This time we are to report the results of our study on the shift ratio of pulmonary blood flow in the right or left lateral positions.

Seven normal subjects were studied by this technique. In supine position, the mean right to left ratio was 53.5% to 46.7%. In right lateral position, the increased amount or right pulmonary blood flow ranged between 8 and 21% in 5 out of 7 subjects as compared with the distribution in the supine position. In left lateral position, the amount of increase to the left was found between 5 and 14% in the above 5 normal subjects. The remaining 2 showed almost no changes in the pulmonary blood flow in their postural change. These two were rather obese.

There was one very obese case (92.5 kg.), whose right to left ratio was 50 to 50 in supine, 47.3 to 52.7 in right lateral and 50.7 to 49.3 in left lateral positions, indicating negative shift. Although this method can know only rough distribution, it may be pointed out that this result was definitely different from those obtained from most of the normal subjects. We consider that the result in this obese case is probably due to the pressure from the intra-abdominal organs, resulting in decreasing the ventillation as well as pulmonary blood flow of the lower side.

There were 4 cases of overdistension, 2 of them were unilateral and the remaining 2 were bilateral. In all of them, the pulmonary blood flows shifted very well to the overdistended lungs.

In 2 cases of diffuse obstructive emphysema, the shift amount in right or left lateral position was found very small.

In 2 cases of pulmonary carcinoma, we determined the change in the pulmonary pressure as main branch of unilateral pulmonary remarkable change in the pressure when either artery was blocked. One of them did not show side of the branch was blocked. The pulmonary blood flow shifted very well to right or left when changing his posture. In another case, who had right pulmonary carcinoma, the pulmonary blood flow did not show any shift to the diseased lung as he was in the right lateral position, but it shifted normally to the left lung in the left lateral position. In this case, the mean pulmonary pressure increased to 21 mmHg as main branch to the normal lung was blocked. In contrast with this fact, when the main branch to the diseased lung is blocked the mean pulmonary pressure became only 11 mmHg.

As a conclusion, the combined use of ^{131}I-MAA pulmogram and postural change will bring out another parameter to the dynamic studies of pulmonary function. Furthermore, we think that there may be a possibility of knowing the amount of pulmonary capillary reserve by this technique.

Study on Pulmonary Circulation by the Use of RISA: Effects of Acute Hypoxia in Cardiopulmonary Diseases

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The effects of hypoxia on pulmonary circulation has been studied by many investigators, but reactivity of pulmonary vascular system induced by hypoxia is not known. In this cent oxygen for 10 minutes on the cardiac ininvestigation, the effects of breathing 12 per dex, pulmonary circulation time, pulmonary blood volume and circulating blood volume were studied by external scanning of RISA.

Methods

3 normal healthy subjects and 11 patients with cardiopulmonary diseases were studied. The instruments with two 2 inch × 2 inch NaI crystal scintillation counters with lead collimator were used for precordial counting. Subjects lay supine, one detector was placed

vertically on left side of sternum in 4th intercostal space, and the other was collimated to cardiac apex with 30° angle obliquely. 50 μCi of ^{131}I as RISA was then rapidly injected into an antecubital vein. At the moment of injection, the recording was begun. Two different shapes of radiocardiogram well obtained; pulmonary circulation time was derived by the method as previously described by Nakazima and associates (presented at the 6th Annual Meeting of Japanese Society of Nuclear Medicine). Cardiac index was calculated using the technique by McIntyre et al. Pulmonary blood volume was calculated from cardiac index multiplied by pulmonary circulation time. Circulating blood volume was obtained by division of injected RISA counts by sample blood counts at 5 minutes. After breathing quietly 12 per cent exygen for 10 minutes, radiocardiogram was again recorded in the same manner and hemodynamic variables are calculated as described above. The values of cardiac index calculated from left heart detection method was evidenced to be approximately the same as that from right heart detection method.

Results

Cardiac index increased in almost all cases; especially in 3 normal subjects it increased markedly. Pulmonary circulation time generally decreased, but in some cases it did not change significantly and in only one it was prolonged. Circulating blood volume and pulmonary blood volume increased slightly. In mapority of cases that cardiac index increased, slightly. In mapority of cases that cardiac index increased, pulmonary circulation time decreased accordingly. No significant correlation was found between circulating blood volume and pulmonary blood volume.

Discussion

The effects of acute hypoxia on pulmonary hemodynamics revealed generally increase in cardiac index, shortening in pulmonary circulation time, and pulmonary blood volume was slightly increased or unchanged. Increase in cardiac index in normal subjects was larger than that in cardiopulmonary patients. This suggested that the reaction of cardiovascular system during hypoxia may decrease in cardiopulmonary patients as compared with normal subjects. Pulmonary circulation time obtained by precordial counting method might include some components of circulation times in both right and left heart, so pulmonary blood volume in this report would include the elements of cardiac blood volume. Alterations of true pulmonary blood volume could not be examined. In this investigation hypoxic effects on pulmonary blood volume was not discussed.

Study on the Measurement of Pulmonary Blood Volume (PBV) with Radio-Cardiogram (RCG).
— An analysis of RCG by its analog computer simulation —

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In 1957, Lammerant reported that PBV might be calculated from the peak-to-peak time of RCG, multiplied by card ac output. It has been reported by a number of investigators that the peak-to-peak time does not represent the true mean pulmonary circulation time. An analog computer analysis of RCG simulated by an appropriate mathematical model has been developed by Kuwahara et al, which makes to be able to quantify cardiac output and equivalent volumes of right and left hearts, pulmonary and body blood vessels. PBV can be calculated from the following equation by using parameter values of the mathematical model, F, Vp, τp and Tp, where F (ml/sec) is a mean blood flow rate, Vp (ml)