ORIGINAL RESEARCH PAPER

Volume-7 | Issue-11 | November-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

"A STUDY OF MORPHOLOGICAL VARIATIONS IN FISSURES & LOBES OF LUNG"

Anatomy

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ABSTRACT

INTRODUCTION: Lungs are divided by fissures into lobes, these fissures in lung enhance uniform expansion, facilitates movements of lobes in relation to one another. Variations in lobes and fissures of lungs are clinically significant. Awareness of these variations is essential during radiological interpretation and guide to cardiothoracic performing segmental resections of lung.

AIMS & OBJECTIVE: To assess of variations in the fissures and lobar pattern of the lungs this is essential for proper identification of normal lung anatomy. To understand the variable appearance of fissures of lung on radiological examination and to identify the bronchopulmonary segments prior to lobectomies & surgical resections of involved segments.

MATERIALS AND METHODS: 50 lungs (25 right side lungs & 25 left side lungs) used during routine dissection for the medical undergraduates classes & from the Museum of the Department of Anatomy in the Saraswathi Institute of Medical Sciences, Pilkhuwa, Hapur were studied for the presence of normal fissures and its variations including number of fissures, accessory fissures and accessory lobes were noted and specimens were photographed.

RESULT: Among 50 adult lungs, 25 were right lung and 25 left lung 16% right adult lungs showed incomplete oblique fissure while no specimen showed absence of oblique fissure in right and left lung both. Left adult lungs showed higher incidences of incomplete oblique fissure than right lungs 20%. Incomplete horizontal fissure is 12%: absence of horizontal fissure is 16% in right adult lung. Accessory fissure and accessory lobes is 8% in right and left lungs. 12% Horizontal fissure were found in left lungs so, 3 lobes were there in these left lungs.

CONCLUSION: Comparison with other studies shows regional variations in morphological patterns of lung fissures and lobes, implying environmental and genetic factors in its development. Knowing the frequency of occurrence of a variant fissure can help the radiologist and clinician to make correct diagnosis, plan, execute, and modify a surgical procedure.

KEYWORDS

Fissures, lobes, Accessory, Lungs, Variations.

INTRODUCTION

Lungs are essential organ of respiration, located in the thoracic cavity, on either side of heart. Their principal function is to transport oxygen from the atmosphere into the bloodstream and to release carbondioxide from the bloodstream into the atmosphere. The endothelium of pulmonary capillaries, in addition to respiratory exchange, helps clearing the thrombi or emboli in circulating blood, liberates thromboplastin, helps conversion of angiotensin 1to angiotensin 2 and modifies the hormones and prohormones.

Right lung is broader and heavier than the left lung. Right lung is divided into superior, middle and inferior lobes by oblique and horizontal fissure. Oblique fissures seperates inferior from middle and upper lobes. Right oblique fissure crosses the inferior border of right lung approximately 7.5cm behind its anterior end. On the posterior border it is either at level of 4^{th} thoracic spine or slightly lower. The horizontal fissures upper and middle lobes. It passes from the oblique fissure near the mid axillary line horizontally forwards to anterior border of lung, and then passes backward to hilum on mediastinal surface. Left lung is divided into superior and inferior lobe by an oblique fissure which extends from the costal to medial surface of lung both above and below the hilum.

The visceral or pulmonary pleura adhere closely into pulmonary surface and its interlobar fissure. The fissure can be complete or incomplete. In complete the lobes remain held together only at the hilum by bronchi and pulmonary vessels. It is said to be incomplete when there are areas of parenchymal fusion between the lobes or the entire fissure may be absent. Parenchymal fusion of varied extent along the floor is found in case of incomplete fissure. Surgeons approach to ligate the vessels and bronchi through the depth of the fissure otherwise the lung parenchyma has to be dissected to reach those structures leading to preoperative haemorrhage and more postoperative complications. Gradation of fissures is important surgically; Grade 1 oblique fissure makes the approach easy while doing lobectomy and in video assisted thoracoscopic surgeries. Completeness of a fissure is determined as per the grading given by Craig and Walker.

Grade 1- complete fissure with entirely separate lobes.

Grade 2- complete visceral cleft but parenchymal fusion at the base of the fissure.

Grade 3- visceral cleft evident for part of the fissure.

Grade 4- complete fusion of the lobes with no evident fissural line.

Finding accessory fissures in lung specimens not uncommon, but appreciating them on radiographs and CT scans is difficult. They usually occur at the boundaries between bronchopulmonary segments. The commonly found accessory fissures are Superior accessory fissure (SAF) separates superior segment from the rest of the segments of lower of lung. The inferior accessory fissure (IAF) separates a small infracardiac lobe from other segments of lower lobe of lung on the diaphragmatic surface and the left minor fissure (LMF) separates the lingual from the other segments of upper lobe of left lung

Lung develops as an endodermal diverticulum at about 28 days after fertilization. The lung buds from foregut bifurcates into two main bronchi left and right which ultimately develops into secondary bronchi and the lung lobes. In prenatal life fissures separate individual bronchopulmonary segments. All fissures gradually get obliterated leaving behind oblique and horizontal fissures. Any variations in the morphological pattern of fissures indicate variations from normal pattern of development of lung. Hence, detection of any accessory

fissure is indicative of persistence of those prenatal fissures.

The knowledge of anatomical variations of lobes and fissures of the lung is important for identifying precise location, extent and morphology of bronchopulmonary segments.

Hence, this study aims to find out the variations in the morphology of lung fissures and lobes in the human lung and compare the findings with previous studies to derive a conclusion.

AIMS AND OBJECTIVES

The aims of the present study are:

- Knowledge of variations in the fissures and lobar pattern of the lungs is essential for proper identification of normal lung anatomy.
- To understand the variable appearance of fissures of lung on radiological examination for evaluation of diseases & related abnormalities.
- To identify the bronchopulmonary segments prior to lobectomies & surgical resections of involved segments to know variations of lobes & fissures which may alert the surgeons from the problems encountered during surgical resections.

MATERIALS AND METHODS:

Lungs of formalin fixed comprised of 25 right side lungs & 25 left side lungs which were used during routine dissection for the medical undergraduate's classes & from the Museum of the Department of Anatomy in the Saraswathi Institute of Medical Sciences, Pilkhuwa, Hapur. These lungs were observed & photographed for the following data collection:

1. Morphology of lobes & fissures.
2. Presence of any abnormal or incomplete fissure.
3. Presence of any accessory lobe.

OBSERVATIONS AND RESULTS:

Following results were observed among 50 adult lungs, 25 were right lung and 25 left lung.

A. Right adult lungs:

1. Incomplete oblique fissure- 4 (16%)
2. Incomplete horizontal fissure-3 (12%)
3. Absence of oblique fissure- 0
4. Absence of horizontal fissure- 4 (16%)
5. Accessory fissure-2 (8%)
6. Accessory lobes in upper lobe- 2 (8%)

B. Left adult lungs:

1. Incomplete oblique fissure- 5 (20%)
2. Absent oblique fissure- 0
3. Horizontal fissure- 3 (12%) so, **3 lobes was found in these left lungs.**
4. Incomplete accessory fissure- 2 (8%)
5. Accessory fissure in lower lobe- 2 (8%)

Fig-1 Incomplete oblique fissure in right lung.

Fig-2 Incomplete oblique fissure in left lung (at posterior end)

Fig-3 Incomplete horizontal fissure in right lung.

Fig-4 Absence of complete horizontal fiisure in right lung shows only 2 lobes in right lung.

Fig- 5 Presence of complete horizontal fissure in left lung.

Fig-6 Presence of Incomplete Horizontal fissure in left lung.

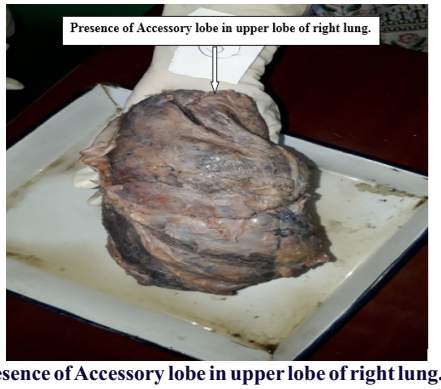

Fig-7 Presence of Accessory lobe in upper lobe of right lung.

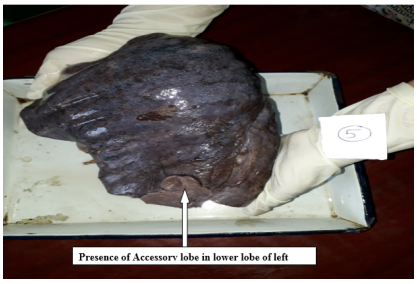

Fig-8 Presence of Accessory lobe in lower lobe of left lung

DISCUSSION

Lung fissures help in uniform expansion of the whole lung & they also form the boundaries for the lobes of the lungs. Therefore precise knowledge of normal position is mandatory for proper understanding of lobar anatomy & locating bronchopulmonary segments. The present study was preformed to examine the morphology of fissures & lobes, to note the variations and the findings are being compared with previous research works by different authors.

Defective pulmonary development will give rise to variations in fissures and lobes. Absence or incomplete oblique or horizontal fissure could be due to obliteration of these fissures either completely or partially. An incomplete fissure is a cause for postoperative air leakage during lobectomies and also causes the odd appearance of fluid tracking within the fissure. Incomplete fissures may also alter the spread of diseases within the lung. Incidence of incomplete oblique fissure in right lung in this study is 16% which is higher than studies by Y.Mamatha et.al in 2016 (15%), Ambali Manoj P et.al in 2014 (14%), Sanjenbam Sonali Devi et.al in 2015 (12.9%), Arora NK et.al in 2016 (11.11%) and lower than by Azmera Gebregziaher et.al in 2015 (47.82)% and DhanlakshmiVet.al in 2016 –(32)% . In left lung incidence of incomplete oblique fissure is 20% which is higher than studies by Ambali Manoj P et.al in 2014 (18%), Arora NK et.al in 2016 (4.35%) and Sanjenbam Sonali Devi et.al in 2015 - (8.1%), and lower than the studies by Y.Mamatha et.al in 2016 and Azmera Gebregziaher et.al in 2015 (35%), DhanlakshmiVet.al in 2016 – (38%) and incidences of incomplete oblique fissure is higher in left lung as compared to right lung oblique fissures. Incidences of absence of oblique fissure in right & left lung is same, no case of absence of oblique fissure in right & left lung was reported in our study. It is similar to studies stated by other authors also except Ambali Manoj P et.al in 2014 study in which it was reported 4% absent oblique fissure in both right & left lung and Y.Mamatha et.al in 2016 was found 1%.

In the present study horizontal fissure in right lungs were absent in 4 lungs i.e 16% which is nearby same as stated by Arora NK et.al in 2016 -16.66%, Azmera Gebregziaher et.al in 2015- 17.39%, and DhanlakshmiVet.al in 2016 -18% but it is higher than the studies by Sanjenbam Sonali Devi et.al in 2015 study i.e (1.6%) and Y.Mamatha et.al in 2016 (1%). Due to absence of complete horizontal fissure in these right lungs only 2 lobes was found in these lungs. Incomplete horizontal fissure in right lung was found in 3 lungs i.e 12% which is different from the other studies as Azmera Gebregziaher et.al in 2015- 68.42%, Sanjenbam Sonali Devi et.al in 2015 - 62.4% and DhanlakshmiVet.al in 2016 - 52%. Peculiar feature of our study is we found complete horizontal fissure in 3 left lungs and due to presence of this horizontal fissure on left side lungs these lungs have 3 lobes. This knowledge of anatomy may help clarification of confusing radiographics findings like extension of fluid into an incomplete major fissure or spread of various diseases through different pathways.

Accessory fissures could be the result of non obliteration of spaces which normally are obliterated during development. Thus defective pulmonary development gives rise to variations in lobes & fissures or by the aplasia or agenesis of a part of a lung. In the present study accessory fissure was more commonly observed in the right lungs than the left lungs. Finding accessory fissures in lung speciemens is not uncommon but are often unappreciated or misinterpreted on radiographs and CT scans. Accessory fissures when present at abnormal locations in the lungs give rise to abnormal lobes of the lung aerated by normal bronchus. Accessory fissures can be mistakenly confused with areas of linear atelectasis, pleural scars, or walls of the bullae. From a radiological point of view, an accessory fissure may commonly be misinterpreted as a lung lesion. On CT scans accessory fissures are seen as high attenuation curvilinear band. The commonly found accessory fissures are superior accessory fissure. In this study we found 8% incidences of accessory fissures in right and left lung. In right side lung finding of accessory fissures is same as study of DhanlakshmiVet.al in 2016 (8%) and lower than the studies reported by Ambali Manoj Pet.al in 2014 (38%) and Azmera Gebregziabher et.al in 2015 (41.5%) while on left side lung it is comaparatively higher than the study of DhanlakshmiVet.al in 2016 (2%) and lower than by the same studies by Ambali Manoj P et.al in 2014 (32%) and Azmera Gebregziabher et.al in 2015 (12.9%).

Developmentally the lungs are derived from endodermal and mesodermal germ layers. 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, muscles and cartilages supporting the bronchi are derived from the foregut splanchnopleuric mesoderm, which covers the bronchi as they grow out of the mediastinum in to the pleural space.

When fetus is 4 weeks old, a respiratory diverticulum appears as an outgrowth from the ventral wall of the foregut. During its separation from the foregut the lung bud forms the trachea and two lateral outpocketings, the bronchial buds. At the beginning of the fifth week, each of these buds enlarges to form right and left main bronchi. The right and left bronchi further divide into three and two secondary bronchii respectively, thus foreshadowing the three lobes of the lung on the right side and two on the left side.

As the lung grows the spaces and fissures that seperates individual bronchopulmonary segments become obliterated except along the planes, which persist as oblique and horizontal fissures.

When these fissures undergo partial or complete obliteration , it results in an incomplete fissure or absence of fissure. Accessory fissure could be the result of non obliteration of spaces which are normally obliterated. Thus, defective pulmonary development gives rise to variations in lobes and fissures.

The result of present study and their comparison with the previous works show that there is a variations in the lobes & fissure is very common out of total 50 human lungs we found variations in 24 lungs and wide range of difference in occurrence of variations in fissures and lobes of lungin comparison to other authors. This implies that a variety of genetic and environmental factors might affect development of these fissures. Knowledge of such variations might explain bizarre presentation of certain clinical cases pertaining to lung pathologies, help the radiologist and clinician to make correct diagnosis and surgeons to plan, execute and modify a surgical procedure.

CONCLUSION

In the present study the commonest variation is being the incomplete fissure both on right and left lung, the reason could be defective persistence or obliteration of embryological fissures that initially seperates individual bronchopulmonary buds/ segments as observed by other authors. Clinicians must be aware of the frequency of variations in the pattern of the lobes and fissures of the luns in order to avoid and reduce the mortality and morbidity associated with invasive procedures. Radiological diagnosis of diseases like lobar pneumonia and tumours should be based on the knowledge of variations of fissures of lung.

Conflict of interest:- None

REFERENCES

1. Singh AK, Niranjan R. A cadaveric study of anatomical variations of fissures and lobes of lung, Nat J Clin Anat. 2014;3(2):76-8
2. Larsen WJ, Sherman LS, Potter SS, Scott WJ. Development of respiratory system In: Human Embryology. 3rd Ed Elsevier; New York. 2001. 125-7
3. Meenakshi S, Manjunath KY, Balasubramanyam V.Morphological variations of the lung fissures and lobes. Ind J Chest Dis Allied Sci. 2004; 46:179-182
4. Jadhav Mayuri, Pawar Pradeep, Mikam Vasudha, Tawte Aparna, Mane Smita. Anomalous Lobar Pattern of Right Lung: A case report. Journal of Research in Medical and Dental Science 2013;1(2).
5. Craig SR, Walker WS. A proposed anatomical classification of the pulmonary fissures: J R Coll Surg Edinb. 1997, Aug;42(4):233-4.
6. K. Lakshmi Kumari, K. Deena Usha Kumari, D: Asha Latha Morphological Variations of Fissures ofLungs. IOSR Journal of Dental and Medical Sciences Nov. 2015;14 (11) Ver. IV:50-53.
7. Nene,R.,Gajendra,S.and Sarma,R.(2011).Lung lobes and fissures; a morphological study. International journal of experimental and clinical Anatomy.5; 30-38
8. Godwin, J.D.and Tarver,R.D.(1985).Accessory fissures of the lung. AJR: 144; 39-47
9. Glazer,H.,Anderson,D.and Dicroce,J.(1991).Anatomy of the major fissure; evaluation with standard and thin section CT. Radiology.180;839-844

10. Rosse C, Gaddum-Rosse P. Hollinshead's Textbook of Anatomy. Philadelphia: Lippincott-Raven; 1997.
11. Arora NK, Khan AZ, Srivastava S, Haque M, Qadeer F. Morphological Variations in Fissures and Lobar Pattern in Human Lungs. Ann. Int.Med. Den. Res. 2016;2(1):106-9.
12. SanjenbamSonaliDevi (2015). A Study of Variations of Lobes and Fissures in Human Fetal Lung IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 12 Ver. III (Dec. 2015), PP 24-29
13. Dhanalakshmi V, Manoharan C, Rajesh R, Suba Ananthi K. MORPHOLOGICAL STUDY OF FISSURES AND LOBES OF LUNGS. Int J Anat Res 2016;4(1):1892-1895
14. Y. Mamatha, Chaitanya Krishna Murthy, B. S. Prakash. STUDY OF MORPHOLOGICAL VARIATIONS OF FISSURES AND LOBES OF LUNG. Int J Anat Res 2016, 4(1):1874-77. ISSN 2321-4287
15. Azmera Gebregziabher Variations of Fissures and Lobes of theLungs in Human Cadavers in Selected Universities of Ethiopia ISSN : 0975-9492 Vol. 6 No.6 Jun 2015