

Morphological Variations of the Lung Fissures and LobesA.Senthamizchelvan¹, P.Mangaiyarkkarasi², E.Manikandan³^{1,2}Assistant Professor, Department of Anatomy, Government Thanjavur Medical College, Thanjavur³Tutor, Department of Anatomy, Government Medical College Nagapattinam, Nagapattinam

Received: 25-07-2023 / Revised: 28-08-2023 / Accepted: 30-09-2023

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Conflict of interest: Nil

Abstract:

Introduction: Awareness of anatomical variation in lung is essential for doing segmental lobar resections of lungs. This study aims to find variation in morphology of lung fissures and lobes in Indian population to provide data for radiologists and surgeons for correct diagnosis and plan of surgery.

Methods: Morphological variations of fissures and lobes of the lungs were studied in 24 right and 26 left isolated lungs from dissection hall from a tertiary care teaching hospital.

Results: Horizontal fissure was absent in 12.5 % and incomplete horizontal fissure in 12.05%. In right lungs oblique fissure incomplete in 11.5%. Various parameters were measured by inch tape in cms. In right lung specimens heights were 14-16 cms in 41.6% and 17-21 cms in 58.4%. The breadth at the level of hilum 9-12cms in 70.84% and 13-14cms in 29.16%. The width of the right lungs at the apex level 3-4cms in 58.4% and 5-6 cms in 41.6% and width at the level of base is 10-13 cms in 75% and 14-15cms in 25%. The length of oblique fissure is 12-15 cms in 63.6% and 16-18 cms in 36.4%, the length of horizontal fissure were 4-6 cms in 33.3%, 7-9 cms in 29.2%, 10-12cms in 25% and absent fissures in 12.5% specimens. The height of left lung specimens was about 14-16 cms in 38.4% and 17-21 cms in 61.6%. Breadth at the level of hilum was 8-11 cms in 46.2% and 12-14 cms in 53.8% specimens. The width of left lung at the level of base were about 10-12 cms in 61.6% and 13-15 cm in 38.4%. The length of oblique fissure of left lungs were about 12-14 cms in 23%, 15-17cms in 30.7%, 18-22cms in 38% and incomplete (4 cms) in 7.7%. One left lung show 2 fissures about 4%.

Conclusions: The nature of fissure is of great importance in planning operative strategy of thoracoscopic pulmonary resection. An incomplete fissure may contribute to postoperative air leakage. Incomplete fissure mimic usual patterns of collapse seen in patients with bronchial lesions and may also give rise to appearance of pleural effusions. Also they alter the spread of disease within lung. Hence awareness regarding anatomical variations is essential for performing lobectomies and segmental resection and interpreting radiological images.

Keywords: Lung, Fissure, Anatomical Variations.

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Introduction

The lungs are essential organs of respiration and are situated in the thoracic cavity on either side of the mediastinum. The lungs are divided by fissure into lobes which facilitate movements of lobes and accommodate the greater distension of the lower lobes during the respiration [1]. Amongst the pair, the right lung is divided into three lobes upper, middle and lower by oblique and horizontal fissures and the left lung is divided into two lobes namely upper and lower lobes by oblique fissure [2]. The oblique fissure runs downwards and forwards crossing the posterior border about 6cm below the apex and inferior border about 5 cm from the median plane. The horizontal fissure runs horizontally at the level of fourth costal cartilage and meets the oblique fissure in the midaxillary line. Knowledge of the normal position of fissures is necessary for their appreciation of lobar anatomy and thus for locating the bronchopulmonary

segments which is significant both anatomically and clinically. Hence the awareness of their variations is essential in performing lobectomies and in surgical resection [3-5]. It could also be of significance in interpreting radiological images. [7,9] In the current study, we focused on the morphological variations of lobes and fissures of both lungs in the south Indian cadaveric specimens.

Materials and Methods

The present study was carried out in 50 lungs (24 right and 26 left) specimens which were formalin fixed, preserved in the dissection hall of Anatomy Department of Government Thanjavur Medical College, Thanjavur. The lungs were belonged to the adult age of 45-75 years. No gender difference of the lungs was made in this study. Any part of the lung was cut off during removal. Such lung was excluded from the study. The following parameters

were noted, lobes, number of fissures, height, breadth and width.

Results and observations:

Right Lung: We started our analysis with right lung. The height of right lung ranged from 14-16 cm in 10(41.6%) and 17-21 cm in 14 (58.4%) specimens. In the present study the breadth of right

lung ranges from 9-12 cm in 17 (70.8%) and 13-14 cm in 7 (29.2%) specimens respectively. The width of right lung at the level of apex ranged from 3-4 cm in 14 (58.4%) and 5-6 cm in 10(41.6%) specimens. In the present observation, the width of right lung at the level of base ranged from 10-13 cm in 18(75%) and 14-15 cm in 6 (25%) specimens.

Table 1: Measurement of right lung

SI No.	Height in cm	No of specimen	Percentage
1.	14-16 cm	10	41.6%
2.	17-21 cm	14	58.4%
SI No.	Breadth in cm	No of specimens	Percentage
1.	9-12 cm	17	70.8%
2.	13-14 cm	7	29.2%
SI No.	Width at apex level	No of specimens	Percentage
1.	3-4 cm	14	58.4%
2.	5-6cm	10	41.6%
SI No.	Width at the level of base	No of specimens	Percentage
1.	10-13cm	18	75%
2.	14-15 cm	6	25%

Next we measured fissures of the right lung, the length of the oblique fissure of right lung ranged from 12- 15cm (58.33%) in 14 and 16-18 cm (41.67%) specimens. The length of horizontal fissure is 4-6 cm in 8(33.37%), 7-9 cm in 7(29.13%), 10-12cm in 6(25%) specimens. Three specimens showed absent fissures (12.5%).

Table 2: Fissures of right lung

SI No.	Oblique fissure length in cm	No of specimens	Percentage
1.	12-15 cm	14	58.33%
2.	16-18 cm	10	41.67%
SI. No	Horizontal fissure length in cm	No of specimens	Percentage
1.	4-6 cm	8	33.37%
2.	7-9cm	7	29.13%
3.	10-12cm	6	25.0%
4.	Absent minor fissure	3	12.50%



Figure 1: Absent Horizontal fissure in right lung

Left Lung: Next we started analysis of left lung, in the present study the height of left lung ranged from 14-16cm in 10(38.46%) and 17-21 cm in 16(61.54%) specimens.

In the present study the breadth of left lung at the level of hilum is 8-11 cm in 12 (46.16%) and 12-14

cm in 14 (53.84%) specimens. In the present study the width of left lung at the level of apex is 3- 5 cm in 22 (84.62%) and 6-7 cm in 4 (15.38%) specimens. The width of the left lung at the level of base is 10-12 cm in 16 (61.54%) and 13-15 cm in 10 (38.46%) specimens.

Table 3: Measurement of left lung

SI No.	Height in cm	No of specimens	Percentage
1.	14-16cm	10	38.46%
2.	17-21 cm	16	61.54%
SI No.	Breadth at hilum	No of specimens	Percentage
1.	8-11 cm	12	46.16%
2.	12- 14 cm	14	53.84%
SI No.	Width at the apex	No of specimens	Percentage
1.	3-5 cm	22	84.62%
2.	6-7 cm	4	15.38%
SI No.	Width (base) in cm	No of specimens	Percentage
1.	10-12 cm	16	61.54%
2.	13-15 cm	10	38.46%

Coming to fissures in left lung, in the present study of left lungs one lung show two fissures out of twenty six where others have oblique fissure alone. In the present study oblique fissure in left lung was observed by measuring its length .Out of 26 left lung 2 lung showed incomplete fissure about less than 5 cms approximately in 8% of study specimens, others ranges from 12-22 cms.

Table 4: Fissures in left lung

SI No.	Fissures in left lung	No of specimens	Percentage
1.	Oblique fissure alone	25	96.15%
2.	Two fissures	1	3.85%
SI No.	Length of oblique fissure	No of specimens	Percentage
1.	12-14cm	6	23.08%
2.	15-17cm	8	30.76%
3.	18-22 cm	10	38.46%
4.	Incomplete 4cm	2	7.70%

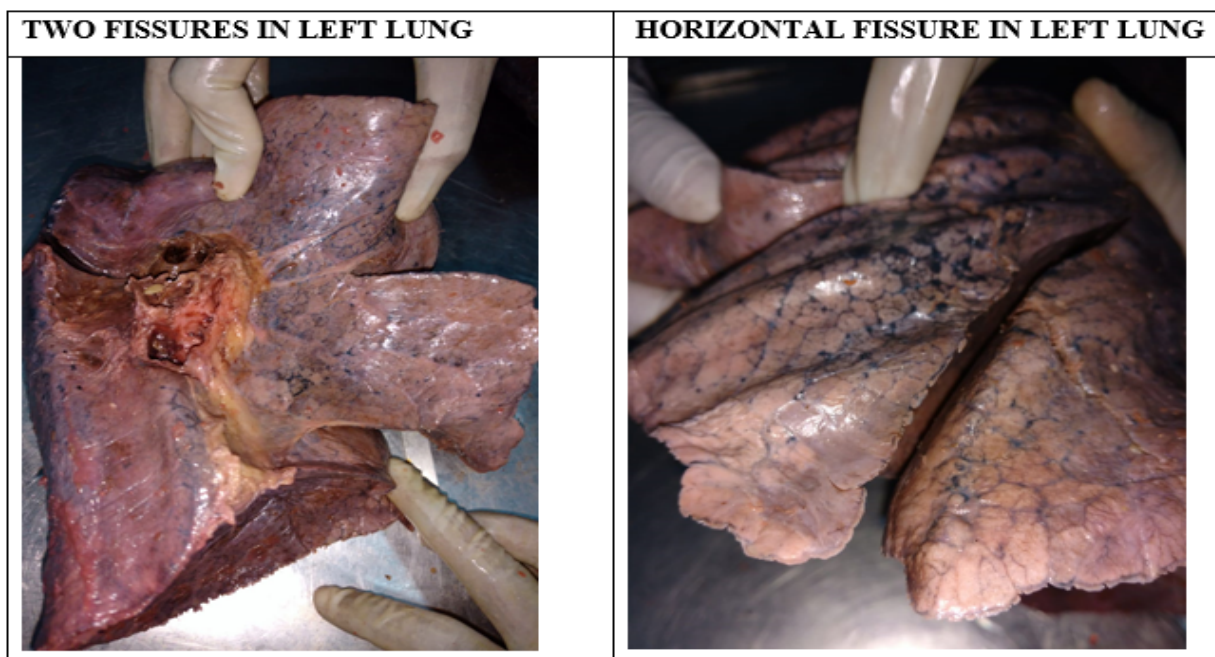


Figure 2: Abnormal fissures in left lung



Figure 3: Incomplete horizontal and Oblique Fissure – Right and Left Lung

Discussion

The present study done in 50 lungs (24 right & 26 left) showed height of both lung ranges between 17-21cms around 60 % of specimens and 14-16 cms in 40 % specimens approximately. Among the right lung specimens examined, 3 lungs (12.5%) showed absence & 3 lungs (12.5%) showed incomplete horizontal fissure, others 18 (75%) found normal. None of the right lung specimens showed any accessory fissure. Among left lungs one lung showed two fissures out of twenty six where others have oblique fissure alone approximately 4%. Out of 26 left lung 2 lung showed incomplete fissure about less than 5 cms approximately in 8% of study specimens, others ranges from 12-22 cms. The results obtained from this study is compared with various studies like Ghosh E [6] and Meenakshi S et al. [1] Ghosh E did study in 82 human lungs whereas Meenakshi S et al did their studies in 30 pairs of human lung.

In a study done by Ghosh E the observation was as follows among the right lung specimens examined, one lung showed absence of oblique fissure & 22 right lungs had no horizontal fissure. None of the right lung specimens showed any accessory fissure. Among the left lung specimens studied, incomplete oblique fissure was seen in 29 lungs & absence of oblique fissure in two lung specimens.

Similarly the results of Meenakshi et al studies as follows, five right-sided lungs showed absence of horizontal fissure, 19 showed incomplete horizontal

fissure. Eleven right-sided and 14 left-sided lungs showed incomplete oblique fissure and two right-sided lungs showed both absence of horizontal fissure and an incomplete oblique fissure. Accessory fissure was seen in three left-sided and one right-sided lung.

Results of Niranjana [13] study done in 2014 are as follows, Nine out of 30 left lungs showed incomplete oblique fissures. Eight out of 30 right lungs showed incomplete transverse fissure but oblique fissure was complete, and in two right lungs, incomplete oblique and transverse fissures were found. In one cadaver one accessory lobe and one accessory fissure was present, on right side. As comparing with above studies the findings of our studies shows more significance values [10,11].

In the present study, the height of right lung ranges from 17-21cm 58.3% whereas the left lung is 61.5%. So the right lung is shorter than left lung. The breadth of right lung ranges from 13-14 cm is 29.16% whereas the left lung is 53.8%. Hence the left lung is broader than right lung. The width at the level of apex of right lung ranges from 3-4 cm is 58.3% whereas left lung is 84.6%. The length of oblique fissure ranges from 12-15 cm is 63.6% whereas in left lung is 23%. Oblique fissure of right lungs in the present study was incomplete in 6.67% while Nene et al [12] observed 6%, Prakash et al [8] showed 9%.

Conclusion

The nature of fissure is of great importance in planning operative strategy of thoracoscopic pulmonary resection.

An incomplete fissure may contribute to postoperative air leakage. Incomplete fissure mimic usual patterns of collapse seen in patients with bronchial lesions and may also give rise to appearance of pleural effusions.

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