Lung Scintigraphy in Pneumoconiosis

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Lung scintigraphy was performed in 20 patients of pneumoconiosis and 5 persons without evidence of cardiopulmonary diseases. All of the subjects were employees of an iron foundry and a ship building factory. Scintigrams were obtained by injecting 300 microcuries of 131I-MAA intravenously to the subjects in supine position. Linear scanning of the lungs using the slit-type collimeter, chest x-ray, ESR, pulmonary function test and EKG were also taken in all individuals and findings of these tests were compared with that of lung scintigraphy.

Abnormalities indicative of disturbed blood circulation were noted in 9 of 20 patients. In these 9 patients, x-ray film of the chest showed lesions of PR4 in one, of PR3 in one and PR2 in all others.

In all of the individuals in whom the pulmonary function test gave slightly abnormal results, the lung scintigram also revealed abnormalities of various degrees. The magnitude of abnormalities in lung scintigraphy did not, however, show a definite correlation with the MBC or %FEV1.0", the lack of correlation probably being due to the fact that the pulmonary function was severely impaired in none of the subjects studied.

There was no appreciable difference in the ESR or findings of EKG or linear scanning of the lungs in patients with abnormal lung scintigram compared with the results of those tests in the individuals without any evidence of cardio-pulmonary diseases.

In some individuals, the radioactive MAA was injected with the subject in sitting position. When the radioactive MAA was injected with the subject in supine position, the area of decreased uptake of the material corresponded with lesions in chest x-ray films. When the radioactive MAA was injected to the subject in sitting position, however, the scintigram showed decreased uptake of the material in the apical portions of the lungs. It should be emphasized, therefore, that the intravenous injection of the radioactive MAA should be given with the subject in supine position in lung scintigraphy in patients with pneumoconiosis.

Changes of Pulmonary Extravascular 3H-Water Space Following Surgical Obstruction of Lymphatic Circulation

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Changes of the pulmonary extravascular 3H-water space (Vthol) was followed up by double isotope dilution method(1) after surgical obstruction of lymphatic circulation in dogs.

Further Vthol was compared with gravimetric extravascular water volume(2). Correlation between Vthol and gravimetric values was statistically significant. (r=0.765, p<0.05).

In the first and third day after surgical obstruction of lymphatic circulation at both sides of cervical venous angle without thoracotomy, the increase of Vthol was significant, but in the fifth day it decreased within the normal range.

From these data it was suggested that obstruction of lymphatic circulation resulted in changes of pulmonary extravascular 3H-water space.
in pulmonary interstitial edema but it retired in the fifth day, because of lymphaticovenous communication and/or collateral circulation.

Studies on the Regional Pulmonary Lymphodynamics

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The present study was designed to find a clinical method for indirect measurement of pulmonary lymphodynamics using radioactive iodinated serum albumin (R\textsuperscript{131}ISA).

Basic Studies:

Basic experiments were carried out on normal dogs. R\textsuperscript{131}ISA was injected into the lung percutaneously. Lymph samples prior to and at interval following a percutaneous injection of R\textsuperscript{131}ISA or Na\textsuperscript{131}I at lung were obtained from the thoracic duct or right lymph ducts by canulating at the junction of the internal and external jugular veins, and also blood samples were supplied from the femoral vein.

R\textsuperscript{131}ISA of lymph and blood were measured by well type Scintillation Counter. R\textsuperscript{131}ISA injected into lung was slowly absorbed from lymphatic pathway whereas Na\textsuperscript{131}I was rapidly absorbed into blood stream.

Clinical Application:

The two normal subjects, 20 pulmonary carcinoma patients, 5 lung abscess patients and one pulmonary tuberculosis patient were studied using this method. R\textsuperscript{131}ISA was injected into the lung percutaneously dose of 30\textendash;50 \(\mu\)Ci/0.1 ml.

Radioactivity in the injected area was measured after administration of R\textsuperscript{131}ISA 1 hrs. 3 hrs, 6 hrs, 12 hrs and 24 hrs respectively.

The pulmonary absorption rate of R\textsuperscript{131}ISA was determined by radioactive curve in the administered area, and calculated on the value of one half (T\textsubscript{1/2}).

Absorption rate (T\textsubscript{1/2}) of R\textsuperscript{131}ISA in the injected area were, on the average, 19 hrs. in normal subjects, 15 hrs. in pulmonary carcinoma, 9.5 hrs. in abscess the lung, and 15 hrs. in pulmonary tuberculosis respectively.

R\textsuperscript{131}ISA absorption curve of pulmonary carcinoma without carcinomatous pleurisy was different from that of pulmonary carcinoma with carcinomatous pleurisy. The absorption curves consist of one components exponential curve in the first case, and consist of two components exponential curve in the second case.

Summary:

1) R\textsuperscript{131}ISA, percutaneously injected into the lung, entered mainly lymphatics. The pulmonary absorption rate of R\textsuperscript{123}ISA in injected area would likely be relative to regional lung lymph flow.

2) Absorption of R\textsuperscript{131}ISA from the lung in lung abscess was more accelerated than that in lung carcinoma.

3) In absorption curve of R\textsuperscript{131}ISA in lung carcinoma, there were different components with or without carcinomatous pleurisy.