385

QUANTITATIVE ANALYSIS OF LOCAL PULMONARY FUNCTION BY Kr-GAS,ONE VENTILATION METHOD.

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We tried to analyze the local pulmonary function in healthy group and pulmonary disease group by using Kr-gas one ventilation method.And we compared this results with conventional pulmonary function test,using functional image and phase image analysis. This functional image was significantly related to pulmonary functional test.To obtain the functional image, over inspiration Kr gas and expirate with maximum effort and aquired the expiration rate.By this analysis we acquired not only total pulmonary function but also regional pulmonary function.

386

CLINICAL EVALUATION OF REGIONAL PULMONARY FUNCTION USING Kr—81^m GAS.

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In order to investigate the regional pulmonary functions, a scinticamera with kr—81^m was employed. 10 patients were selected as control subjects, 15 patients with chronic obstructive pulmonary disease, 5 patients with interstial pulmonary disease, and 10 patients with other pulmonary disease were examined.
The regional pulmonary functions evaluted by this method were compared to the overall pulmonary functions.
Throgh this study, clinical superiority of this method was suggested.

387

PULMONARY FUNCTION AND $\dot{V}/\dot{Q}$ DISTRIBUTION IN HYPERTHYROIDISM.

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Pulmonary functions of the hyperthyroidisms were evaluated before and after therapy. Kr-81m continuous inhalation and perfusion study, spirography (VC,RV,FRC,TLC,CV) DLco,flow volume (V25,V50) and QFM(carotid artery blood flow)study were done before and after therapy of 36 hyperthyroidisms.
As a result VC% increaed and RV% decreased significantly after the therapy, due to improvement of weakness of respiratory muscle. No significant changes were recognized on FRC,TLC,CV,DLco,V25,V50 after the therapy. Carotid artery blood flow recovered to normal renge after the therapy. Perfusion shifted to the upper lung fields in 70%of the patients. There was no significant change of ventilation after the therapy.
Therefore $\dot{V}/\dot{Q}$ ratios in upper lung fields decreased in hyperthyroid state. After the therapy, according to normalization of T4 value and carotid artery blood flow, perfusion in upper lung fields recovered to normal pattern. Shift of perfusion to upper lung fields was considered to be one of the significant index,as well as T4 value and carotid artery blood flow.

388

QUANTITATIVE ANALYSIS OF PULMONARY VENTILATION SCANS WITH N-13 NITROGEN GAS AND POSITRON EMISSION TOMOGRAPHY: (1) SIMULTANEOUS EXPONENTIAL EQUATION METHOD.

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The subject inhales N-13 nitrogen gas diluted with oxygen gas in a closed circuit. When the count rate comes up to equilibrium in 2 or 4 min, the so-called equilibrium scan (EQ) is performed for 3min. Then the radioactive gas is washed out by the room air, during which the wash-out scan (WO) is performed for 5min. The insolubility of nitrogen gas allowed us to employ the single compartment model, and the dynamics of the count rate in a single pixel was expressed in terms of the alveolar volume (V) and the ventilatory time constant (T) of that pixel. We integrated the equation during the scanning period of EQ and WO, expressed the pixel count in each scan wih V and T, and solved the equations simultaneously to obtain V and T. In clinical studies, poorly ventilated regions, which had decreased counts in EQ images, showed normal V values. Fibrotic regions showed normal T and decreased V. Our method yields not only the distribution of alvelar volume which we cannot evaluate in EQ images but also more accurate regional T values than Stewart-Hamilton method.