

## 239

REGIONAL VENTILATION AND PERFUSION IN INTERSTITIAL PNEUMONIA AT REST AND DURING EXERCISE. H. SEKINE, N. OKAZAWA, S. SUGIMOTO, Y. WATANABE, K. KAWAKAMI, T. SHIMADA. JIKET UNIVERSITY. TOKYO. N. KATSUYAMA. RYUKYU UNIVERSITY. OKINAWA. S. TO-MINAGA. JUNTENDO UNIVERSITY. TOKYO.

In order to know the pathophysiological change of interstitial pneumonia, it is important to detect the morphological change in vascular and air way systems in the lung. The subjects consisted of 12 patients of interstitial pneumonia. The Kr-81m bolus inhalation from various lung volumes were done to estimate regional abnormalities of static compliance. The regional distribution of ventilation-perfusion ratio ( $\dot{V}/\dot{Q}$ ) in the lung was obtained from the continuous inhalation and infusion of Kr-81m. In 6 patients, regional distribution of  $\dot{V}/\dot{Q}$  were measured at rest and during exercise. In advanced stage of the disease, radioactivity in lower lung fields was decreased in bolus inhalation from TLC-400ml lung volume. These findings are representing air way rigidity, especially in lower lung fields. Concerning  $\dot{V}/\dot{Q}$  distribution, fibrotic patients shift the blood flow to the upper lung fields by smaller exercise than the normals. It should be noted that not only was perfusion in upper lung fields increased in the disease, but was reduced in lower lung fields. So, late in the course of extensive in the disease, pulmonary vascular bed in lower lung fields may be restricted. It seems possible that blood flow shifts easily toward the upper lungs by weak exercise.

## 240

A STUDY OF REGIONAL PULMONARY FUNCTION TESTS USING POSITRON LABELLED GASES—MAINLY EVALUATION FOR REGIONAL PULMONARY DIFFUSIBILITY USING  $^{11}\text{C}$ O. M. Furudate\*, Y. Asanuma\*\*, H. Itoh\*\*\*, M. Matsuda\*\*\*, A. Nishimura\*\*\*, I. Suzukawa\*\*\* and T. Yamada\*\*\*.

\*Department of Radiology, Hokkaido Univ., School of Medicine, Sapporo City. \*\*Noboribetsu-Branch of Hokkaido University Hospital, Noboribetsu City. \*\*\*Japan Steel Works Memorial Hospital, Muroran City. \*\*\*\*Accelerator Group of Japan Steel Works Company, Muroran City.

In this study an attempt was made to evaluate the regional pulmonary diffusibility test using  $^{11}\text{C}$ O and comparative studies of regional pulmonary function tests were made using positron labelled gases and the conventional radioisotopes.  $^{11}\text{C}$ O,  $^{11}\text{C}$ O<sub>2</sub> and  $^{13}\text{N}_2$  were used as positron labelled gases and  $^{133}\text{Xe}$  and  $^{99\text{m}}\text{Tc}$ -MAA for conventional study. A single image or sequence of dynamic images were photographed by scintillation camera equipped with a high energy collimator for positron and simultaneously the data were collected by computer. A single breath method was used and after a short period of breath holding (10-20sec.), the inspired gas was washed out for rebreathing room air. From the dynamic images, wash out curve and clearance rate were extracted with the aid of computer. In conclusion,  $^{11}\text{C}$ O gas is useful for the feasibility of regional pulmonary diffusing capacity.

## 241

EVALUATION OF REGIONAL VENTILATION BY FUNCTIONAL IMAGES IN PATIENTS WITH LUNG CANCER. I. Narabayashi, K. Sugimura, R. Onishi, K. Ito, S. Nishiyama, T. Fukugawa, Y. Inoue, S. Kimura and M. Matsuo. Department of Radiology, Kobe University School of Medicine and Hyogo Prefectural Hospital. Kobe and Nishinomiya.

The purpose of this study is to evaluate regional ventilation by functional images in lung cancer. Ventilation ( $\text{Xe-133}$ , Kr-81m) and perfusion ( $\text{Tc-99m}$  MAA) studies were performed on the same day in 36 patients with lung cancer.

The computer calculated mean value of the transit time of Xe-133 equilibrium washout curve for each of a 64 x 64 matrix using height over area method and reconstructed the functional image. The values of %  $\dot{V}$  with Kr-81m and %  $\dot{Q}$  with Tc-99m MAA were expressed as percentage of the total lung respectively.

Functional image of  $\dot{V}/\dot{Q}$  ratio (Kr-81m ventilation/Tc-99m MAA perfusion) was also reconstructed by computer display.

These functional images were useful for depicting ventilatory abnormalities in the patients with lung cancer. However, mean value of the transit time of Xe-133 washout curve seemed to have a limited role in the quantitative assessment of regional ventilation, because of affinity of Xe to fatty tissue. On the other hand, the correlation coefficient between %  $\dot{V}$  with Kr-81m and %  $\dot{Q}$  with Tc-99m MAA was 0.852. There were some mismatched cases between ventilation and perfusion in lung cancer.

## 242

STUDIES ON THE TOPOGRAPHICAL DISTRIBUTION OF  $\dot{V}/V$ ,  $\dot{Q}/V$  AND  $\dot{V}/\dot{Q}$  IN THE LUNG USING XE-133 CONTINUOUS INTRAVENOUS INFUSION METHOD. K. Higashiya, M. Mishima, K. Chin, M. Nakagawa, K. Kuno Department of Respiratory Disease, Hyogo Prefectural Tsukaguchi Hospital, Amagasaki

We developed the method of calculating  $\dot{V}/V$ ,  $\dot{Q}/V$  and  $\dot{V}/\dot{Q}$  in the lung of the quietly breathing subject using Xe-133 continuous intravenous infusion method. Xe-133 is injected at the constant flow rate into right cubital vein of the subject who is breathing quietly from open circuit. We calculate S1, S2 and S3 by integrating the time activity curve.

S1: Just after the end of injection while closed circuit breathing is performed.  
S2: During the dynamic equilibrium state in the period of infusion.

S3: At the end stadium of closed circuit breathing.

From these values,  $\dot{V}/V$ ,  $\dot{Q}/V$ ,  $\dot{V}/\dot{Q}$  are calculated in normal and COPD. Then functional image and log distribution curve are made. As the objective parameter, coefficient of variation (C.V.) of this distribution is calculated.

The merits of this method are as follows:

- 1: Single nuclide.
- 2: Small statistical error. (integration method)
- 3: Performable in poor risk patients. (quiet breathing method)