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ON LINE COMPUTA-AIDED REGIONAL LUNG FUNCTION STUDIES IN INFANTS AND CHILDREN USING Xe-133 GAS AND Tc-99m MAA.

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Recently radioisotopic regional lung function studies for infants and children have been seen on several literatures. For Xe-133 ventilation and perfusion study we made three types of the special closed circuit using mask,T-piece,bag and one way valve, (the smallest dead space is about 10ml). Until this september 357 radioisotopic regional lung function studies were perfomed for infants and children,ranged frome 2 days old to 14 years old. The data of the ventilation and perfusion studies were calculated by this fomula using on-line computa system(scintipac 230).
V,$\dot{Q}$ and $\dot{V}$= regional lung count/ whole lung count. MTT= total count under the washout curve/equilibrium count (V). Distribution index= regional lung count/whole lung count ÷ regional lung area/ whole lung area
In 9 cases with Bochdalek hernia and 15 cases with eventration of diaphragm the lung function of affected side was improved gradually during 2-3 months after the operation but in Bochdalek hernia the lower lung of affected side kept low distribution index of $\dot{Q}$ and high $\dot{V}/\dot{Q}$ ratio.

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USE OF MONODISPERSE AEROSOLS FOR QUANTITATIVE DEPOSITION STUDIES.

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Monodisperse sebacate aerosols labelled with Tc-99m or dye were produced by a condensation technique. The aerosols ranging from o.4 to 5 microns in diameter were available by increasing vapor pressure of sebacate oil. The aerosols were used for the model and animal studies.

(1) Two mechanisms were proposed on the aerosol depositions in post stenosis. The one is turbulent deposition which becomes less by using lighter gas such as helium as a carrier of the aerosols. The other is inertial deposition which increases markedly with the size of the aerosols.

(2) The regional deposition patterns were studied in the cast of the human nasal cavity. A distinct spot was observed in the anterior part of the middle turbinate with 4 micron aerosols. The spot became small and multiple with smaller sized aerosols.

(3) Pulmonary depositions of a dog measured by gamma camera agreed well with those obtained from photometry and filters. The combined use of scintillation imaging with photometry will be useful to quantify the deposition and clearance of the aerosols which are rapidly absorbed from the lung.

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AEROSOL INHALATION LUNG IMAGING: MEASUREMENT OF AEROSOL SIZE AND EFFECT OF CARRIER GAS.

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The purpose of the study was to measure the actual size of aerosol generated by an ultrasonic nebulizer (Mistogen EM 142) and to learn how the size distribution is altered by changing the carrier gas for aerosol from air to a mixture of 80% He and 20% O_2 and by placing a reservoir between the generator and a mouth piece. Changes in aerosol inhalation lung images by difference in aerosol size were also evaluated. The aerosol size distribution was measured by a cascade impactor. Sequential inhalation lung images were taken. The mean median diameter of aerosol was 4.18 μ with air as a carrier gas and without placing a reservoir, 3.73 with air and with a reservoir, and 2.76 with a He-O_2 mixture with a reservoir; their geometric standard deviations were 1.76, 1.73 and 1.82, respectively. To evaluate ventilation distribution in the lung, the He-O_2 mixture as a carrier gas with a reservoir intervened was most suitable; for the diagnosis of obstructive airways disease, air with a reservoir; for imaging "hot spots" in lung cancer, air without a reservoir; for lung cancer complicated with obstructive airways disease, the He-O_2 mixture with a reservoir. Sequential aerosol inhalation lung imaging revealed some slowing or complete stasis of migrating radioactivity along the airway at the site of cancer infiltration, indicative of the disturbed mucociliary clearance mechanism. Aerosol inhalation lung imaging is potentially useful for evaluating the mucociliary clearance mechanism, an important nonrespiratory function of the lung whose evaluation is not feasible by any other means available at the present time.

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EVALUATION OF EFFICIENCY OF NEBULIZERS USED IN INHALATION THERAPY.

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Three types of aerosol nebulizers used in clinical practice, a jet type (JT), an IPPB (Bennett PR-2) and an ultrasonic nebulizer (Mistogen EM 142)(US) were studied regarding aerosol size distribution, efficiency in aerosol output, efficiency in lung deposition and deposition patterns in the lung. The JT was operated both manually and mechanically. Tc-99m-albumin solution was the agent for aerosol generation. Aerosol size was measured by a cascade impactor, efficiency by measuring radioactivity in the lung and nebulizers and deposition patterns by visual comparison. Mass median diameter (MMD) was the largest (4.18 μ) with its geometric standard deviation of 1.76 with the US, and the other nebulizers showed smaller MMD (1.30 - 1.70 μ) and broader geometric standard deviations. Aerosol output was 4 times efficient with the US as with the others. Lung deposition was 8 times efficient with the US, 7 times with the mechanically operated JT, and 6 times with the IPPB as the manually operated JT. Overall aerosol lung deposition in the lung was the most efficient with the US, but the IPPB showed a better penetration in the normal or the patients with the least obstructive disturbance. Manually operated JT produced the so-called central deposition pattern even in the normal subjects. In summary, of the three nebulizers tested, the MMD of aerosol generated was the largest with the US, but it was the most efficient in aerosol output and lung deposition.