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A MORPHOLOGICAL STUDY OF FISSURES AND LOBES OF LUNGS IN A TERTIARY HEALTH CARE CENTRE: A CADAVERIC STUDY

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ABSTRACT

Background: Lungs are paired organs essential for respiration in the thoracic cavity. Each lung is divided into lobes by fissures. Fissures in the lung enhance uniform lung expansion. Fissures may be complete, incomplete, or absent. The right lung is divided into the upper and middle lobes by the horizontal fissure, and the lower lobe is separated from the middle lobe by an oblique fissure. The left lung is divided only by a single fissure into the upper and lower lobes.

Objective: A detailed knowledge of variations of classical and accessory fissures in lungs is necessary for proper radiological interpretation.

Method: Thirty-two pairs of lungs procured from formalin-fixed cadavers used for undergraduate teaching at IMS and SUM Hospital Bhubaneswar were studied. Lungs were studied for (a) the Presence of normal fissures and lobes, (b) Variations of fissures, complete or incomplete, and (c) Accessory fissures.

Observation: Incomplete horizontal fissures in 37%, incomplete oblique fissures in 18%, and complete absence of horizontal fissures in 7% of the right lung. In the left lung, we found 18% incomplete oblique fissure. No cases of accessory fissures were found.

Conclusion: A detailed knowledge of lobes and fissures of the lungs is mandatory before any surgical and diagnostic procedure on the lungs. Variations are prevalent and bound to pose critical post-operative complications.

KEY WORDS
Lobes of lung, Oblique fissure, Horizontal fissure

INTRODUCTION

Lungs are conical-shaped paired organs essential for respiration in the thoracic cavity. Each lung is divided into lobes by fissures. Fissures in the lung enhance uniform lung expansion. Fissures may be complete, incomplete, or absent. The right lung is divided into the upper and middle lobes by the horizontal fissure, and the lower lobe is separated from the middle lobe by an oblique fissure. The left lung is divided only by a single fissure into the upper and lower lobes. These fissures are double-folded visceral pleura. There may be accessory fissures in addition to the main fissures, which usually indicate a junction between bronchopulmonary segments. In surface marking, an oblique fissure is drawn by joining a point 2 cm lateral to the spine, another point on the 5th rib in the axillary line, and a 3rd point on the 6th costal cartilage 7.5cm from the median plane. The horizontal fissure is drawn in the anterior border of the right lung at the level of the 4th costal cartilage to a point in the 5th rib in the midaxillary line. Each lung is divided into ten bronchopulmonary segments aerated by a tertiary bronchus. They are considered anatomical, surgical, and functional sectors of the lung.

OBJECTIVE

A detailed knowledge of variations of classical and accessory fissures is necessary for proper radiological interpretation and will also be helpful for cardiothoracic surgeons while conducting segmental resection.

MATERIALS AND METHODS

Thirty-two pairs of lungs procured from formalin-fixed cadavers that are meant for undergraduate teaching at IMS and SUM Hospital, Bhubaneswar, were used for the study.

Lungs were studied for;

- Presence of normal fissures and lobes.
- Variations of fissures, complete or incomplete.
- Accessory fissures.

OBSERVATION

FIGURE-1. ABSENCE OF FISSURE IN RIGHT LUNG

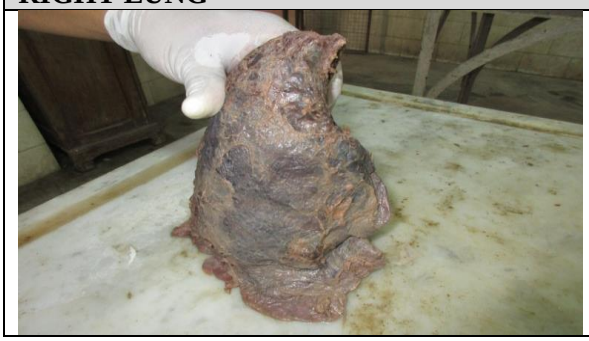

FIGURE-2. LEFT LUNG WITH NORMAL OBLIQUE FISSURE

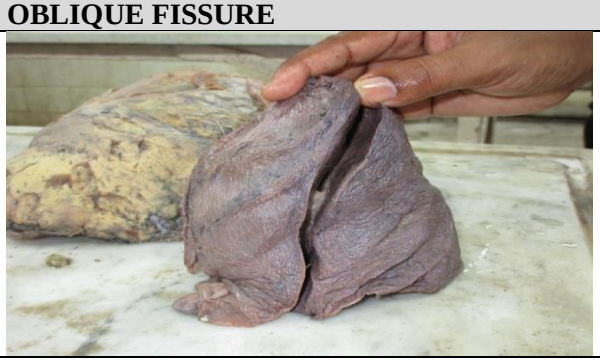

FIGURE-3. LEFT LUNG WITH INCOMPLETE OBLIQUE FISSURE

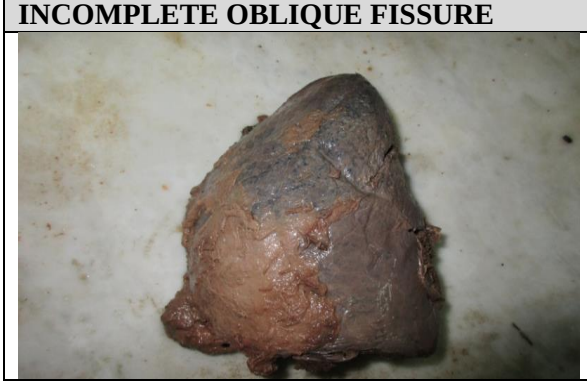

FIGURE-4. RIGHT LUNG ABSENCE OF HORIZONTAL FISSURE

FIGURE-5. RIGHT LUNG WITH COMPLETE HORIZONTAL AND OBLIQUE

FIGURE-6. RIGHT LUNG WITH INCOMPLETE OBLIQUE FISSURE AND ABSENT HORIZONTAL FISSURE

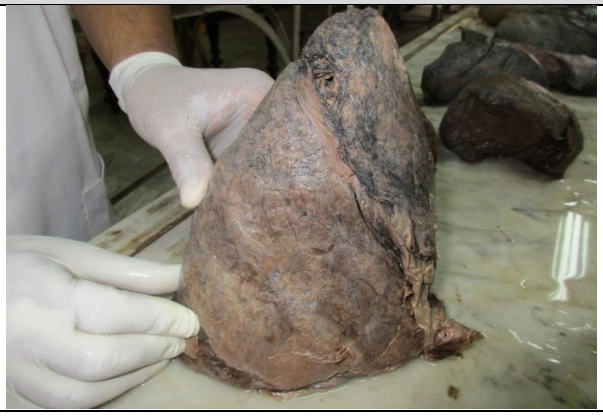

FIGURE-7. RIGHT LUNG WITH ONLY OBLIQUE FISSURE AND ABSENT HORIZONTAL FISSURE

Absence of horizontal fissure in 2 right lungs, an incomplete horizontal fissure in 12 right lungs, an incomplete oblique fissure in 6 right lungs, an absence of oblique fissure in 1 right lung, absence of horizontal and oblique fissure in 1 right lung, presence of complete horizontal fissure in 18 right lungs, presence of complete oblique fissure in 25 right lungs. Incomplete oblique fissure in 6 left lungs.

According to Craig and Walker [1] criteria:

		Complete	**Incomplete**	**Absence**
Right lung	Horizontal fissure	56%	37%	7%
	Oblique fissure	79%	18%	3%
Left lung	Oblique fissure	82%	18%	0%

		Grade 1	**Grade 2**	**Grade 3**	**Grade 4**
Right lung	Horizontal fissure	56%	32%	6%	6%
	Oblique fissure	79%	15%	3%	3%
Left lung	Oblique fissure	82%	14%	4%	0%

Grade 1- Complete fissure with entirely separate lobes.
Grade 2- Complete visceral cleft but parenchymal fusion at the base fissure.
Grade 3- Visceral cleft evident for a part of fissure.
Grade 4- Complete fusion of lobes with no evident fissure line.

DISCUSSION

Identifying the completeness of the fissure is crucial before lobectomy, as individuals with incomplete fissures are more prone to develop postoperative air leaks [2][3]. The fissureless technique, such as the "tunnel technique" approach, can perform lobectomy or segmentectomy without a defined fissure [4]. In thoracoscopic lobectomy for congenital lung malformations (CLMs), the prevalence of incomplete fissures varies depending on the location, with Grade 2 and Grade 3 incomplete fissures being more common [5]. The anatomy of pulmonary fissures is highly variable, with incomplete fissures being more prevalent than complete fissures in both lungs [6]. Therefore, preoperative assessment of the fissure completeness is essential to determine the appropriate surgical approach and minimize the risk of postoperative complications, such as air leaks. In our investigation, an incomplete horizontal fissure in the right lung was seen in 37% of cases, with an oblique fissure demonstrating incompleteness in 18%. Similarly, the left lung revealed incomplete oblique fissures in 18% of the total cases. These findings correlate with prior studies undertaken by Radha et al. [7] and K. Lakshmi Kumari et al. [8].

Furthermore, our analysis showed a total absence of horizontal fissure in 7% of right lung specimens, whereas the absence of the oblique fissure was noted in 3% of instances. Notably, the horizontal fissure, whether entirely or partially absent, was revealed to be a common anatomical variant. The prevalence of a missing horizontal fissure on the right side ranged from 3% to 50%, as reported in another research [9,10,11]. Ghosh et al. [6] also described instances of a complete lack of fissure in the right lung.

Comparatively, changes in the left lung were less prevalent than in the right. Prakash et al. [8] reported a 10.7% prevalence of missing fissures in the left lung, a finding not reproduced in our analysis. This stresses the need for comprehensive studies to distinguish the whole spectrum of pulmonary fissure abnormalities.
We compiled the results of different authors with our study and presented them in below table 2[12-15].

Author	Lung	Fissure	Incomplete	Absent
Radha k et al 2015	Right	Horizontal	43%	17%
		Oblique	17%	0%
	Left	Oblique	23%	0%
Prakash et al 2010	Right	Horizontal	50%	7.1%
		Oblique	39.30%	7.1%
	Left	Oblique	35.70%	10.70%
Dhanalakshmi v. et al 2016	Right	Horizontal	52%	18%
		Oblique	32%	0%
	Left	Oblique	38%	0%
K. Lakshmi Kumari et al 2015	Right	Horizontal	33%	4%
		Oblique	12%	20%
	Left	Oblique	28%	12%
Y. Mamata et al 2016	Right	Horizontal	50%	0%
		Oblique	15%	0%
	Left	Oblique	35%	5%
Present study	Right	Horizontal	37%	7%
		Oblique	18%	3%
	Left	Oblique	18%	0%

During development, as the lung grows, the space that separates the individual bronchopulmonary buds becomes obliterated except at planes, which is evident in fully developed lungs as oblique and horizontal fissures. Absence or incomplete fissures could be due to obliteration of these fissures either

entirely or partially. Fissures are double-folded pleura that separate the lobes. Obliteration of fissures can be a result of various pathological conditions of the lung, like pleurisy.

CONCLUSION

In the present study, the commonest variation is the presence of incomplete fissures both on the right and left lung. Recognition of lung anomalies improves the understanding of pneumonia, pleural effusion, and diseases spreading through lung parenchyma. Knowledge of the frequency of a variant fissure may help the radiologist and clinician to make the correct diagnosis. It guides cardiothoracic surgeons performing segmental lung resections and lobectomies to have uncomplicated surgery.

REFERENCES

1. Craig R, Walker WS. A proposed anatomical classification of the pulmonary fissures. J R Coll Surg Edinb. 1997 Aug;42(4):233-4.
2. Masahiro, Yanagiya., Masaaki, Nagano., Jun, Nakajima. Fissureless technique of robotic left lingular segmentectomy for primary lung cancer with incomplete fissure: a case report. Journal of Cardiothoracic Surgery, (2023). doi: 10.1186/s13019-023-02211-7
3. Yusuke, Saeki., Kojiro, Nakaoka., Masaharu, Inagaki. Identification of the Separation Range of an Incomplete Interlobar Fissure in Segmentectomy Using Near Infrared. Cureus, (2023). doi: 10.7759/cureus.38009
4. Outside Front Cover. Developmental Biology, (2023). doi: 10.1016/s0012-1606(23)00006-4
5. Filippo, Tommaso, Gallina., Daniele, Forcella., Enrico, Melis., Francesco, Facciolo. Robotic Lobectomy without Complete Fissure for Non-Small Cell Lung Cancer: Technical Aspects and Perioperative Outcomes of the Tunnel Technique. Current Oncology, (2023). doi: 10.3390/curroncol30060441
6. Ghosh E, Basur R, Dhur A, Roy A, Roy H, Biswas A. Variations of fissures and lobes in human lungs - a multicentric cadaveric study from West Bengal, India. Int J Anat Radiol. 2013;2(1):5-8. ID: IJARS/2013/5660:0002.
7. Radha K, Durai Pandian K. Fissure and lobes of lungs: A morphological & anatomical study. Int J Anat Res. 2015;3(2):995-98. ISSN 2321-4287.
8. Dhanalakshmi V, Manoharan C. Morphological study of fissures and lobes of lungs. Int J Anat Res. 2016;4(1):1892-95. ISSN 2321-4287.
9. Kommuru H, Sree Lekha D. Pulmonary fissure and lobar variation in relation to surgical and radiological implications. IOSR J Dent Med Sci. 2013. p-ISSN: 2279-0853.
10. Lakshmi Kumari K, Deena Usha Kumari K. Morphological variations of fissures of lungs. IOSR J Dent Med Sci. 2015. p-ISSN: 2279-0861.
11. Nene AR, Gajendra KS, Sarma MV. Lung lobes and fissures: A morphological study. Anatomy. 2011;5:30-38.
12. George BM, Nayak SB, Marpalli S. Morphological variations of the lungs: A study conducted on Indian cadavers. Anat Cell Biol. 2014;47(4):253-8. doi:10.5115/acb.2014.47.4.253.
13. Jacob JM, Pillay M. Variation in the interlobar fissures of lung obtained from cadavers of south Indian origin. Int J Morphol. 2013;31(2):497-494.
14. Dutta S, Mandal L. Natural fissure of lung - Anatomical basis of surgical techniques and imaging. Natl J Med Res. p-ISSN: 2249-4995.
15. Mamatha Y, Murthy CK. Study of morphological variation of fissure and lobes of lung. Int J Anat Res. 2016;4(1):1874-77.