

The Aging Lung

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Aging lung refers to the lung of elderly persons from the natural ageing process, of which the changed state may be superimposed from prior exposure to environmental factors, e.g. air pollutants, smokes, etc., among the additive injurious effects of past diseases. Innate host susceptibility to exogenous or endogenous environmental insults, and lifestyles (urban vs. rural) may also play a role in modifying the degenerative process of senescence to some extent. Exogenous factors include infection, climate, air pollution and mechanical injuries, whereas endogenous environments are certain system diseases, e.g. diabetes mellitus and thromboembolism, as well as infectious diseases e.g. tuberculosis, COVID-19.

Therefore, the term 'ageing lung' refers to the lungs of the elderly characterized by a changed state in terms of morphology, physiology and lung defence mechanism.

Pathological Change

The structural changes in the lung that occur with age include: (1) a 'rounding' of the shape of the lung owing to an increase in the anteroposterior diameter and, to a change in the height of the lung; (2) an increase in the distance between alveolar walls, namely the linear intercept; (3) a decrease in the proportion of alveolar parenchyma; (4) an increase in the number and size of the pores of Kohn; and (4) localized panacinar emphysema.

Physiology

As a person grows older, lung functions becomes compromised including; (1) a loss of lung elastic recoil; (2) an increase in closing volume; (3) changes in subdivisions of lung volume; (4) a decrease in maximum expiratory flows; (5) a decrease in the diffusing capacity of the lung; (6) a decrease in arterial oxygen tension; and (7) a decrease in response to stimuli.

Lung Defense

Decreased mucociliary clearance, alteration in respiratory mechanics and, concomitant illnesses, e.g, disorders of the esophagus and Parkinson's disease, predispose elderly people to lung aspiration. Specific immune responses are greatly suppressed as a result of decreased accessory cytokine production, low T-lymphocyte proliferative response and alterations in T-cell-B-cell subpopulations that would result in imperfect T-cell-B-cell interaction.

Environment and the Ageing Lung

Lung changes that occur during the ageing process may be the result of the natural degenerative process of ageing alone, or may be the result of a combination of ageing plus damage from environmental insults, which are most severe to their impact on the elderly.

There are a few relevant facts about the elderly which need to be mentioned in order to put the subject into perspective.

(1) Older people are more likely to suffer ill-health than those under 60 years of age.

(2) Among elderly living in the same environment, the outcomes of afflictions on health are not the same. The differences may be caused by the diversity of individual physical endurance and general health, the condition of the organ exposed to adverse conditions and the individual's socioeconomic status *per se*.

(3) Rapid globalization of social and cultural structures manifested in eating and drinking habits as well as smoking, not to mention housing, has created an environment detrimental to the lung as well as to the host as a whole.

(4) A common experience in respiratory critical care is that the elderly patient experiences more difficulty in recovering.

Exogenous Environment

Infection, climate, air pollution and mechanical injuries make up the main exogenous factors that have a considerable impact on humans.

Certain infections in the elderly are more prevalent present a different clinical course than in the younger cohorts. For instance, during COVID-19 outbreaks, more older people than young people would succumb to severe pneumonia. Chickenpox is generally benign in children, but in infected older people it tends to progress to varicella pneumonia. Some bacterial pneumonias mainly attack elderly adults or present different clinical pictures from those in younger people. *Klebsiella* pneumonia is almost a disease of the elderly.

The elderly do not tolerate drastic clinical changes well. During the rainy season or monsoon in the humid tropics, many aged persons who are exposed to wet weather become severely ill with respiratory tract infection from which they do not recover.

Chronic obstructive pulmonary disease is another consequence of smoking that occurs mostly at older ages.

Indoor air pollution is increasingly of concern because of the risk it poses to lung health. Asthma and hypersensitivity pneumonitis are associated with indoor exposure to foreign proteins; airborne transmission of infectious disease, such as Legionellosis, is well known.

The health hazard of indoor radon has been recognized. Inhaling radon decay products appears to act synergistically with cigarette smoking in causing lung cancer.

Mechanical injuries, such as blunt chest trauma, often cause severe complications in the elderly, namely lung contusion and lung hemorrhage.

Endogenous Environments

Concomitant diseases, either respiratory or systemic, are gross exaggerations of what has already happened to the aged lung. While the risk of developing venous thrombosis increases with age, pulmonary thromboembolism is a major cause of morbidity and mortality in the elderly. Disorders of the esophagus and/or Parkinson's

disease in elderly patients are usually associated with lung aspiration and subsequent pneumonia.

Tuberculosis cases increases with increasing age. The prevalence of TB among the elderly has been attributed to the reactivation of early postprimary lesions or previously healed disease, partly as a result of immunoincompetence. Of particular interest is the clinical and pathological behavior of the tuberculosis ageing lung, compared with that of young patients. Not only are the types of lesions different in the aged, but the course of disease is also more insidious and less destructive in the aged.

In summary, the ageing lung or the lung of the elderly is associated mostly with changes that significantly affect its ability to maintain homeostasis, so that it is particularly vulnerable to environmental insults.

Documents used for editing

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