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NUMERICAL EVALUATION OF AEROSOL DEPOSITION PATTERNS

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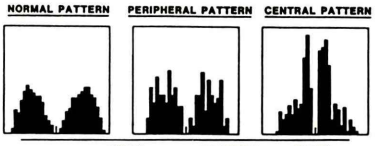
"Unevenness" on aerosol inhalation lung images has been numerically evaluated. Pathological lung images range from peripheral to central patterns corresponding to chronic bronchitis and emphysema, respectively, but how these patterns are numerically expressed by the indexes of "unevenness" proposed by us previously has not been known. 9 normals, 7 and 1 patients showing peripheral and central patterns were selected. 15 indexes from averaged count profiles and 6 from shape were obtained for each subject. The mean and other basic statistical values were calculated for each index and a comparison was made between the 3 groups of subjects. The results obtained are shown in the following figure and table.



	NORMAL	PERIPHERAL	CENTRAL
AREA	LARGE	SMALL	SMALL
LX	LARGE	SMALL	SMALL
XG	NEGATIVE	POSITIVE	POSITIVE
H(HV)	SMALL	LARGE	LARGE
CSD(HV)	SMALL	MEDIUM	LARGE
CVAR(HV)	SMALL	MEDIUM	LARGE
CL(HV)	SMALL	LARGE	LARGE
DM(HV)	LARGE	SMALL	SMALL
DSD(HV)	LARGE	SMALL	SMALL
DVAR(HV)	SMALL	MEDIUM	MEDIUM
ANG(HV)	SMALL	MEDIUM	LARGE
MAC(HV)	SMALL	MEDIUM	LARGE
HW(HV)	LARGE	MEDIUM	SMALL

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SIMPLIFICATION OF AEROSOL INHALATION LUNG CINE-SCINTIGRAPHY AND ITS QUANTIFICATION.

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The purpose of the present study was to simplify our original method of radioaerosol inhalation lung cine-scintigraphy and its quantification to evaluate mucociliary clearance function of the lungs.

The original method of measuring radioactivity for 2 hrs after inhalation of aerosol could be shortened to 1 hr without sacrificing the cine-scintigraphic evaluation and the repeat measurement at 24 hrs could be dispensed with; instead, the alveolar deposition ratio (ALDR) which was defined as the amount of aerosol in the lungs at 24 hrs could be estimated by the multiple linear regression junction ALDR = - 47.03 + 0.44 x FEV1.0% + 0.59 x LRR60; here, FEV 1.0% was forced expiratory volume in 1 sec divided by forced expiratory volume in per cent and LRR60, the lung retention ratio (LRR) at 60 min. This formula could be applied to both patients and normals with r = 0.813 ($p<0.0001$). In normals simply the amount of smoking with or without LRR60 could also give a good estimate of ALDR. Once ALDR was derived, airway clearance efficiency and airway deposition and retention ratio could be easily calculated.

Thus the presetn revision seems to have facilitated a wider use of this method in clinical practice.

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XE-133 WASH OUT AND REGIONAL VENTILATION.

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The purpose of this study was to evaluate the characteristics of the distribution of regional ventilation in the lungs. Xe gas was inhaled with a semi-equilibrium method and washed out with air. T1/2exp's and T(A/H)'s previously reported were calculated in the whole and regional lungs. We also calculated and ideal half time (rT1/2R) by dividing the real half time by the ideal half time to use as an index of unevenness of ventilation.

The distribution of the regional clearance indexes, T1/2exp's and T(A/H)'s, followed a log normal distribution ($p<0.01$). The geometric means of regional T1/2exp's and T(A/H)'s correlated well with whose in the whole lung, respectively ($r = 0.91$ - 0.98, $p<0.001$). The geometric standard deviation had no correlation with lung function data and rT1/2R. In the apex-to-base distribution of regional clearance index, there was a level where regional clearance index increased suddenly. The level progressed toward the apex with the decrease of FEV1.0%, MMF, V50, and V25, or with the increase of RV/TLC. Closing volume and rT1/2R had no correlation with it.

In conclusion, clearance index calculated in the whole lung would be the geometric mean of the regional clearance index. Geometric standard deviation of regional clearance index, would not be different between the normal subjects and the patients with various lung diseases or COPD. Decrease in ventilation seems to begin from the lung base and go toward the apex with the progress of the obstructive changes of the lungs.

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A study on accuracy of $\dot{V}/V$ distribution analysis of Xe-133 washout test.

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We had reported a new program of $\dot{V}/V$ distribution analysis by Xe-133 washout test to the 22nd meeting of this society. It consist of a new counting unit, measuring of ventilation volume required to wash out 50% of Xe-133, VI/2, presentation of $\dot{V}/V$ distribution by histogram.

This time, accuracy of this program was examined as follows.

1) Xe-133 washout curves of whole lung, right, left, upper, middle and lower region of the lung by ordinary method were compared with predicted washout curves that was the summation of exponential wash out curves manifested as each counting unit. These were correspond eachother. This suggest the accuracy of counting unit of our program.

2) VI/2/FRC were compared with L.C.I., a parameter of Nitrogen washout test. These correlation coefficient was 0.77. The value of VI/2/FRC and L.C.I. was more than 4.5 and 14.0 respectively in patient with C.B., pneumoconiosis etc. and less than 4.0 and 14.0 respectively in normal subject.