changes and regional pulmonary blood flow were investigated and shown in Fig. 4, 5. These findings suggests that decreased +G verse correlation is seen in cardiac diseases. change would be due to increased intravascular absolute pressures, because according to our previous studies, upper to lower ratio of upright lung results in good correlation to left atrial pressures. Cardiac diseases in severe cases are obviously distinguished from lung diseases in these figures. Triangle sign is a case of primary pulmonary hypertension with 60 mmHg of mean pulmonary arterial pressure. The impaired pulmonary circulation could be assessed equally in cardiac diseases and pulmonary diseases by measuring the gravitational changes, both diseases, however, may be distinguished by measuring regional pulmonary blood flow. This suggests that postcapillary pulmonary hypertension would be differentiated from precapillary pulmonary hypertension.

Summary:
Studying the gravitational change in the distribution of pulmonary blood flow by using $^{131}$I-MAA lung profile scanning, various interesting results were obtained. Impaired pulmonary circulation in various cardio-pulmonary disorders can be diagnosed clinically in this technique.

A Study on Lung-Scans Using $^{131}$I MAA

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Clinical experiments on scintigrams using $^{131}$I-MAA, of 23 cases with lung cancer, were carried out and especially the change of picture on their scintigrams before and after the irradiation of $^{60}$Co, were investigated and discussed.

All of the patients whose chest radiograms revealed abnormal shadow on only one side of lung, were found to have more impaired distribution of pulmonary blood flow on the affected side than that on the healthy side. While no change was seen on their radio-
grams after the irradiation of $^{60}$Co, considerable improvement was noticed on their scintigrams in some cases.

Concerning to their prognosis, our investigations should be required further more. Three of them are reported here.

### Applicability of Radioisotope Scanning of the Lungs

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Three aspects of applicability of radioisotope scanning of the lungs were presented.

1) Effect of Oxygen Concentration in Inpired Gas upon Pulmonary Arterial Blood Flow. This problem has been one of the most controversial problems of pulmonary physiology since the end of 19th century. Perfusion scanning of the lungs is best utilized for this purpose. Our present study has disclosed that the pulmonary arterial blood flow is regulated by oxygen concentration in the inspired gas, and if the oxygen concentration is less than that of air in one lung, while the other lung is breathing pure oxygen, the distribution of the pulmonary arterial blood flow in the hypoxic lung is reduced in a gross proportion to its oxygen concentration, although there is fairly wide range in the reduction ratio.

Fishman and others made the experiment of unilateral breathing of hypoxic gas of 10-12 percent oxygen concentration in six subjects and could not find any alteration in either total minute blood flow to each lung. They concluded at that time that the hypoxic stimulus did not affect directly upon either the lung or the post-arteriolar segments of the pulmonary vascular resistance to blood flow. Subsequently they tried the administration of 5 percent oxygen to one lung in five and found the reduction of the total flow perfusing the hypoxic lung in three. Defares and others studied the effect of 10 percent oxygen in thirteen normal subjects and concluded a significant change in flow ratio occurred in hypoxic lung. In our study inhalation of 12 and 15 percent oxygen revealed a significant reduction of the pulmonary arterial blood flow to the hypoxic lung. The Fick principle was used so far by most investigators, but we gave up both the catheterization and arterial cannulation and just tried to see the effect of unilateral hypoxia on the partition ratio of the pulmonary arterial blood flow to each lung by means of radioisotope perfusion scanning of the lungs.

2) Estimation of Pulmonary Arterial Blood Flow in the Transplanted Lung of the Dog. Forty perfusion scannings of the dogs which were home- or auto-transplanted unilateral lung were performed by injecting 50-70 microcuries of $^{131}$I-MAA intravenously. It is difficult to estimate the lung function of the dog whose unilateral lung was transplanted. But perfusion scanning can reveal how much blood flow is persistently present in the transplanted lung. The calculated blood flow from the cps curves obtained at the scanning procedure can grossly tell how much rise of the pulmonary arterial pressure is expected during contralateral pulmonary arterial obstruction. Perfusion scanning in lung-transplanted dogs is now an indispensable procedure to assess the function of the transplanted lung of the dogs.

3) Pulmonary Scanning after Infusing $^{131}$I-MAA through the Bronchial Artery. In ten patients of lung cancer, $^{131}$I-MAA was infused through the bronchial artery in order to obtain the positive image of tumor itself by means of pulmonary scanning. The particles of $^{131}$I-MAA are not only trapped in tumor vessels but also are they captured by intercostal arteries and other bronchial arterio branches. Therefore the image obtained by the scanning is widely spread and it is not possible to obtain only tumor image itself, but the area perfused by the bronchial artery. And there is no evidence that the clearance rate in the non-tumor area is quicker than