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LUNG IMAGING OF INHALED C15O2 AND 11CO.
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Serial positron imaging of inhaled C15O2 and 11CO was performed in 5 normal subjects and 15 patients with various pulmonary diseases. The subject inhaled radioactive gases in a single breath.The clearance of them from the lung field was imaged with a conventional gamma camera equipped with a tungsten collimator for shielding 511KeV photons.
Since C15O2 is almost instantaneously taken up by pulmonary capillary blood, regional blood flow can be assessed by the clearance rate of C15O2. In a patient with multiple pulmonary embolism, "hot spots" of radioactivity identified the presence, location, and magnitude of embolized pulmonary segments. Collateral blood flow can also be assessed by the clearance rate of the embolized region.
The clearance rate of 11CO in the total lung field was correlated well with DLCO/Va which is the parameter of pulmonary diffusion. This fact suggests that not only DLCO but also regional diffusion capacity can be evaluated from the clearance rate of 11CO.

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REGIONAL PULMONARY BLOOD FLOW AND DIFFUSION ASSESSED BY C15O2 and 11CO INHALATION.
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Cyclotron-produced C15O2 and 11CO were used to assess regional blood flow and diffusion. The parameter of blood flow was estimated from the clearance rate (2) calculated by the exponential clearance curve of C15O2. The alveolar transfer rate (1) was calculated by the clearance curve of 11CO and 2 value in the same region, using a non-linear least-squares fitting method.the values of 1 and 2 in the upper and lower lung field were evaluated in 5 normal subjects and 15 patients with various pulmonary diseases.
Alveolar transfer rate in patients with interstitial fibrosis was slightly lower than that in normal subjects. But blood flow in the same patients was significantly lower than normal values. Alveolar transfer rate in patients with pulmonary emphysema was markedly low suggesting decreased pulmonary capillary beds.
This method using C15O2 and 11CO inhalation may be useful in the differential diagnosis between various pulmonary disorders.

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DIAGNOSIS OF PULMONARY DISEASES WITH POSITRON COMPUTED TOMOGRAPHY (1) : QUANTITATIVE MEASUREMENT OF LUNG DENSITY USING C-11-CO INHALATION METHOD.
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Quantitative measurement of lung density was performed with Positron Computed Tomography using C-11-CO inhalation method. Using this method, total lung density, lung blood volume and extravascular lung density could be determined. On normal subjects (supine) anteroposterior profiles of total lung density and lung blood volume rose steeply in the posterior lung field, but that of extravascular lung density was almost flat. These results were consistent with those which we had reported with X-ray CT.

We belive that this technic is useful for the quantitative measurement of lung density, therefore providing many diagnostic informations to understand pulmonary diseases.

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STUDY OF PULMONARY EXUDATION SCINTIGRAPHY.
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During the elapse of acute pancreatitis, severe trauma, sepsis and so on, acute severe respiratory failure can happen. Laboratory findings of hypoxemia, decreased pulmonary compliance, and radiographic evidence of widespread air-space consolidation are characteristic. A computerized scintigraphic technique using Tc-99m HSA for the analysis of this disease(ARDS) was evaluated to determine the ability to detect pulmonary capillary protein leak. This method compares the change in radioactivity over the lung following intravenous Tc-99m HSA to the radioactivity over the heart. Each lung was devided into three parts (upper, middle, and lower) and ROI was set in each part. The lung to heart ratio was plotted vs. time for 60 min, and a linear regression was fitted to the data points displayed. The slope index was obtained from each part of the lung fields. To evaluate sensitiveness for detection of the pulmonary capillary protein leak, lung to heart ratios were compared with abnormal findings on the chest plain film. The lung to heart ratio has a good correlation to the abnormality on chest film. This study suggests that lung to heart ratio is a sensitive technique for the detection and kinetic analysis of a pulmonary protein leak.