ly decreased in the lower region on the sitting position by low oxygen breathing. However, the regional pulmonary ventilation was not changed significantly in any regions.

The regional ventilation-perfusion ratio (V /Qc) was decreased from the upper region by air breathing, and increased on the contrary by low oxygen breathing.

On the supine position the regional pulmonary blood flow and bentilation in air breathing was distributed uniformly over the lung, and V /Qc ratio was also uniformly distributed. However, it showed the slight increase from the upper region to lower region because the pulmonary blood flow in the upper region showed the marked increase as much as 1.5 times of the one in the air breathing.

Regional pulmonary ventilation showed no significant change by the low oxygen breathing both on the sitting and supine position. These findings were obtained directly by the method of isotope-pulmography (^{133}Xe).

Concerning the mechanism which the regional pulmonary blood flow showed the difference in the upper and lower region for the low oxygen breathing is not clear yet, however, it seems to me that it might be due to the difference of grade of reaction of the pulmonary capillary bed for the low oxygen breathing between the upper and lower region.

Application of ^{131}I-labeled Antipyrine to Pulmonary Circulation

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Now pulmonary blood volume (PBV) in cardiopulmonary disorders has been well documented using nondiffusible tracers such as various dyes and RISA. Pulmonary extravascular water volume, however, is little studied.

Chinard in 1951 first demonstrated that two indicators with different capacities for passing through capillary walls produce time concentration curves of different shape after passing through capillary bed. Since that time, a variety of indicators and several methods of analysis of the differences in the dilution curves have been attempted and the estimation of pulmonary edema in animals and in man has been fairly performed by several workers (Ramsey, 1964; Pearce, 1965; Levine, 1965; McCredie, 1967.).

In this study, two indicators of RISA as nondiffusible tracer and ^{131}I labeled antipyrine as diffusible tracer were used to estimate pulmonary extravascular antipyrine space (PEV) by precordial counting technique.

Methods

Five healthy subjects and nine patients with cardiopulmonary diseases were studied. Six patients were with cardiac disease; 5 of them with mitral stenosis and 1 of them with congestive heart failure due to ischemic heart disease. Remaining three patients were with pulmonary disease.

Recording apparatus with two channel scintillation counters was employed. One counter was positioned in the 4th intercostal space on the left sternal line to catch dominantly right heart dilution process, and another counter was placed at cardiac appex with an angle of 30 degrees from vertical line to catch mainly left heart dilution process. Indicator dilution curves were obtained as radiocardiogram by external monitoring following sequential injections of RISA and labeled antipyrine. From each dilution curve two different types of pulmonary circulation times are obtained; one is peak to pesk time (tp) which is obtained directly as an interval from right peak to left peak,, and the other is mean to mean time (tm) which is calculated from isolation of right and left heart dilution curves with extrapolation. The difference (Δt) in pulmonary circulation times of RISA and Antipyrine was calculated. Δtp is derived from the difference in tp and Δtm from that tm. The area under rleft heart dilution curve of antipyrine was approximately equal to the area under the corresponding RISA curve, when corrected by injected counts. The pulmonary

extravascular antipyrine space (PEV) was computed from the difference (Δt) in pulmonary transit time of two indicators multiplied by cardiac output.

Results

The difference in pulmonary circulation time in normal subjects showed, on the average, 0.4 sec in Δtp and 1.0 sec in Δtm. Δt in patients was more prolonged. Δtm was larger than Δtp and relationship between tp and Δtm showed a close linear correlation. Normal values of PEVm was within 100 ml/m^2, PEVm in some potients with cardiac diseases was highly elevated to 268 ml/m^2. There was also a close linear correlation between PEVp and PEVm. PEV was evidenced to dominantly depend upon Δt. In mitral stenosis, PEV was roughly correlated to PBV. The role of PEV in the field of pulmonary circulation concerning the matters of a resistance mechanism of pulmonary vessels should be studied.

Discussion

Although several studies have been reported for estimating pulmonary extravascular water space, no simple and rapid technique has been generally available. The current study was undertaken to estimate pulmonary extravascular water volume utilizing ^{131}I-labeled antipyrine. This method has an advantage over radioactive antipyrine in that the determination can be carried out by the external scanning at the right and left heart over radioactive antipyrine in that the determination can be carried out by the external scanning at the right and left heart over precordium. The study reported here was done to evaluate the indicator dilution method using ^{131}I-labeled 4-iodo-antipyrine which is desirable for estimating pulmonary extravascular water volume by precordial counting.

The Pathophysiological Studies on Tracheo-bronchi — studies on mechanism of tracheo and bronchial wall using RI —

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The pathophysiological aspects of tracheobronchi were studied from the standpoint of the absorptive capacity. Present report showed the absorptive capacity of bronchial wall in various respiratory diseases. The following results were obtained.

Method:

The absorptive capacity, as mentioned before, was assessed in terms of introducing RI (^{32}P) into a certain bronchial lumen and analyzing its blood radioactivity curves.

The absorptive capacity of bronchial wall was proved experimentally by the method of double block, and the differences of absorptive capacity due to the changes of concentration of introduced fluid into bronchial lumen and the transition of intracellular RI on its autoradiogram were identified.

Results:

1. The absorptive capacity of bronchial wall showed the highest and fastest in the normals, but it showed tendency of reduction in orders of bronchial asthma, chronic bronchitis, lung cancer, pulmonary tuberculosis and bronchiectasis.

2. In bronchial asthma, it differed from the time of attack and non-attack. It was correlative with the viscosity. The higher the viscosity, the lower did the absorptive capacity tend to decrease.

3. The absorptive capacity in both of tracheo and bronchial wall showed good tendency, but in broncho-periphery, it tended lower value compared with them.

4. There was seen clear difference in the absorptive capacity due to the concentration of RI solution. High viscosity made the absorptive capacity tend to decrease and 25% glucose made it good. It was ranged as high viscosity<25% glucose<dionosil aqueous in order.

5. Under the influence of vague on the ab-