Physiological Significance of Ventilation-Perfusion Inequalities

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Ventilation-perfusion inequalities of the lung can be visualized by processing ventilation and perfusion scintigraphic images by administration of radioxenon. Physiological consequence of the ventilation-perfusion inequalities is thought to cause loss of gas exchange function of the lung. However, any attempt to qualify these scintigraphic data related with the physiological consequence has not yet been done.

Both ventilation ($\dot{V}$) and perfusion ($\dot{Q}$) image were converted into 40×40 digitized frames and were processed by the digital computer to construct ventilation/perfusion image ($\dot{V}/\dot{Q}$) and to derive quantitative relation between $\dot{V}$ and $\dot{V}/\dot{Q}$ as well as $\dot{Q}$ and $\dot{V}/\dot{Q}$. These quantitative relations were input into the gas exchange model of the computer program as proposed by West et al., and alveolar-arterial gas pressure difference (A-aD) were calculated as a measure of gas exchange efficiency of the lung from these quantitative relations.

Five young healthy non-smokers, four aged healthy non-smokers and four aged healthy smokers were investigated primarily. The relation between $\dot{V}$ and $\dot{V}/\dot{Q}$ as well as $\dot{Q}$ and $\dot{V}/\dot{Q}$ were constituted the lognormal distribution function which were calculated to be of normal range of A-aD. However, in the case of smoker, the first moment of both distribution functions dissociated each other with higher values of the second and the third moment which was calculated to be a significant magnification of A-aD. In seventeen subjects with various lung disease, the estimated values of $A\text{-}aDo_2$ were compared with the measured values of $A\text{-}aDo_2$, and a good correlation was found ($r=0.77$). This type of quantification to interprete scintigraphic data into physiological values should be legitimate, if it is possible.

Particle Size Measurement and Mode of Deporision of ^{99m}Tc-Albumin Aerosol

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There are many unknowns in clinically used aerosol inhalation lung imaging. One is a particle size of aerosol and the other is its mode of deposition. The purpose of the present study is to clarify these two questions by the following experimental methods.

Particle size was measured in an empty column of glass by a sedimentation method. Aerosol