Studies on the Scintigram of Irradiated Lung by Means of ^{131}I-MAA

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Phantoms designed to resemble the lung of rabbit in shape were filled with ^{131}I solution ranging from 20 μCi to 80 μCi.

Difference between both sides of the lung on scintigram was found when the contents of one side exceeded 6 μCi the other side. The ratios of the counting scores using cylindrical hole of 0.5 inch in diameter were measured at the center of each lungs. The values of the ratio 1.2 or 0.8 were measured in the case in which the difference on scintigram was noticed.

One side of the rabbit lung was administered single irradiation of 4000R or 6000R (160VP, 130R/m.) and compared to the other side by radiogram, scintigram, and the ratio as described above.

As the preliminary experiment, difference of left and right lungs in MAA capture was measured to reveal the left lung being larger in this capture.

The capture was increased following 2—3 days of irradiation until 10 days (4000R) or until 5 days (6000R) from which it was deccreased to attain normal value at 30 days.

Hyperemia of the lung following irradiation was considered to be the cause of the increase in the capture. There was no finding on radiograms in the course of the experiment.

A Study on Lung Scintigrams with ^{131}I-MAA

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Since megavoltage equipment has been available, the doses employed in radiotherapy of malignant tumors of the breast have increased and 6,000 rads or even higher have become common. The incidence of pulmonary fibrosis has increased at the same time.

In this stady, first of all, the telecobalt gamma irradiation ranging from 2,000 to 8,000 R. was performed to the portion of right lung in 30 adult rabbits.

Both lung scintigrams and chest films were studied every week.

Secondarily, radiation effects were observed histopathologically.

Study on the Shift Ratio of Pulmonary Blood Flow in Right or Left Lateral Positions: Application of ^{131}I-MAA Pulmogram

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We have been using ^{131}I-MAA pulmogram method to estimate the relative amount of pulmonary blood flow to bilateral lungs since 1965. This method requires a slit type collimator that is attached to the probe of the scintiscanner (3×2 inches crystal).

This time we are to report the results of our study on the shift ratio of pulmonary blood flow in the right or left lateral positions.

Seven normal subjects were studied by this technique. In supine position, the mean right to left ratio was 53.5% to 46.7%. In right lateral position, the increased amount or right pulmonary blood flow ranged between 8 and 21% in 5 out of 7 subjects as compared with the distribution in the supine position. In left lateral position, the amount of increase to the left was found between 5 and 14% in the above 5 normal subjects. The remaining 2 showed almost no changes in the pulmonary blood flow in their postural change. These two were rather obese.

There was one very obese case (92.5 kg.), whose right to left ratio was 50 to 50 in supine, 47.3 to 52.7 in right lateral and 50.7 to 49.3 in left lateral positions, indicating negative shift. Although this method can know only rough distribution, it may be pointed out that this result was definitely different from those obtained from most of the normal subjects. We consider that the result in this obese case is probably due to the pressure from the intra-abdominal organs, resulting in decreasing the ventillation as well as pulmonary blood flow of the lower side.

There were 4 cases of overdistension, 2 of them were unilateral and the remaining 2 were bilateral. In all of them, the pulmonary blood flows shifted very well to the overdistended lungs.

In 2 cases of diffuse obstructive emphysema, the shift amount in right or left lateral position was found very small.

In 2 cases of pulmonary carcinoma, we determined the change in the pulmonary pressure as main branch of unilateral pulmonary remarkable change in the pressure when either artery was blocked. One of them did not show side of the branch was blocked. The pulmonary blood flow shifted very well to right or left when changing his posture. In another case, who had right pulmonary carcinoma, the pulmonary blood flow did not show any shift to the diseased lung as he was in the right lateral position, but it shifted normally to the left lung in the left lateral position. In this case, the mean pulmonary pressure increased to 21 mmHg as main branch to the normal lung was blocked. In contrast with this fact, when the main branch to the diseased lung is blocked the mean pulmonary pressure became only 11 mmHg.

As a conclusion, the combined use of ^{131}I-MAA pulmogram and postural change will bring out another parameter to the dynamic studies of pulmonary function. Furthermore, we think that there may be a possibility of knowing the amount of pulmonary capillary reserve by this technique.

Study on Pulmonary Circulation by the Use of RISA: Effects of Acute Hypoxia in Cardiopulmonary Diseases

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The effects of hypoxia on pulmonary circulation has been studied by many investigators, but reactivity of pulmonary vascular system induced by hypoxia is not known. In this cent oxygen for 10 minutes on the cardiac ininvestigation, the effects of breathing 12 per dex, pulmonary circulation time, pulmonary blood volume and circulating blood volume were studied by external scanning of RISA.

Methods

3 normal healthy subjects and 11 patients with cardiopulmonary diseases were studied. The instruments with two 2 inch × 2 inch NaI crystal scintillation counters with lead collimator were used for precordial counting. Subjects lay supine, one detector was placed