G) Lung, Heart and Blood Flow

Clinical Significance of Radioaerosol Scanning in Lung Disease

H. Ito, S. Nomura and K. Torizuka
Department of Radiology
Y. Ishii, T. Mukai and T. Kosaka
Central Clinical Radioisotope Division
Kyoto University School of Medicine, Kyoto

133-Xe is one of the most useful nucleides both for inhalation and perfusion study in lung disease.

Also, clinical usefulness of radioaerosol scanning combined with perfusion scanning by 131-I-MAA has been established. By the difference of physical properties of gas and aerosol, the distribution of these materials in the lung is not similar.

We compared 99 mTc-albumin aerosol scanning with inhalation scanning by 133-xenon. The most characteristique patterns of aerosol scan were exessive deposition of aerosols and peripheral defect. In hypoventilated area where 133-xenon could enter by steady-state rebreathing, these patterns were showed. For example, in lung cancer having bronchial stenosis at 1-main bronchus, aerosol scan showed exessive deposition at the left hilum and peripheral defect, while 133-xenon could enter more peripherally.

The distribution ratio of aerosols to r-lung and 1-lung was nearly equal to the ratio of inhaled 133-xenon.

We postulated that the exessive deposition would show relative ventilatory volume of the diseased lung, and that the cause of excessive deposition would be abrupt change of air flow rate at the site of bronchial stenosis.

Compared with 133-xenon inhalation study, we showed that aerosol scan would be useful in detecting the site of bronchial stenosis and in assessment of relatively decreased ventilation.

"Hot" Spot on Aerosol Inhalation Scan: Its Significance

T. Isawa and K. Okubo
Department of Medicine, The Research Institute for Tuberculosis, Leprosy and Cancer, Tohoku University, Sendai

Occurrence of an area of excessive radioactive deposition or a "hot" spot on the aerosol inhalation scan has been considered disadvantageous and prevented from a wide acceptance and clinical application of this procedure. The purpose of this paper is to show that this is a misconception.

Aerosol inhalation scans in normal subjects shown uniform patterns of aerosol distribution nearly identical to their perfusion counterparts. Patients with obstructive airway disease show distinctly abnormal configurations, namely centrally located "hot" areas and irregular peripheral patchy distribution of aerosol or peripheral "hot" spots, and combination of each. The abnormal central and peripheral patterns correspond re-

Presented by Medical*Online

spectively with the emphysematous and bronchitic categories described by Burrows and others. In patients with bronchogenic carcinoma, the "hot" spot is seen at the site of bronchial compression or endobronchial tumor. When a tumor grows larger so that the bronchial lumen is occluded, the "hot" spot disappears with no aerosol deposited in the distal part of the lung, indicating the absence of an effective airflow.

Aerosol inhalation scanning is also useful in the estimation of differential ventilation in the animal experiments such as in the dogs. In the assessment of postoperative lung function in the canine lung transplants, partial bronchial obstruction at the bronchial anastomotic site was indicated on the aerosol inhalation scan as a "hot" spot. The "hot" spot occurred transiently in allografts and autografts in the immediate postoperative period as a result of edema, at the time of rejection in allografts, and many months postoperatively in autografts as a result of bronchostenosis by scar formation.

In summary, a "hot" spot on aerosol inhalation scan is a useful sign indicating the presence of partial obstruction in the airway.

Lung Scintigram with ^{133}Xe

H. Hishida, Y. Koga and H. Simura

Department of Radiology, School of Medicine, Showa University, Tokyo

Dynamic study of pulmonary function was performed with ^{133}Xe by scinticamera.

Breathing with a closed circuit and injecting ^{133}Xe gas in its circuit, after a single deep breath, scintiphoto was took during breath holding for 30 minutes (inhalation scintiphotogram). Then, after rebreathing for 3 to 5 minutes (rebreathing photograms), gas was washed out (wash-out photos). During all these phases, radioactivity of each lung was recorded as wash-in and wash-out curve.

Abnormal pulmonary function were observed with these techniques and compared with perfusion scintiphotos and X-P.

This technique is especially useful for observation of cases with poor ventilation by means of obstructive disturvance in spite of normal X-P. (e.g. bronchral asthma, emphysema, lung cancer etc.)

A Study of ^{99m}Tc Aerosols and ^{133}Xe Gas Inhalation Scintigraphy

H. Inoue, Y. Matsuda, S. Hamano, R. Izuchi and M. Iio

National Hospital Nakano, Tokyo

Pulmonary inhalation scintigraphy was done, using ^{99m}Tc albumin and ^{133}Xe gas. ^{99m}Tc albumin aerosols were produced with ultrasonic nebulizer and were inhaled about 8 minutes. Immediately after completion of the inhalation procedure, scintigraphy was done.

^{133}Xe gas was inhaled with O_2 in spirometer.

Inhalation scintigrams of 90 patients were done, 47 tuberculosis, and 43 non-tuberculosis.

^{99m}Tc aerosols inhalation scintigram patterns were classified four categories, Lung-field type, Bronchial type, Madara type, and Mixed type. The lung-field type, ^{99m}Tc aerosols deposition is homogenous in lung field. The bronchial type, aerosols deposite only in trachea and major bronchi. The madara type shows geographical

Presented by Medical*Online