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REGIONAL DISTRIBUTION OF  $\dot{Q}$  AND  $V_A/V$  MEASURED WITH Kr-81m. T.Abe, R.Shigemoto, K.Umegaki, A.Kishimoto, O.Kitada, M.Sugita, K.Higashiya, N.Mishima, M.Nakagawa, K.Kuno, K.Yamada. Hyogo College of Medicine and Tzukaguchi Hospital Nishinomiya and Amagasaki.

The regional distribution of  $\dot{Q}$  and  $V_A/V$  in the lung was obtained from the continuous infusion of Kr-81m. Measurements were made in twelve patients with lung disease, who were instructed to breath normally after 10 second-breath-holding. There was a good agreement between Kr-81m lung counts ( $C_0$ ) during 10 second-breath-holding and Tc-99m MAA lung counts. ( $r=0.987$ ) During a steady state, which occurs as early as after several breaths at tidal volume, the arrival of Kr-81m in the alveolar compartment ( $C_0(1-e^{-\lambda t})$ ) equals to the removal of Kr-81m by ventilation ( $C_m V_A/V$ ) and radioactive decay of Kr-81m ( $C_m(1-e^{-\lambda t})$ ), where  $C_m$  is Kr-81m lung counts during a steady state,  $\lambda$  is the radioactive decay constant. In practice, Kr-81m counts in the pulmonary artery ( $C_a$ ) should be subtracted from  $C_0$  and  $C_m$ .  $C_a$  can be obtained from a early image during Kr-81m continuous infusion.

$V_A/V$  corrected by  $C_a$  was a good agreement with  $V_A/FRC$  in twelve patients with lung disease, ( $r=0.922$ ) therefore our method is available for a quantitative analysis of regional lung function.

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PERFUSION AND VENTILATION SCINTIGRAPHY IN LUNG DISEASES. Y.Yamagishi, T.Kumazaki, S.Shiiba, K.Honda, M.Karasawa, F.Hikita, S.Hosoi A.Okuyama, S.Mitanihara, H.Ohmiqawa, K.Suzawara and N.Ariga. Dep.of Radiology Nippon Medical School.

Clinical usefulness of perfusion scintigraphy by Tc-99m-M.A.A. combined with ventilation scintigraphy by Xe-133 gas was emphasized in 68 cases (Table) of lung diseases. Images of the case of lung cancer (hilus) anomaly of pulmonary artery, follow up after lung operation and Swyer-James were highly evaluated in this series.

|                        |    |
|------------------------|----|
| lung ca.               | 16 |
| chr.bronchitis         | 11 |
| lung tbc.              | 4  |
| operated lung          | 4  |
| sarcoidosis            | 4  |
| pneumonia              | 3  |
| pneumothorax           | 3  |
| bullae                 | 3  |
| anomaly of PA          | 2  |
| aortitis               | 2  |
| emphysema              | 2  |
| pneumoconiosis         | 2  |
| relaxatio of diaphragm | 1  |
| Swyer-James Synd.      | 1  |
| misc.                  | 10 |
|                        | 68 |

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REGIONAL PULMONARY PERFUSION, ALVEOLAR OXYGEN TENSION AND PHARMACOLOGICAL EFFECTS. T.Isawa, T.Teshima, T.Hirano, A.Ebina and K.Konno. The Research Institute for Chest Diseases and Cancer, Tohoku University. Sendai.

Regional pulmonary arterial perfusion is regulated by regional alveolar oxygen tension. Alveolar hypoxia induces regional hypoxic vasoconstriction and alveolar hyperoxia hyperoxic recruitment of the pulmonary vascular beds and/or potentially vasodilation. The following is a summary of our drug study which we conducted to examine whether the drugs used could alter pulmonary vascular responses to alveolar hypoxia and hyperoxia. Each drug was administered systemically by drip infusion. The right upper lobe of an adult mongrel dog was isolated in vivo by a balloon catheter and artificial ventilation was done by using nitrogen, air and 60% oxygen to induce alveolar hypoxia, normoxia and hyperoxia, respectively, while the rest of the lungs kept a spontaneous air respiration. Aminophylline (0.24 mg/kg/min) induced further regional hypoxic vasoconstriction but acted as a vasodilator under alveolar hyperoxia. Isoproterenol (0.1  $\mu$ g/kg/min) and noradrenaline (1  $\mu$ g/kg/min) abolished regional hypoxic vasoconstriction but their actions were blocked by pretreatment with propranolol and phenoxybenzamine, respectively. In the reimplanted lung, however, propranolol did not counteract isoproterenol. Propranolol per se (1 mg/kg) and dopamine (10  $\mu$ g/kg/min) did not change vascular responses to alveolar oxygen tension. Prostaglandin  $F_{2\alpha}$  reduced regional perfusion under alveolar hyperoxia. Allegedly selective  $\beta_2$  adrenoreceptor stimulators, salbutamol (0.1  $\mu$ g/kg/min) and procaterol (5 ng/kg/min) did not ameliorate vascular responses to alveolar hypoxia.

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RADIOAEROSOL INHALATION LUNG CINE-SCINTIGRAPHY. T.Isawa, T.Teshima, T.Hirano, A.Ebina and K.Konno. The Research Institute for Chest Diseases and Cancer, Tohoku University. Sendai.

"Radioaerosol inhalation lung cine-scintigraphy" or "inhalation lung cine-scintigraphy" for short is a new imaging modality which has enabled to visualize cinematographically the dynamic mucociliary clearance mechanisms in the lungs. Instead of delayed sequential imaging at certain points of time following radioaerosol inhalation, radioactivity has been measured continuously over the thorax for 30 to 120 min with a patient in the supine position by a gamma camera and the data was fed into a computer in 64 x 64 matrices. The data was retrieved and a series of lung image frames of 10 sec each were generated on the TV screen for a high speed dynamic display at the speed of 18 frames per sec. An 18 mm movie camera was used to make motion pictures. Thus mucociliary clearance was dynamically visualized. Regions of interest were visually selected over the lung images on the TV screen and time activity or clearance curves were obtained over the selected regions of interest to calculate tracheal velocity or disappearance rate of radioactivity in each region of interest selected. Tracheal velocity was averaged 11 mm/min in the normal subjects but it was retarded in patients with obstructive airways disease. Even stagnation, regurgitation, complete stalemate or migration toward the opposite bronchus was observed. Migration was hindered and/or stopped at the site of cancer infiltration. Cough and clearing throat maneuver were effective in airway clearance in patients with disturbed mucociliary clearance mechanisms. This methodology would serve as a useful adjunct to the study of mucociliary clearance mechanisms in the lungs, an important non-respiratory lung function.