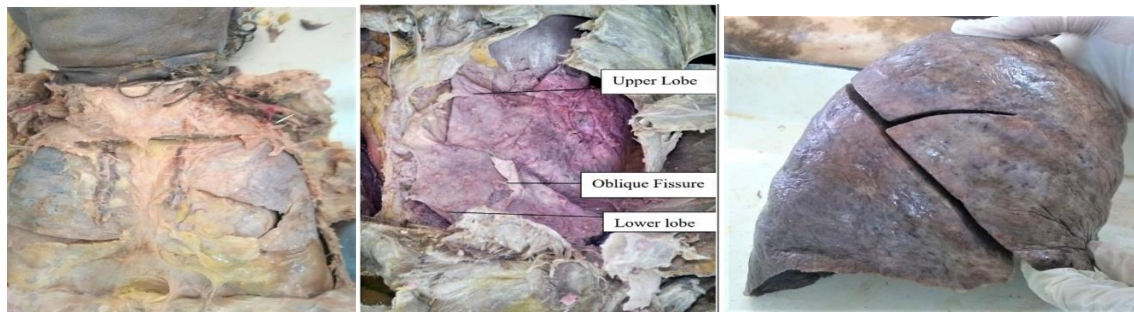


Fig 4,5:The Right Lung In-situ

Fig 6:The Incomplete RPHF

Table 3: The results of previous studies and their comparison with the present study

Authors	Lung of the Right Side				Lung of the left side	
	Oblique Fissure		Horizontal Fissure		Oblique Fissure	
	Incomplete	Absent	Incomplete	Absent	Incomplete	Absent
Medlar[4]	25.60%	4.80%	62.30%	-	10.60%	7.30%
Lukose et al[5]	-	-	21%	10.50%	21%	-
Meenakshi et al[6]	36.6%	-	63.30%	16.60%	46.60%	-
Prakash et al[7]	39.30%	7.10%	50%	7.10%	35.70%	10.70%
Quadros et al[8]	5.55%	-	25%	11.11%	2.50%	-
Bincy M. George et al[9]	3.07%	-	3.07%	35.38%	15.06%	-
Dimple Mote et al[10]	16.6%	-	6.6%	13.3%	3.3%	-
SubhalakshmiWahengbam et al[11]	42.86%	7.14%	61.90%	19.05%	40.54%	2.70%
Present Study	-	-	16.67%	9.52%	-	-

Discussion

Many authors have reported variations in the pattern of fissures and lobes of the lung. Lungs develop from the endodermal foregut. Embryonic, pseudo glandular, canalicular, saccular, and alveolar are

respectively the stages of lung development. The boundaries between these stages are not sharp; rather, overlap occurs between various gestational ages and individuals[12]. At around 28 days of fertilization during the stage of development, the lung tissue forms

multiple bronchopulmonary buds and the fissures separate individual bronchopulmonary buds/segments and later become obliterated. In a fully developed lung, the spaces remain along interlobar planes that give rise to major (oblique) and minor (horizontal) fissures[13]. Above table-3 indicates the results of previous studies and their comparison with the present study. In a study done by Medlar[4] it was found that 25.60% of incomplete, 4.80% of absence of oblique fissure and 62.30% of incomplete horizontal fissure of the right lung and 10.60% of incomplete, 7.30% of absent oblique fissure of the left lung respectively. Lukose et al[5] found 21% of incomplete and 10.50% of absent horizontal fissure of the right lung and 21% incomplete oblique fissure of the left lung respectively in their study. Meenakshi et al[6] found 36.6% of incomplete oblique fissure and 63.30% of incomplete, 16.60% of absent horizontal fissure of the right lung and 46.60% incomplete oblique fissure of the left lung respectively in their study. The study done by Prakash et al⁷ found 39.30% of incomplete, 7.10% of absence of oblique fissure and 50% of incomplete, 7.10% of absent horizontal fissure of the right lung and 35.70% of incomplete, 10.70% of absent oblique fissure of the left lung respectively. In a study by Quadros et al[8] it was found that 5.55% of incomplete oblique fissure and 25% of incomplete, 11.11% of absent horizontal fissure of the right lung and 2.5% of incomplete oblique fissure of the left lung respectively. In a similar study by Bhima Devi et al. 9% of the right lungs studied showed incomplete oblique fissure while in the study of Nene et al as 6% [15,16]. B. M. George et al[9] found 3.07% of incomplete oblique fissure and 3.07% of incomplete, 35.38% of absent horizontal fissure of the right lung and 15.06% incomplete oblique fissure of the left lung respectively in their study. The study done by Dimple Mote et al[10] found 16.6% of incomplete oblique fissure and 6.6% of incomplete, 13.3% of absent horizontal fissure of the right lung and 3.3% of incomplete oblique fissure of the left lung respectively. Subhalakshmi Wahengbam et al[9] found 42.86% of incomplete, 7.14% of absent oblique fissure and 61.90% of incomplete, 19.05% of absent horizontal fissure of the right lung and 40.54% incomplete, and 2.70% of the oblique fissure of left lung respectively in their study. This study has found 11.36% of incomplete and 12.64% of absent horizontal fissure on the right lung respectively. There was no evidence of an incomplete or absent oblique fissure in both the lungs as found in the previous studies which is a matter to be considered. The fissures of lung are essential as they form the boundaries for the lobes of the lungs. Information about the incomplete separation of the lobes and the identification of such fissures is significant before planning lobectomies as persons with incomplete fissures are liable to develop postoperative complications such as air leaks and may require procedures such as stapling or pericardial sleeves later[14].

Conclusion

The study concludes with a few important aspects which are needed to be considered before going for any clinical examination or surgery of the thoracic region. The Lungs develop from the endodermal foregut. The presence of the anomalous fissure pattern and any other anomaly is as a result of the defect in the development of lung during the embryonic life. It is important to study the morphology of the lungs thoroughly before planning for surgical resections of lung and lobectomies so as to avoid the spread of the infection as a result of an

absent fissure or an incomplete fissure. Thus, the present study helps in knowing the anatomical variations that could be found in various individuals. This study can not only help in the clinical examination and thoracic surgeries but also this knowledge can be added to the field of radiology to evaluate the CT, MRI and other techniques done in diagnosis of the disease and planning for the various surgeries and prevent the life threatening complications that could occur during the intra- operative and Post- operative period.

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