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

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

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

M. Hori, M. Sugita, K. Kimura, S. Takasugi, K. Yamada, S. Yoneda
O. Kitada, T. Inoue and H. Abe
First Department of Internal Medicine, Medical School
F. Kajiya
Department of Electronic Engineering, Faculty of Engineering Osaka University, Osaka

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

lung was divided into 3 regions (upper, middle, lower). In ventilation studies, peak heights after a single breath obtained for each region are thought to represent regional ventilation. Regional ventilation (V) were calculated from the values of minute ventilation volume obtained by spirometry technique and the regional percentage of ventilation volume. In the same way, perfusion peaks for pulmonary blood flow obtained for each region represented regional perfusion (Q) which were calculated from the cardiac output obtained by ^{99m}Tc-Albumin technique and regional percentage of blood flow.

In this way, regional V/Q could be obtained but this method has some problems because breath-holding is unphysiologic and it is doubtful that peak heights after ihalation represented the regional ventilation.

Therefore, regional washout curves which have many informations about ventilation were analized using compartment analysis technique. The compartment model of the lung consists of six compartments which have the pulmonary functions and a dead space compartment. Regional ventilation per unit volume (rate constant Ki) were obtained by fitting method using an analogue computer. Several experiments were performed on the compartment model: The effect of Ki on the washout curves in region i and the other regions. The effects of initial concentration and volume of dead space on each regional washout curve, etc.

Measurement of Pulmonary Blood Flow and Mean Transit Time by using Radiopharmaceutical

S. Yoneda, M. Sugita, K. Kimura, S. Takasugi K. Yamada, S. Hori,
O. Kitada, M. Inoue and H. Abe
First Department of Internal Medicine, Medical School.
F. Kajiya
Technical Institute
Osaka University, Osaka

The radioactive ^{99m}Tc-albumin method for the measurement of cardiac output and the transpulmonary blood volume and the transpulmonary mean transit time was used.

The experiments were carried out in six patients with cardiac and/or pulmonary diseases and in three subjects without any disorders of heart and lung.

With the patient in the supine (or sitting) position the detecting head of a scintillation camera was placed close over the heart. Data were recorded on magnetic tape for computer evaluation at various intervals after rapid injection of 4 mCi of ^{99m}Tc-albumin into an antecubital vein. A magnetic tape controller transfered data from the memory system onto the magnetic tape.

By using time-lapse curves concerned with radioactive counts from areas of interest of the pulmonary artery and the left ventricle and/or the left atrium, peak to peak times and mean transit times calculated by decomvolution method were measured.

Cardiac output was measured by the Stewart-Hamilton method with monoexponential extrapolation of the downslopes.

In three out of six cases whose peak to peak times and mean transit times were simultaneously measured, the two values were almost equal. Although the measurement of peak to peak times is simple and convenient, the caution must be needed against experimental errors.

Each lung was divided into three areas such as the upper, the middle and the lower one. Lung transport functions (distributions of circulatory transit times across each area of the lung) were obtained from lung-input and lung-out dilution curves using a lumped-parameter model and