ORIGINAL ARTICLE

Variations of Lung Fissures: A Cadaveric Study

Ambali Manoj P[1], Jadhav Surekha D[2], Doshi Medha[1], Patil Raosaheb[1]*
Roy Priya[1], Desai Rajeev R[1]
[1]Department of Anatomy, Krishna Institute of Medical Sciences, Karad - 415539, Maharashtra, India; [2]Department of Anatomy, Padmashri Dr. Vithalrao Vikhe Patil Foundation Medical College, Ahmednagar-414003 (Maharashtra) India

Abstract:
Background: The presence of fissures in the normal lungs enhances uniform expansion and hence facilitates more air intake. Accessory and incomplete fissures of varying depth can be seen in unusual locations of the lung, delimiting abnormal lobes which correspond to the normal bronchopulmonary segments. The knowledge of anatomical variations of lung fissures is essential for clinicians, surgeons, and for radiologist for recognizing various images of related abnormalities because an accessory or anomalous fissure can be mistaken for a lung lesion or an atypical appearance of pleural effusion. *Aims and Objectives:* The aim of the present study is to observe the variations of lung fissures in Indian population. Fifty pairs (right- 50; left- 50) of lungs were used for this study. Each lung was studied carefully for number of fissures whether complete or incomplete or absent. Presences of accessory fissures were noted. *Results:* We observed complete absence of fissures in two right and left lungs. Accessory fissures were present in 38% right lungs and 32% in left lungs. *Conclusion:* Incidence of absence of oblique fissure and accessory fissure was greater in our present work when compared our results with other authors. Considering this we feel that more elaborative study should be done on this topic which will throw more light on this.

Keywords: Fissures, Lobes, Lung, Broncho-pulmonary segments, variations.

Introduction:

The lungs are the essential organs of respiration. The right lung is divided into superior, middle and inferior lobes by oblique and horizontal fissures. The oblique fissure separates the inferior lobe from middle and while the short horizontal fissure separates the superior and middle lobes. The left lung is divided into superior and inferior lobe by an oblique fissure [1]. The fissures of the lung facilitate the movements of lobes in relation to one another which accommodate the greater distention and movements of lower lobes during respiration [2]. Lung fissures may be complete whereas lobes remain intact at hilum by bronchi and pulmonary vessels or they may be incomplete when there is a parenchymal fusion between lobes, may be absent or accessory fissures may be present [2, 3, 4]. Presence of accessory fissures in lung specimens is not uncommon, but it is difficult to appreciate them on radiographs and CT scans hence they are either not appreciated as distinct entities or are completely misinterpreted. They usually occur at the boundaries between bronchopulmonary segments [5]. The knowledge of the anatomy and variations of the lung fissures is essential for proper identification of normal lung anatomy, evaluation of disease, for identification and interpretation of their variable imaging appearance and related abnormalities [6, 7]. Also, it is important for identification of broncho-pulmonary segments during lobectomies and surgical resection. Awareness of variations of fissures and lobes may alert surgeons to potential problems which may be encountered during surgical intervention [8]. Considering the clinical and anatomical importance of this topic, the present study is undertaken to determine the morphology of the lung in Indian population.

Material and Methods:

Present study was carried out in the Department of Anatomy Krishna Institute of Medical Sciences,

Karad. Hundred (Right: 50; Left: 50) adult lungs of unknown age and sex were used. Each lung was studied carefully for number of fissures whether complete or incomplete or absent. We also observed the presence or absence of accessory fissure.

Results:

Right lung: The horizontal fissure was absent (Fig. 1) in 4 (8%) and incomplete (Fig. 2) in 14 (28%) right sided lungs.

Fig.1 - Showing Absence of Horizontal

Fig .2 - Showing Incomplete Fissures of Right Lung

Oblique fissure was absent (Fig. 3) in 2 (4%) lungs and incomplete in 7 (14%). We reported complete absence of fissures in two right lungs (Fig. 4) and accessory fissures were present (Fig. 5) in 19 (38%) specimens.

Left lung: The oblique fissure was absent (Fig.6) in 2 (4%) lungs and it was incomplete (Fig. 7) in 16 (18 %) lungs. Accessory fissures were present (Fig. 8) in 16 (32%)

Fig .3 - Showing Absence of Oblique Fissure in Right Lung

Fig. 4 - Showing Absence of Fissure in Right Lung

Fig.5- Accessory Fissures (Arrows) on Basal Surface

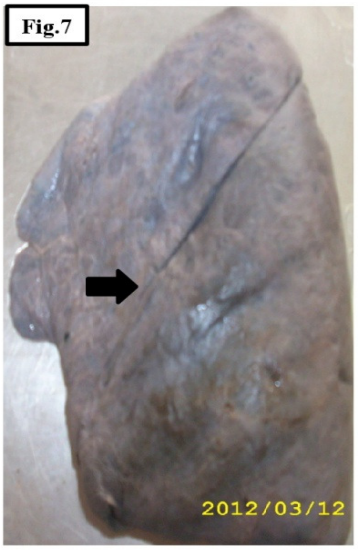

Fig. 7 - Showing Incomplete Fissure of Left Lung

Fig.6 - Showing Absence of Fissure in Left Lung

Fig.8 - Showing Accessory Fissures in Left Lung

Discussion:

Lung fissures help in a uniform expansion of the whole lung and they also form the boundaries for the lobes of the lungs. Therefore, precise knowledge of their normal position is mandatory for proper understanding of lobar anatomy and locating broncho-pulmonary segments [2]. Lung buds develop from the foregut and it divides into two primary bronchial buds at around 28th days after fertilization. Then they develop into the right and left lungs [9]. As the development progresses, the formation of numerous broncho-pulmonary buds take place. In the later part of development, these buds usually fuse completely except at sites of fissure formation which results in the forma-

tion of fissures and lobes [9, 10]. If the development of the lung is defective, then it gives rise to variations in lobes and fissures of the lung [9, 11].

Absence or incomplete fissure could be due to obliteration of fissures either completely or partially and accessory fissures could be the result of non obliteration of spaces which normally are obliterated [9]. The lobes of the lungs show partial fusion because of incomplete lung fissures which is very common [12, 13]. Table 1 compares the study results of various researchers regarding the incidence of lung fissures with present study. Incidence of absent or incomplete horizontal fissure of the right lung was less in the present study than reports obtained by Meenakshi et al, IEHAV, Prakash et al [4,13,15]. We observed absence of oblique fissures in 4% right and left lungs but IEHAV, Meenakshi et al, Prakash et al. did not observe absence of oblique fissure in both the lungs. However, Medlar [12] reported absence of oblique fissure in 4.8 % in right lungs and 7.3% in left lungs. We observed higher prevalence of accessory fissures in right (38%) and left (32%) lungs which were not reported by other researchers (Table 1).

The lung fissures are usually used as landmarks in specifying lesions [16]. Accessory fissures may be confused with areas of linear atelectasis, pleural scars, or walls of bullae [5]. Variation in lung fissure anatomy may confuse a radiologist while interpreting skiagrams because usually they may be mistaken as pleural effusion [4]. Awareness of variations of lung fissure is essential for surgeons performing lung resections.

Conclusion:

Prevalence of absence of oblique fissure and accessory fissure was greater in our present work when compared with the previous works. That shows that there is a wide range of difference in occurrence of horizontal, oblique and accessory fissures between and among different populations which insinuate that a variety of genetic and environmental factors might be responsible for development of these fissures. Knowledge of such variations might explain confusing presentation of certain clinical cases pertaining to

Table 1: Showing Incidence of Lung Fissures Observed by Various Authors in Cadaveric Study

		Lukose et al. [14]	IEHAV [13]	Meenakshi et al. [4]	Prakash et al. [15]	Present Study
Right lung						
Horizontal fissure	**Absent**	10.5%	21.0%	16.6%	57.1%	08.0%
	Incomplete	21.0%	67.0%	63.3%		28.0%
Oblique fissure	**Absent**	-	-	-	-	04.0%
	Incomplete	05.3%	30.0%	36.3%	39.3%	14.0%
Both fissure	**Absent**	-	-	03.0%		04.0%
Accessory fissure		-	-	-		38.0%
Left lung						
Oblique fissure	**Absent**	-				04.0%
	Incomplete	21.0%	30.0%	46.6%	35.7%	18.0%
Accessory fissure		-	-	-	-	32.0%

lung pathologies.

Also knowing the frequency of occurrence of a variant fissure in a particular population might help the radiologist, clinician to make correct diagnosis and to the surgeon to plan, execute and modify their surgical procedures. Wide ranges of variations of lung fissures are reported by various researches in different population. Therefore, we feel that more elaborative study should be done on this topic by using different population and large number of sample size which will throw more light on this vital topic.

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***Author for Correspondence:** Dr. Manoj P. Ambali, Professor, Department of Anatomy, Krishna Institute of Medical Sciences (KIMS) Karad - 415539, (Maharashtra), India.*
Cell - 09890959798 Email: ambman65@rediffmail.com