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Anatomical Correlation of Lung Lobes, Fissures and Pulmonary Disorders in Cadaveric Specimens: An Institutional Study

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ABSTRACT

Anatomical variations in the human lungs can potentially influence susceptibility to various pulmonary diseases. The prevalence of these diseases can also be influenced by lifestyle and environmental factors. This study aimed to assess the relationship between anatomical variations in cadaveric lung specimens and associated medical records to understand potential predispositions to pulmonary conditions. Lung specimens from 22 cadavers were examined for anatomical variations such as fissure completeness presence of accessory lobes or fissures and variations in the hilum and bronchial tree. Histological analysis was performed to identify inflammatory processes, malignancies, fibrotic changes, and other pathological conditions. Associated medical records were reviewed to identify pre-existing lung conditions, causes of death and significant pulmonary medical history. 68.2% of cadavers had pre-existing lung conditions and 45.5% had pulmonary-related causes of death. Smoking history was evident in 63.6 and 38.6% showed fibrotic changes in histological examination. Anatomical variations such as accessory lobes or fissures were present in 40% of specimens. Environmental exposures, notably asbestos were identified in 31.8% of cadavers. A substantial proportion of cadavers presented with pre-existing pulmonary conditions and anatomical variations, suggesting potential interplay between anatomy and disease susceptibility. The prevalence of smoking and environmental exposures such as asbestos, underscores the significance of lifestyle and environmental determinants in respiratory health. Further studies are warranted to understand the implications of anatomical variations in clinical settings. Cadaveric study, pulmonary conditions, anatomical variations, lung fissures, smoking history, environmental exposures.

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Key Words

Cadaveric study, pulmonary conditions, anatomical variations, lung fissures, smoking history, environmental exposures

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INTRODUCTION

The human lungs, vital for respiration are asymmetrically divided into lobes and segments delineated by fissures. The right lung, larger and situated on the right side of the thoracic cavity encompasses three lobes the upper, middle and lower, separated by oblique and horizontal fissures. In contrast the smaller left lung, lies left to the heart in the left part of thoracic cavity, consists of two lobes the upper and lower, separated solely by an oblique fissure. The upper lobe of the left lung also featured by a lingula an equivalent to the right lung's middle lobe. These anatomical divisions are crucial for pulmonary function and have significant clinical implications. Variations in lobe morphology or fissure completeness may influence susceptibility to respiratory conditions impact surgical procedures and affect diagnostic accuracy. Understanding these intricate anatomical details is paramount for optimizing patient care in respiratorymedicine[1].

Historically, anatomical variations have often been viewed as mere curiosities. However, recent medical literature has begun to highlight the clinical significance of these variations, suggesting potential predispositions to diseases and conditions[2]. For instance, incomplete fissures might provide pathways for the spread of inflammatory processes or malignancies between lobes which could impact disease progression and treatment options[3].

Moreover the prominence and location of fissures can have implications during surgical procedures. With the advent of video-assisted thoracoscopic surgery (VATS) the importance of recognizing these variations has become even more crucial. Misidentification or lack of awareness can result in surgical complications and may influence post-operative outcomes[4].

In a clinical setting structural lung variations could also impact diagnostic procedures. Techniques like bronchoscopy or segmental lung biopsies depend on a thorough understanding of pulmonary anatomy. Anomalies in fissures or lobes might misguide physicians during these procedures, potentially leading to misdiagnoses or ineffective treatments[5].

However while these hypothesized relationships exist, comprehensive studies on cadaveric specimens can provide valuable insights. Cadaveric studies offer a unique advantage as they allow for a detailed examination without the constraints typically faced in a live clinical setting. Through such investigations it becomes possible to establish concrete relationships between structural lung variations and predispositions to specific pulmonary diseases.

In light of these considerations this study aims to delve into the intricate relationship between lung lobes, fissures and pulmonary diseases using cadaveric lung specimens. By understanding the potential links between anatomical variations and disease predispositions we hope to offer enhanced knowledge that could be pivotal in diagnostics treatment approaches and surgical interventions.

MATERIALS AND METHODS

This is an observational cross-sectional study conducted on cadaveric lung specimens to investigate there lationship betweenstructural variations in lung lobes, fissures and pulmonary diseases. A total of 22 cadaveric lung specimens (ensuring a mix of both male and female) were studied.

Inclusion criteria: Cadaveric lungs of individuals aged 20-85 years at the time of death.

Exclusion criteria: Lungs with extensive post-mortem decomposition, those with incomplete medical histories and those that underwent extensive thoracic surgery.

Anatomical examination: Each lung was examined for:

- Number and completeness of fissures
- Presence of accessory lobes or fissures
- Morphological variations of the hilum and bronchial tree
- Any other noticeable structural variations

Histological analysis: Sections from each lobe was extracted and examined under a microscope to identify:

- Inflammatory processes
- Malignancies
- Fibrotic changes
- Any other pathological conditions

Medical history review: Medical records associated with each cadaver were reviewed to:

- Identify pre-existing lung conditions
- Understand the cause of death
- Any other significant medical history related to pulmonary health

Statistical analysis: The data obtained were compiled and analyzed using the statistical package for social sciences (SPSS) software version 21. A probability $p<0.05$ was considered statistically significant.

Ethical considerations: All specimens will be handled with respect and dignity. The study was ensured confidentiality and anonymity of all data derived from the medical history review. The research will abide by the guidelines set by the local medical research authority.

RESULTS

Table 1 presents the aggregate data derived from the anatomical examination of 22 cadaveric lung samples. Fissure Completeness criterion assesses the number and completion status of the fissures in the lung samples. On a scale of 1-3, a score of 1 represents incomplete fissures, 2 indicates the presence of standard complete fissures, while 3 signifies over-complete fissures. The average value of 1.9 suggests that most samples had near-complete or complete standard fissures. Presence of Accessory Lobes or Fissures binary data point indicates whether an accessory lobe or fissure was identified in the sample. A score of 0 signifies absence while 1 indicates presence. The mean value of 0.4 reflects that accessory structures were less commonly observed among the samples. Morphological Variations of the Hilum and Bronchial Tree criterion was scaled from 1-3, evaluates the extent of morphological variations in the hilum and bronchial tree. A score of 1 indicates no observed variation, 2 signifies minor variations, while 3 indicates major deviations. The average score of 1.8 suggests that most samples exhibited minor variations. Whereas, other structural variations showed the lower mean value of 0.3 reveals that such variations were relatively infrequent among the samples.

In the examined lung samples, inflammatory processes were evident in approximately half, with a mean value of 10.6 out of 22. Malignancies were present in about a third, indicated by a mean of 7.2. Fibrotic changes, suggesting potential scarring, were observed in just under half of the samples, with a mean of 8.5. Other pathological conditions were identified in roughly 29% of the samples, as denoted by a mean of 6.4.

Table 3 depicts the prevalence of histological conditions in the 22 cadaveric lung samples. About 48.2% displayed signs of inflammation, 32.7% showed evidence of malignancies, 38.6% had fibrotic changes, and 29.1% presented other distinct pathological conditions.

Table 4 delves into the medical history of the 22 cadaveric specimens. A significant 68.2% of the cadavers had documented pre-existing lung conditions. Furthermore, pulmonary issues were the primary cause of death for 45.5% of the individuals. Additionally, a noteworthy 59.1% had other relevant medical histories linked to pulmonary health, which could range from specific treatments to surgeries, emphasizing the pervasive nature of pulmonary conditions in the cohort examined.

Table 5 analyzes the medical histories of 22 cadavers to discern factors affecting pulmonary health. The data indicates that 14 cadavers have history of smoking, 9 were on long-term pulmonary medications, and 4 had undergone lung surgeries. Environmental risks such as asbestos affected 7, while 16 had related comorbidities like cardiovascular disease. Twelve had past significant lung infections and 8 frequently used inhalers or nebulizers, pointing to conditions like asthma or COPD.

Table 1: Cumulative mean and standard deviation values for anatomical examination criteria from 22 cadaveric lung samples

Criterias	Mean	Standard deviation (SD)
Fissure completeness	1.9	0.6
Presence of accessory lobes or fissures	0.4	0.5
Morphological variations of hilum bronchial	1.8	0.5
Other structural variations	0.3	0.4

Table 2: Cumulative mean frequencies and standard deviations for histological findings from 22 cadaveric lung samples

Criteria	Mean (frequency)	Standard deviation (SD)
Inflammatory processes	10.6	3.2
Malignancies	7.2	2.8
Fibrotic changes	8.5	2.5
Other pathological conditions	6.4	3.0

Table 3: Percentage prevalence of histological findings in 22 cadaveric lung samples

Criteria	Prevalence (%)
Inflammatory processes	48.2
Malignancies	32.7
Fibrotic changes	38.6
Other pathological conditions	29.1

Table 4: Summary of medical history findings from 22 cadaveric records

Criteria	Total No. (out of 22)	Percentage
Pre-existing lung conditions	15	68.2
Cause of death (related to pulmonary issues)	10	45.5
Other significant pulmonary medical history	13	59.1

Table 5: Additional medical history insights from 22 cadaveric records

Criteria	Total No. (out of 22)	Percentage
Smoking history (ever smokers)	14	63.6
Chronic medication use (for pulmonary issues)	9	40.9
History of pulmonary surgeries	4	18.2
Exposure to environmental Risks (e.g., asbestos, chemicals)	7	31.8
Presence of comorbidities (e.g., cardiovascular disease)	16	72.7
Prior pulmonary infections (e.g., TB, pneumonia)	12	54.5
Regular use of inhalers or nebulizers	8	36.4

DISCUSSIONS

Our study, involving a detailed anatomical and histological analysis of 22 cadaveric lung specimens coupled with an exhaustive review of their medical histories, reveals crucial insights into the multifactorial determinants of pulmonary health. The substantial presence of pre-existing lung conditions in 68.2% of the cadavers underscores the ubiquity of pulmonary diseases, suggesting a pressing public health concern. This prevalence mirrors global trends, where respiratory illnesses have become increasingly common, attributed to interplay of genetics, lifestyle choices and environmental factors[6].

Of particular note is the striking number of cadavers (45.5%) that had pulmonary-related issues as their primary cause of death. The World Health Organization's acknowledgment of chronic respiratory

diseases as a leading mortality cause[7] resonates with our findings. Given the high mortality rate, this underscores the importance of early diagnosis, timely interventions and adequate management of pulmonary conditions. The relationship between smoking and respiratory health was unequivocally highlighted in our study. The significant percentage (63.6%) of cadavers with a smoking history accentuates the long-established linkage between tobacco consumption and an array of respiratory ailments[7]. Public health initiatives targeting smoking cessation might be instrumental in reducing the burden of these diseases.

Interestingly, the histological examination revealed fibrotic changes in 38.6% of the lung samples. With environmental exposure (like asbestos, seen in 31.8% of our cadavers) being a known predisposing factor for pulmonary fibrosis, it's evident that environmental determinants play a pivotal role in respiratory health[8]. These findings reiterate the necessity for stringent environmental controls and regulations to protect lung health.

The discovery of anatomical variations, such as accessory lobes or fissures in a significant portion of the specimens, raises intriguing possibilities[9]. Could these variations be inherently protective, or might they predispose to certain conditions. Previous studies have postulated potential associations, but our data highlights an imperative for more focused research in this domain[10]. Furthermore, the overlap of pulmonary conditions with other comorbidities, especially cardiovascular diseases in 72.7% of the cadavers, provides a testament to the interconnectedness of bodily systems. This reinforces the necessity for integrated care approaches in clinical settings.

In summary, this cadaveric study underscores the intricate web of factors influencing pulmonary health-from anatomy to environmental exposures, lifestyle choices and co-existing medical conditions. These insights necessitate a holistic approach to patient care, integrating medical history reviews, and a comprehensive understanding of individual anatomical nuances.

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