

these area according to our calculation, because airflow speed was highest in segmental bronchi. The aerosol particles produced by ultrasonic nebulizer was not monodisperse but was considered to be about 2 microns as mass median diameter. This aerosol was medium sized particles, therefore, its distribution in human airways was showed in central as well

as distal airways. When this aerosol was inhaled by deep breath with the same cycle of normal respiration, hot spots of aerosol were observed in segmental bronchi particularly of upper lobe. It was suspected from these theoretical and experimental analysis that segmental bronchi were liable to be attacked by medium to large sized particles.

Simulation Studies of Regional Pulmonary Ventilation Using Xenon-133

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Eight subjects consisting of three normal persons and five patients with pulmonary diseases were studied with Xenon-133 washout and N₂ washout to evaluate ventilatory function.

All studies were carried out with the subjects in the upright position and camera placed against the posterior thorax. 5 mCi of xenon-133 was injected into cubital vein. The subject held his breath for ten sec and he then rebreathed from the closed system until equilibrium was attained. The system then closed off and the subject breathed room air, while washout data were recorded on magnetic tape for computer analysis. All of the xenon-133 washout curves were corrected for the effect of xenon-133 uptake by the chest wall.

For the purpose of studying regional ventilation mathematical model was applied. In

the model the only variable was tidal volume of each region and that was calculated by fitting closely computed points to an experimental curve using digital computer.

In the patients with obstructive diseases the value of regional minute ventilation per unit volume (VE/V) of slow compartment appeared to be lower and the volume ratios of slow compartment divided by the total lung volume to be higher compared with normal subjects.

Comparison of the results of xenon-133 clearance with standard N₂ washout studies indicated the sensitivity of the radioxenon technique because the radioxenon technique demonstrated clearly the increase of volume of slow space in a patient with chronic bronchitis whose index of inspired gas distribution taken from N₂ washout curve was within normal range.