ynx, the trachea, the carina and the bronchi and is ingested with saliva into the stomach. For studying ventilation distribution extrapulmonary deposition at the above mentioned sites is cumbersome. To minimize extrapulmonary deposition, the following modification in the inhalation method was devised and was found useful. Between an ultrasonic nebulizer and the mouthpiece attached to a non-rebreathing double-J-valve, a blower and a reservior for aerosol were inserted. The reservoir was equipped inside with a non-rebreathing one way valve. The ultrasonically generated aerosol was driven into the reservoir by the blower and was inhaled with tidal ventilation passing through the non-rebreathing one way value inside the reservoir, a leading tube and a double-J-valve and a rubber mouth piece. The size of the aerosol thus inhaled was less than 3 micron in diameter.

Application of this modified inhalation method confirmed in a more definite fashion the previously reported characteristics of radioaerosol inhalation lung scanning. An interesting finding in lung cancer patients was found in addition to the previously reported characteristics. Twenty-nine patients with lung cancer were studied by bronchoscopy and lung function tests as well as by radioaerosol inhalation and perfusion lung scans. Twenty of the 22 patients who showed carinal deposition of radioaerosol had the widened carina and the other two had the normal carina without widening. Five of the remaining 7 patients without carinal radioaerosol deposition showed the normal carina and 2 of the 7 patients showed carinal widening. Thus the correlation between the scan finding of aerosol deposition and the bronchoscopic finding of the carina was good in 25 of the 29 (86.2%). When this was considered a positive rate, a false positive or a false negative rate was 2/29 each. In 10 patients with chronic obstructive lung diseases the positive rate was 3/10 (30%) and it was 14/60 (23.3%) in patients with miscellaneous lung diseases.

Thus carinal radioaerosol deposition in lung cancer seems afford an important information regarding carinal widening due to mediastinal lymph node metastasis.

Clearance of Radioactive Particles in the Lung

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(1) Examinations of the Particles Inhaled.

99m-Tc-Sn colloid was nebulized by ultrasonic nebulizer. The diameter of the aerosol was determined by photoscattering method. The results were, CMD : 1 micron, MMD : 2 microns, and geometrical SD : 1.6. Electro-microscopically

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its diameter was, CMD : 0.4 microns and geometrical SD : 1.7.

(2) Compartment Analysis of Clearance Curve.

Ten persons were examined for 15 hours after inhalation of the aerosolized ^{99m}Tc-Sn colloid. The total clearance curve was analyzed to be two compartments system. The rapid compartment was the clearance of the hilar region, and the slow compartment was that of peripheral airways.

The results were variable. The clearance of particles was closely related to the pattern of initial deposition. The pattern of deposition was dominated by the particle size inhaled and the pattern of patient's respiration. It seemed difficult to control these conditions strictly.

Transmission Scan of Lung

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In order to obtain a image of regional change of lung volume causing by respiratory change, so-called transmission scanning has been attempted to applicate by means of a scintillation camera recording compatible with computer processing. This method has been known to be merited without in vivo administration of radioactive materials, but with the use of transmission flux of gamma ray through body. Since logarithm of the transmission activity from a gamma ray source has a linear relation with lung density which is a composite of tissue and air, the transmission activities thus obtained might represent a degree of aeration of a regional lung region.

A patient in a sitting position with a plane phantom including 10–20 mCi of ^{99m}Tc from behind was recorded by a scintillation camera in front at various level of respitation, obtaining a transmission scan changing its intensity corresponded with a regional volumetric change of lung. In normal subject, graded change of lung volume from reserve volume (RV) to total lung capacity (TLC) was shown to be increasing activities down towards dependent part of lung. At the same time, spirometric change could also be obtained from upper and lower lung fields, which clearly showed that the spirographic change was more notable at the lower than the upper part of the lung. At a region without ventilatory change such as bullous lung, no change of transmission activities was observed at varing level of respitation. It was highly probable for this method to be used as a simple atraumatic detecting mean for so-called "closing volume" of small airway disease, where notable volume change would not appear until a certain level of respiration such as FRC.

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