

K. Heart, Lung and Peripheral Circulation

INHALATION SCAN USING ^{81m}Kr -GAS

— ITS APPLICATION FOR THE CLINICAL
DIAGNOSIS OF THE VARIOUS PULMONARY DISEASES —

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Inhalation scan using ^{81m}Kr -gas was performed in the various pulmonary diseases, in order to examine the ventilatory function of the lung after the measurement of ratio of forced expiratory volume in the normal and diseased lung field.

In order to take inhalation scan, the patient is placed in sitting position at front of the LFOV scinticamera and is forced to inhale ^{81m}Kr -gas through the nasal catheter leading from the ^{81}Rb - ^{81m}Kr generator following the injection of 10ml air into the generator. The patient holding the breath for 6 seconds and then forced to exale. During this period of 10 seconds, the phenomenon are stored into the syntipac 200 mini-computer. Histograms are obtained in the upper and lower lung fields bilaterally. The ratio of forced expiratory volume in the corresponding field is calculated from the following formula :

$$[\text{CPa}(0) - \text{CPa}(n)] / \text{CPa}(0) = \text{FEVn} / (\text{Va} + \Delta\text{Va})$$

Result

Inhalation scan is applied to the various pulmonary diseases such as lung cancer, radiation pulmonary fibrosis and chronic abstructive pulmonary disease. In cases of lung cancer, there is disturbance of respiratory function at the site of lesion when compared to the remainder of the normal lung.

In cases of chronic obstructive pulmonary disease, the inhalation scan is performed at three state such as pre-, in- and post-attack of the disease. During the asthma attack the respiratory function is disturbed considerably when compared to the pre-attack state.

In each pulmonary disease, the ratio of forced expiratory volume is measured from the histogram and pulmonary function is evaluated.

STUDIES ON PULMONARY VENTILATION FUNCTION IN PATIENTS WITH BRONCHIAL ASTHMA BY USING ^{81m}Kr

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Comparison between spirometry and static image of radioactive krypton at a clinically symptom-free condition and at an asthmatic condition induced by specific antigen was studied in patients with bronchial asthma. A scinti-camera was set up to focus on the back of the sitting subject. Before and after the subject inhaled repeatedly the various concentration of specific antigen for 5 minutes, he was instructed to inhale a single breath of krypton. As soon as the examination with krypton was over, the spriometry was performed. Then the static images of krypton were compared with the data of spirometry.

The following conclusions were obtained:

1. In some cases static image in a single breath of krypton gave us more sensitive information to evaluate minimal dosis of antigen for in asthmatic condition than digital data of spirometry did.
2. The time-sequential and regional changes after inhalation of the antigen could be easily evaluated by images obtained from external measurement of krypton in the lungs repeatedly.
3. Radioactive procedure could be performed easily even though in the attack phase of bronchial asthma.