of patients of the 3rd group. Pulmonary perfusion scintigraphy in patients with VSD is a valuable procedure that provides an important information to evaluate the extent of pulmonary hypertension.

Quantitative Estimation of Pulmonary Hypertension by Perfusion Scintigraphy

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A nontraumatic technique for estimation of pulmonary arterial pressure in the patient with pulmonary hypertension was studied by perfusion scintigraphy of intravenously injected ^{99m}Tc-labelled macroaggregated albumin using scintillation camera and computor system.

Perfusion scintigraphys were obtained in 22 patients. Seven patients had precapillary arterial pulmonary hypertension, seven had postcapillary venous pulmonary hypertension, three had heart disease with no pulmonary hypertension (non hypertensive) and five had no disease (normal). The Upper/Lower lobe blood flow ratio (U/L ratio) was calculated as the ratio of concentration of radioactivity between the upper and lower thirds of the right lung scintigram. Vertical or Horizontal image was obtained in the sitting posture or supine posture during injection of ^{99m}Tc-labelled macroaggregated albumin. The Vertical/Horizontal ratio (V/H ratio) was calculated by dividing U/L ratio of vertical image by that of horizontal image. In five normal subjects, seven patients with precapillary arterial pulmonary hypertension and seven patients with postcapillary venous pulmonary hypertension, this V/H ratio averaged 0.51 ± 0.09, 0.94 ± 0.22 and 0.89 ± 0.24. This V/H ratio in patients with pulmonary hypertension was significantly greater than normal. There was an excellent correlation between V/H ratio and the mean pulmonary arterial pressure.

This method appears to be useful in determining whether the pulmonary arterial pressure is elevated in patients with pulmonary hypertension.

Perfusion and Ventilation Scintigraphy in Follow-up Study of Lung Cancer

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Perfusion and ventilation scintigraphy using ^{99m}Tc-MAA, ^{133}Xe solution, ^{133}Xe gas and ^{81m}Kr gas carried out on 230 cases of lung cancer. In order to evaluate the clinical significance of perfusion and ventilation scintigraphy in follow up study of lung cancer, a series of 41 proven cases of lung cancer, those had periodical repetation of perfusion and ventilation scintigraphy during the course of radiation therapy, was reviewed and following results were obtained:

1) There was a good correlation between the grade of impairment of gas ventilation and blood perfusion in most of cases. However, in several cases a considerable discrepancy was noticed between them, and in such cases perfusion was usually more severely impaired than ventilation. This tendency appeared to be a distinct feature in lung cancer.

2) Both ^{133}Xe gas and ^{81m}Kr gas were useful for estimation of inhalation, however, washout study was impractical for ^{81m}Kr gas because of extremely short half life of 13 seconds.

3) Diminished perfusion was much more clearly shown in ^{99m}Tc-MAA scintigraphy than ^{133}Xe solution scintigraphy.

4) In certain cases of hilar cancer, perfusion scintigraphy often revealed no noticeable improvement for pulmonary vascular obstruction in spite of marked radiographical regression of tumor shadow after radiation therapy.

5) Perfusion and ventilation scintigraphy often gave us new additional informations about the pathophysiological condition of main pulmonary arteries and main bronchi, those were hardly recoginzable on plain chest X-ray films, and was found to be a useful non-traumatic procedure for follow up study of lung cancer.

Aerosol Inhalation Lung Imaging: Aerosol Patircle Size, Inspiratory Flow Rate and Mode of Aerosol Deposition

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Radionuclide lung perfusion and aerosol inhalation imaging have the capability of detecting abnormalities in pulmonary diseases. However, the effects of aerosol particle size, the inspiratory flow rate during aerosol inhalation and airways abnormality on aerosol inhalation images have not been studied well yet. We have measured the size of aerosol particle by gravitational sedimentation and studied above aspects in vitro by using airway models as reported previously. The present study was undertaken in an attempt to correlate the human aerosol inhalation lung images with these results in normal subjects and patients with lung cancer.

We have found that when a reservoir was placed between an ultrasonic nubulizer (Mistogen EN-142) and a mouth piece, most of aerosol obtained at the mouth piece consisted of 1 to 3 μ in size with a larger-sized aerosol removed by the reservoir, while without the reservoir in place aerosol tended to be larger in size, say 3 to 10 μ in diameter. With increasing size and inspiratory flow rate during aerosol inhalation, inhalation images showed the so-called central pattern, indicating an excessive deposition of inhaled aerosol on the major airways and less aerosol in the lung parenchyma. Thus the major airways were roughly depicted as in crude bronchography. With the reservoir in place and by inhaling a smaller-sized aerosol with tidal ventilation, aerosol deposited in the lung parenchyma with little radioactivity in the major airways.

Therefore it seemed more reasonable to use a larger-sized aerosol or to inhale aerosol with increased flow rate in imaging pathology such as stenosis or partial obstruction in the major airways up to the secondary bronchi, while for lesions in the smaller airways, a smaller-sized aerosol was more useful. The selection of aerosol size and inhalation flow rate was particularly useful in patients with lung cancer in whom cancerous endobronchial lesions were depicted as "hot spots". Furthermore sequential delayed imaging was diagnostically useful for the evluation of mucociliary clearance mechanism at the "hot spots"; if "hot spots" did not disappear in 2 to 3 hours, denudation of the ciliated epithelium was highly suspected.