ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 02 | February - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

MULTIPATTERN VARIATION IN CADAVERIC HUMAN PULMONARY FISSURE: A MORPHOLOGICAL STUDY IN INDIAN CADAVER

Anatomy

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ABSTRACT

INTRODUCTION: knowledge of the morphological pattern of fissure and lobes of lungs can contribute to decreases morbidity and mortality associated with cardiopulmonary surgeries. Anatomical variation of fissure in human lungs noticed as absent, incomplete or complete during routine dissection. **AIM:** My study was aimed at analyzing into the morphological multipattern of fissure and lobes of lungs. **MATERIALS AND METHODS:** The present study based on macroscopic examination of 60 (30 right and 30 left) embalmed human cadaveric lungs. After thoroughly observation of each lung specimens were noted pattern of lobes, fissure variation and studied in detail. All lungs specimen was photographed for record. **RESULT & CONCLUSION:** In the present study following observation was made: Right sided lungs had, Incomplete Horizontal fissures in 11 lungs, absent horizontal fissures in 01 lung and incomplete oblique fissure in 08. Left sided lungs had, Incomplete oblique fissures in 09 lungs, knowledge of variation in the morphological pattern of fissure and lobes of lungs useful tool for medical clinicians, radiologist and cardiopulmonary surgeon for interpretation of correct location of bronchopulmonary segments.

KEYWORDS

Bronchopulmonary Segment, Fissure, Lobe.

INTRODUCTION

Lungs are essential paired respiratory organs situated on either side of heart in thoracic cavity. Each lung is approximately half conical in shape & presents an apex, base, three borders & two surfaces. The left lung has superior and inferior lobes separated by an oblique fissure, while right lung has oblique and horizontal fissures dividing it into superior, middle, and inferior lobes. The oblique fissure being less vertical on right lung than left lung separates inferior lobe from middle and upper lobe. It cuts into the whole thickness of lung, except at the hilum (1). Fissure facilitate the movement of lobes in relation to one another thus helping in uniform expansion of the whole lung in inspiration. The oblique fissure cuts the posterior border of both lungs at the level of forth or fifth thoracic spine. Reach above the hilum on mediastinum surface then continue across the inferior surface turn upward on mediastinum surface reach below the hilum (2).

Lung develop as an endodermal diverticulum at about 28 days. diverticulum bifurcate into 2 primary bronchi which ultimately develop into both lungs(3).

Bifurcated endodermal diverticulum gives origin to a monopodial ventral diverticulum which later become upper lobe bronchus .at this stage left bud has only 2 bronchial tubes where as the right lung bud consists 3 bronchial tubes. the monopodial branching of stem bronchi will result in accessory bronchi These endodermal tubes together with lung buds give origin to definitive lobes of adult lung. In subsequent development 10 bronchi divide dichotomously until 18 generations of sub divisions are produced. The monopodial branching of stem bronchi account for accessory bronchi and lobes often found in an adult lung (4).

During fetal life fissures embryologically separate individual bronchopulmonary segments. During development only oblique and horizontal fissure persist and gradually develop and rest obliterated. Along these fissure pleurae is reflected on all sides (5).

Generally, fissure is complete reaching up to the hilum and lined by pleura, but sometimes lungs shows incomplete fissure or even absence that will give rice partially or completely fused lobe. The fissures facilitate the movement of lobes in relation to one other which accommodate the greater distention and movements of lower lobes during respiration (6).

Parenchymal fusion of varied extent along the floor is also found in case of incomplete fissures. Sometimes, fissures may be absent altogether. Anatomical classification proposed by Craig and Walker (7) based on both the degree of completeness of the fissures and the location of the pulmonary artery at the base of the oblique fissure was followed to determine the presence of completeness of fissures.

Grade I: Complete fissure with entirely separated lobes.

Grade II: Complete visceral cleft but parenchymal fusion at the base of fissure.

Grade III: Visceral cleft evident for a part of fissure.

Grade IV: Complete fusion of lobes with no evident fissural line.

Incomplete pulmonary fissures (partial fusion between lobes) are common; more than half of pulmonary fissures are incomplete. The most accurate findings come from studies of fixed and inflated lung specimens rather then study based on radiology (8). Incomplete fissures create inconvenience during surgeries. Conjoined lobes must be separated, which usually requires additional lung staples. Incomplete fissures may alter the usual patterns of collapse seen in patients with endobronchial lesions. The usual distal collapse may not occur if the fissure between the obstructed lobe and a non-obstructed lobe is incomplete. Collateral air drift may keep the obstructed lobe aerated even though the bronchus supplying the lobe is obstructed. Incomplete fissures can give rise to unexpected appearances of pleural effusions (8). Certain cases of extra lobes, radiologically it may misinterpret as lung lesions. Its presence shows a significant increase in the size of mediastinum around the trachea in CT scan (9,10). Incomplete pulmonary fissure, infection may spread to adjacent lobes. Postoperative air leakage also become great challenge during pulmonary surgeries with incomplete pulmonary fissure. Those lungs that show presence of accessory lobes and variation in pattern of fissure may lead to misinterpretation radiograph or CT scan is common entity (11). Certain finding of x-rays and CT scan lead to towards wrong interpretation such as liner atelectasis, plural scar or wall of bullae due to lack of knowledge (2,3,4). The present study based on macroscopic variation of lungs in Indian adult human cadavers.

MATERIALS AND METHODS

The present study carried out in department of Anatomy, Kanti Devi Medical College, Mathura was based on macroscopic examination of 60 (30`right and 30 left) adult human cadaveric lungs. All were fixed in formalin. All sample belonged to the age group 25 to 75 years. Gender difference not considered in this study. Exclude damaged lungs during procured sample for study. After thoroughly observation of each lung specimens were noted pattern of lobes, fissure variation. Studied

pattern and position of fissure. Follow the Craig and Walkar classification during observation. All lungs specimen was photographed for record.

RESULT

The observations regarding variation in oblique fissures, horizontal fissures, and accessory fissures in both right and left lungs are tabulated in Table 1. The oblique fissure was complete in 22(73.3%) of right lung and 21(70%) of left lung while it was found to be incomplete in 08(26.6%) out of 30 right lung specimens (30.43%) and 09 (30%) out of 30 left lung specimens. 17(56.6%) horizontal fissures of right lung were complete, 11 (36.6%) were incomplete and one (13.04%) was absent. The criteria here used to decide the lung fissure incompleteness was the connected lobes by chunk of parenchymal tissue anywhere in the fissure, and those failed to reach the hilum of lung.

According Craig and Walker's classification (Table 2) data depicted as 40% of right sided and 60% of left sided lung oblique fissure, and 73.3% of right sided horizontal fissure can be classified as grade I. Similarly, 20% oblique fissure of left lung, 16.6% oblique fissure of right lung including 6.6% of horizontal fissure of right lung can be categorized as grade II. 16.6% oblique fissure of left lung, 20% oblique fissure of right lung including 16.6% of horizontal fissure of right lung can be categorized as grade III. 3.3% oblique fissure of left lung and 23.3% oblique fissure of right lung including 3.3% of horizontal fissure of right lung can be categorized as grade IV horizontal fissure was und. The criteria here used to classify.

DISCUSSION

Ontogenetically the lung is a composite of endodermal and mesodermal tissues. The endoderm of the lung bud gives rise to the mucosal lining of the bronchi and to the epithelial cells of the alveoli. The vasculature of the lung & the muscles & cartilage supporting the bronchi are derived from the foregut splanchnopleuric mesoderm, which covers the bronchi as they grow out from the mediastinum into the pleural space (5). Cadavers are still the best source to analyse all the domains of anatomy. Researchers in different studies of lungs performed on cadavers have reported their findings time to time and again which is compared with the present study shown in table 3(11) Absence or incompleteness of fissures could be due to obliteration of these fissures either completely or partially with defect in embryological development, there can be variation in the lobes and fissures of lungs.

Several authors have reported varying percentage of incidence of absence of oblique fissure in the lung, but in the present study, there we did not find any case of absence of oblique fissure in both lungs. In the present study, the left lung showed incomplete oblique fissure which is in conformity with previous studies. There was higher percentage of incidence of incomplete oblique fissure in the right lung as compared to the left lung in present study. When compared with other studies, the incidence of the percentage of incomplete oblique fissure of the right lung is more than the previous studies (Table 3). The incidence of the percentage of incomplete horizontal fissure was less than the previous studies except the values obtained by Varalakshmi et al. Incidence that absent horizontal fissure is commonly occurring variation as reported by earlier (Table 4). Only the study of Mamatha et al. (14) did not show its appearance. Incidence of missing horizontal fissure in present study (3.3%) is less than some studies (12, 13). The pattern, location and nature of pulmonary fissure is of must key importance in planning pulmonary surgeries. In order to provide a frame work for description of operative technique and to allow meaningful comparison between different surgical series, Craig and Walker (7) have proposed a fissural classification based on both the degree of completeness of the fissures and the location of the pulmonary artery at the base of the oblique fissure (11). Gradation of fissures is important surgically for easy approach in surgical procedure and to prevent postoperative haemorrhage and complications. In cases of incomplete fissures where parenchymal fusion

Post-operative air leakage is due to an incomplete fissure (10). The accessory fissure might act as a barrier to spread in the tissue creating a sharply demarcated pneumonia, which could be misinterpreted as atelectasis or consolidation (15).

The accessory fissure might act as a barrier to spread in the tissue creating a sharply demarcated pneumonia, which could be misinterpreted as atelectasis or consolidation (16,17).

Accessory fissures are sometimes present which appear differently on X-rays and CT scan. The present studies emphasize the clinical importance of the knowledge of variations of fissures in the lungs to medical clinicians, radiologists, and cardiopulmonary surgeons.

CONCLUSION

Arrest any step during development of lung by division and redivision from lung bud will give rise to variation in pattern of fissure and lobes of lung. Preside knowledge about morphological variation anatomy of lung can play key role for performing cardiopulmonary surgeries and interpreting radiological data.

Acknowledgements: We thanks all the faculty and staff of our department for their support and motivation during this article.

Table No.01: - Distribution of variation of pulmonary fissure in lungs.

Variation in Fissures	Right lungs n=30		Left lungs n=30	TOTAL n=60
	Horizontal Fissure	Oblique Fissure	Oblique Fissure	Total No. Of Fissure (%)
Complete	17(56.6)	22(73.3)	21(70.0)	60 (66.6)
Incomplete	11(36.6)	08(26.6)	09(30.0)	28 (31.1)
Absent Of Fissure	01(3.3)	NIL	NIL	01(11.1)
Accessory Fissure	01(3.3)	NIL	NIL	01(11.1)
TOTAL	**30(100%)**	**30(100%)**	**30(100%)**	**90 (100%)**

Table No.02: -Distribution based on Craig & walker's classification.

Classification based on Craig & walker's	Right lungs n=30		Left lungs n=30
	HORIZONTAL FISSURE (%)	OBLIQUE FISSURE (%)	OBLIQUE FISSURE (%)
Grade-I	22(73.3)	12(40.0)	18(60.0)
Grade-II	02(6.6)	05(16.6)	06(20.0)
Grade-III	05(16.6)	06(20.0)	05(16.6)
Grade-IV	01(3.3)	07(23.3)	01(3.3)
TOTAL	**30(100%)**	**30(100%)**	**30(100%)**

Table No.03: - Comparison of pulmonary fissure of present study with different studies.

STUDY	RIGHT LUNGS N=30				LEFT LUNGS N=30	
	Horizontal Fissure		Oblique Fissure		Oblique Fissure	
	Incomplete	Absent	Incomplete	Absent	Incomplete	Absent
Varalakshmi et al.[12] (2014)	30	10	21	4.8	10.6	7.3
Divya et al[13] (2015)	50	21.4	10.7	NIL	14.8	7.4
Mamatha et al.[14] (2016)	50	NIL	15	NIL	35	05
Present study 2021	36.6	3.3	26.6	NIL	30.0	NIL

FIG.NO.O1- Incomplete horizontal fissure of right lung

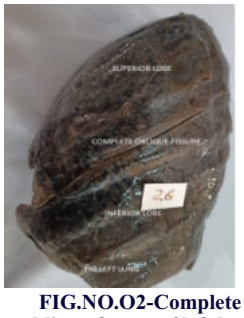

FIG.NO.O2-Complete oblique fissure of left lung

FIG.NO.O3-Complete oblique and horizontal fissure of right lung

FIG.NO.O4-Assesory and incomplete fissure of right lung

PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr

FIG.NO.O5 Incomplete oblique fissure of left lung

FIG.NO.O6 Incomplete horizontal fissure of right lung

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