Lung Scintigraphy with ^{131}I-MAA and Computer Processing of RI Image

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Lung scintigraphy by ^{131}I-MAA has been studied routinly as one of the lung function test. But it is difficult to evaluate quantitatively local blood flow of lung and dynamic blood flow.

To study this we used PHO/GAMMA scintillation camera, Tosbac 40 minicomputer, teletypewriter, videotaperecorder and diversing collimeter.

The locations, size and degree of diminished distributions in the pulmonary circulation had been made clear by smoothing the lung scintigraphy.

By profile curves of any axis of X or Y distribution of blood flow had been made clear.

RI changes with time any given region of lung and heart could be obtained.

Pulmonary Scintigraphic Abnormalities in Aortitis Syndrome; their Incidence and their Relation to Pulmonary Tuberculosis

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It has been well established that pulmonary arteries may be also involved in aortitis syndrome (Takayasu's arteritis). It is also known that the incidence of tuberculosis is high in this disease and that pulmonary perfusion scans are often abnormal in patients with known tuberculosis. Therefore we have at least two different causes by which pulmonary perfusion scan may become abnormal in this disease. The purpose of this study is to known the incidence of abnormal pulmonary perfusion scans in aortitis syndrome and to decide whether these abnormalities are related to pulmonary tuberculosis or aortitis syndrome per se.

Pulmonary perfusion scans were obtained from 38 cases of aortitis syndrome. Clinical histories and chest films were also carefully reviewed in each case. The diagnosis being confirmed by histories, physical examinations and finally by angiographic studies. ^{131}I-MAA about 0.3 mCi was used for the lung scan and the injections were made in supine position.

Scans were abnormal in 28 out of 38 cases (73%). History of tuberculosis was obtained in 12, out of which scan was abnormal in 10, on the other hand, out of 26 patients without history of tuberculosis, scan was abnormal in 18. X-ray findings indicative of old tuberculous scars were observed in 13, out of which scan was abnormal in 11, while out of 25 patients without tuberculous lesions, scan was abnormal in 17. Though the incidence of abnormal pulmonary perfusion scans is slightly higher in patients with history of tuberculosis or chest film findings of old tuberculous scars, the difference was statistically not significant. There are, however, at least five cases in whom scintigraphic abnormalities were definitely related to old tuberculosis.

It is concluded that the incidence of abnormal perfusion scan is about 70% in aortitis syndrome

and that most, but not all, of these abnormalities are probably related to aortitis syndrome per se and not to pulmonary tuberculosis.

Changes in Perfusion and Ventilation Following Bronchography

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Lung scans of perfusion and ventilation before and after bronchography were obtained in patients with various lung diseases and arterial blood gases including pH, Pco_2, Po_2 and bicarbonate were also measured. Activity of the right and left lungs was estimated with the help of a digital computer.

In eight patients, perfusion studies were performed with the intravenous injection of 200 to 300 μCi ^{131}I-MAA and arterial blood gases were measured before and after bronchography.

After bronchography, in all patients perfusion on the side on which the bronchogram had been carried out was reduced.

Just after bronchography Po_2 was reduced but pH, Pco_2 and bicarbonate were unchanged. After two hours Po_2 returned to normal level.

Two patients had perfusion studies and arterial blood gas measurements before and after bronchial catheterization and anesthesia. Significant changes were not observed in perfusion and arterial blood gases.

Three patients had perfusion and ventilation studies before and after bronchography. Ventilation studies were performed with the inhalation of 3 to 5 mCi ^{99m}Tc-albumin.

The distribution of perfusion and ventilation was both affected by bronchography, but we were unable to demonstrate any relationship between the reduction in perfusion and the reduction in ventilation.

Although the mechanism responsible for the development of perfusion defects following bronchography has not been conclusively established, it seems that bronchial obstruction produces local vasoconstriction by a decrease in regional alveolar oxygen concentration.

Another possibility is that irritation by contrast material causes a reflex vasoconstriction.

Regional Pulmonary Function Studies with ^{133}Xe

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Regional pulmonary function studies were performed during normal breathing at rest with a scintillation camera placed on the back of a sitting subject.

Procedure of a single breath of 5–10 mc Xe gas and washout in the open circuit was performed in ventilation studies (breath-hold 10 seconds). In the perfusion studies, intravenous injection of 5 mc Xe dissolved in saline and equilibration procedure in the closed circuit was performed (breath-hold 15 seconds).

In both ventilation and perfusion studies, each