

MORPHOLOGICAL STUDY OF LOBES, FISSURES AND PULMONARY HILAR STRUCTURES

Neil James ^{*1}, K. Girija Kumari ², Narayanaperumal Mugunthan ³.

^{*1} Post-graduate student, Department of Anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu, India.

² Professor and Head of the Department, Department of Anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu, India.

³ Professor, Department of Anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu, India.

ABSTRACT

Introduction: The organs of respiration, a pair of lungs, are present in the thorax one in each side of the mediastinum. The right lung has two fissures – oblique and horizontal, and the left lung has a single oblique fissure. The division of the lung into different lobes by the fissures helps in the relative movement of the lobes with respect to one another, thereby contributing to the uniform expansion of the lung. Variations are seen in the number and pattern of fissures, as well as the number and arrangement of hilar structures. Knowledge of the normal morphology of the lung as well as the common variations are essential prerequisites for radiologists, pulmonologists and surgeons.

Materials and methods: The variations in the number of fissures, lobes, and arrangement of hilar structures were studied in the right and left lungs of 25 formalin fixed cadavers at Sree Mookambika Institute of Medical Sciences, Kulasekharam.

Results: Left lungs - one lung (4%) had two fissures and three lobes. Hilar structures were normal in number and arrangement. Right lungs - Number and pattern of fissures and lobes were normal in all the specimens. Six lungs (24%) had variations in hilar structures with 4 (16%) of them having a single bronchus, two lungs (8%) having three pulmonary veins and one lung (4%) having the atypical arrangement of hilar structures in which the bronchus and pulmonary artery at the same level.

Conclusion: Prior anatomical knowledge and possible variations in the number of fissures, lobes, and arrangement of hilar structures, which may be regionally different and are essential prerequisites for clinicians, radiologists and surgeons.

KEY WORDS: Lung, Pulmonary, Fissure, Lobe, Hilum.

Address for Correspondence: Dr. Neil James, Post-graduate student, Department of Anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam – 629161, Tamil Nadu, India.

E-Mail: neiljames.e@gmail.com

Access this Article online	Journal Information
Quick Response code  DOI: 10.16965/ijar.2019.103	International Journal of Anatomy and Research ISSN (E) 2321-4287 ISSN (P) 2321-8967 https://www.ijmhr.org/ijar.htm DOI-Prefix: https://dx.doi.org/10.16965/ijar 
	Article Information
	Received: 05 Jan 2019 Peer Review: 06 Jan 2019 Revised: None
	Accepted: 15 Feb 2019 Published (O): 05 Mar 2019 Published (P): 05 Mar 2019

INTRODUCTION

The organs of respiration, a pair of lungs, are present in the thorax one in each side of the mediastinum. The right lung is shorter, wider

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The medial surface of the lung consists of anterior mediastinal and posterior vertebral surfaces. The mediastinal surface has a triangular depression called the hilum. The hilum gives passage to the structures entering and leaving the lung, and these structures together form the root of the lung. The normal arrangement of structures in the hilum is different between the right and left lungs. The right lung has the eparterial bronchus, pulmonary artery, hyparterial bronchus and lower pulmonary vein arranged from above downwards. Before backwards, the structures are upper pulmonary vein, pulmonary artery and bronchus. The left lung has the pulmonary artery, bronchus and lower pulmonary vein arranged from above downwards. The arrangement of structures from before backwards is the same as that of right lung [1].

Studies on the morphology of lung are scarce from the southern Tamil Nadu region. Knowledge of the normal morphology of the lung as well as the common variations are essential prerequisites for radiologists and surgeons. Such knowledge also helps the radiologists in proper interpretation of imaging studies and in avoiding misinterpretation of lesions of the lung. In the current study, we have reported the morphological variations of cadaveric lung specimens from the southern Tamil Nadu region.

MATERIALS AND METHODS

The study was conducted at Sree Mookambika Institute of Medical Sciences, Kulasekharam. A total of 50 lungs from 25 embalmed adult cadavers were studied. The right and left lungs were of equal proportion. Gender difference was not made. The morphology of the lungs, which include the number of lobes and fissures were

noted, along with the pattern of arrangement of the hilar structures. Craig and Walker's classification was used to gauge the completeness of the fissures [3].

RESULTS

Among the 25 left lungs studied, 24 did not have any variation in the number of fissures or lobes, and arrangement of hilar structures. One left lung (4%) had three lobes separated by two fissures, one oblique and the other horizontal (fig. 1).

All of the 25 right lungs had three lobes separated by two fissures (oblique and horizontal). However, six lungs (24%) showed some variation in the number and pattern of arrangement of the hilar structures. Four lungs (16%) had an undivided principal bronchus entering the hilum (fig. 2). One lung (4%) had its undivided bronchus and pulmonary artery lying at the same level in the hilum (fig. 3). Two lungs (8%) showed three pulmonary venous openings in the hilum, of which one lung had a venous opening lower down in the pulmonary ligament (fig. 4).

Fig. 1: Left lung showing three lobes separated by two fissures, one oblique and the other accessory.

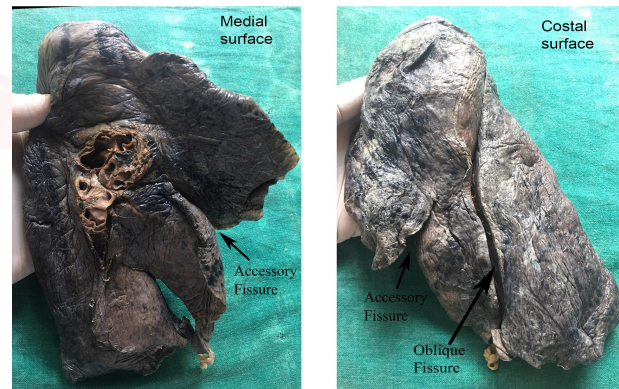


Fig. 2: Right lung showing a single principal bronchus entering the hilum.

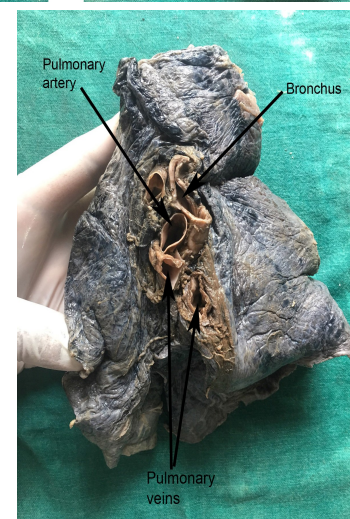


Fig. 3: Right lung showing bronchus and pulmonary artery at the same level.

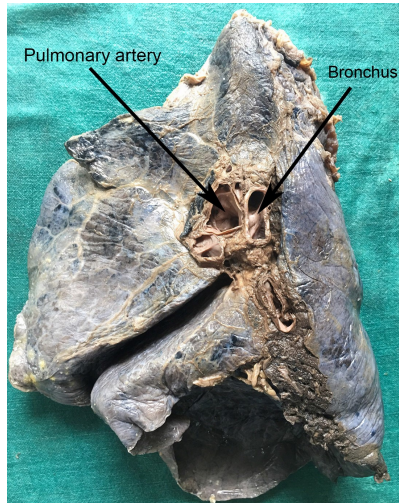
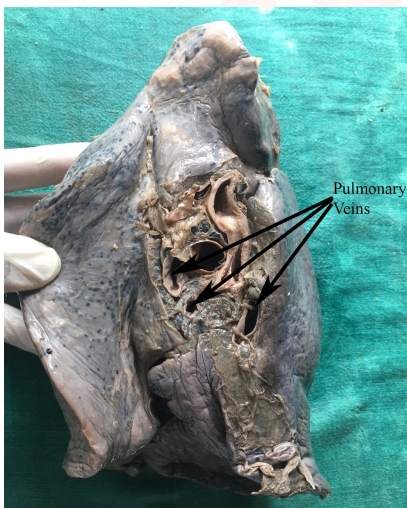


Fig. 4: Right lung showing openings of three pulmonary veins in the hilum.



DISCUSSION

During the development of the lung, numerous bronchopulmonary buds form separately, which later fuse together. The fusion does not occur at the sites of formation of the fissures, thereby resulting in the formation of lobes of the lung [4]. Any variant fusion of the bronchopulmonary buds results in variations in the fissures and lobes of the lung [5].

In the present study, variation in fissures and lobes was seen only in one left lung (4%), which had an additional horizontal fissure and thereby three lobes. Similar findings in left lung had been reported by George et al. in 2.73% of the 73 left lungs they had studied [6]. Hema had reported the same variation in 4 of the 25 left lungs she had studied [7]. Khedekar and Hattangdi had reported a similar finding in 8% of the 25 left lungs they studied [8].

Quadros et al reported an accessory fissure in 9 (22.5%) of the 40 left lungs they studied [9]. With regard to the hilum of the left lungs, no significant variation was observed in the number and arrangement of the structures, in the present study. But many authors have reported variations in the number of bronchi, pulmonary artery and pulmonary vein entering the hilum [6,8,10].

All of 25 right lungs in the present study showed a normal pattern of fissures and lobes. Quadros et al. had found incomplete oblique fissure, incomplete & absent horizontal fissures, and accessory fissures in up to 25% of the 36 right lungs they had studied [9]. Nene et al. had reported incomplete, absent oblique and horizontal fissures and accessory fissures in up to 18% of the 50 right lungs they had studied. They had also observed one right lung showing four bronchopulmonary segments separated by accessory fissures in the diaphragmatic surface [11]. The variations in hilum of the lungs in the present study included single bronchus (16%), bronchus and pulmonary artery lying at the same level (4%) and three pulmonary venous openings (8%). George et al. had reported in their study on 65 right lungs that 21 (32.3%) of them had three venous openings [6]. Murlimanju et al. had reported that one of the 56 right lungs they studied had a single bronchus (1.8%). They had also found that one of the right lungs had four pulmonary venous openings, one of the openings found lower down in the pulmonary ligament, the position being similar to the one found in this study [10].

Khedekar and Hattangdi had observed in their study on 25 right lungs that 2 (8%) of them had three veins in the hilum and one (4%) had a single bronchus [8].

Variations in the fissures of the lung may alter the usual presentation of collapse of lung leading to difficulty in the diagnosis. They may also lead to a marginated pneumonic patch, which may be misdiagnosed as a consolidation or atelectasis [12]. Accessory fissures can be confused with pleural effusion even in a CT scan [13]. A knowledge of the fissural and lobar patterns of the lungs is essential for radiologists, pulmonologists and surgeons for proper diagnosis and surgical planning for segment resections and lobectomies [14].

CONCLUSION

Studies on the morphology of lung are scarce from the southern part of Tamil Nadu and hence this study may add to the already existing similar studies from other parts of the world. Though variations in the fissures and lobes have been commonly reported in the lungs, this study found variation in lobes and fissures in only one lung out of the total fifty studied. The incidence of single bronchus in right lung was more commonly found in the present study when compared to previous ones. Prior anatomical knowledge and possible variations, which may be regionally different, are essential prerequisites for clinicians, radiologists and surgeons.

Conflicts of Interests: None

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How to cite this article:

Neil James , K. Girija Kumari, Narayanaperumal Mugunthan. MORPHOLOGICAL STUDY OF LOBES, FISSURES AND PULMONARY HILAR STRUCTURES. Int J Anat Res 2019;7(1.3):6298-6301. DOI: 10.16965/ijar.2019.103