suggesting the ratio of the pulmonary blood flow of each lung. In normal subjects, the ratio of pulmonary blood flow was estimated 45% in left and 55% in right by these measurements.

## VII. Clinical Applications of Scintillation Camera Present Status and Future of RI Angiography

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Since the scintillation camera can see the entire organ at one time without mechanical scanning, rapid serial images can be obtained provided that gamma photons come enough into the detector.

Recent development of radioisotope cow make one possible to use short halflived nuclide such as $^{99m}$Tc and $^{113m}$In in routine clinical practice. These nuclides do not emit any $\beta$-particle and 10 mCi of radioactive nuclide can be given intravenously with little radiation exposure to the patient. Because of high photon output, the flow of radioisotope in vascular system can be traced morphologically in every second. This new diagnostic method be named "intravenous radioisotope angiography" inasmuch as it provides morphologic information similar to that of x-ray angiography.

The authors attached an oscillograph record camera D (Nikon) to the oscilloscope of the scintillation camera (Nuclear-Chicago) and this motor-driving camera can take serial 36 exposures of 35×24 mm film with speed of one frame per 0.5~1.0 second. We employed $^{113m}$InFe ascorbic acid or $^{113m}$InFe DTPA ascorbic acid as the test radiopharmaceuticals. After intravenous injection of 10 mCi of the agent through antecubital vein, 0.5 second exposure per frame was used for viewing the superior vena cava, right atrium, ventricle, pulmonary arteries, left heart and aorta, 2 second exposure per frame for the abdominal aorta and kidneys, and 4 second exposure per frame for the carotic arteries and brain.

Radioisotope angiograms were demonstrated and their clinical significances were emphasized on normal heart (anterior view and left anterior oblique view), aneurysma of the aortic arch, vena cava superior syndrome, Fallot' tetralogy, abdominal aneurysma, renal tumors (cyst and Grawitz' tumor and their differential diagnosis) and brain tumor.

In conclusion, intravenous radioisotope angiography can be applied without mishap to outpatients, to the extremely ill and to young children. The technic is simple, atraumatic, and without the undesirable pharmacological effects sometimes seen in cases of contrast medium (iodine) idiosyncrasy. Whlie it is true that at present the resolution and information obtained from radioisotope angiography are poor as compared to those from x-ray angiography, the method may be valuable as a screening procedure.

There is a vast possibility of technical improvement in the development of radioisotope imaging devices and the use of ultrashortlived nuclide. In the end of this paper, we demonstrated "cine radioisotope angiography" developed recently in our laboratory by 16 mm cinefilm. Its technical details will be reported elsewhere.