

Lung Scanning in Congenital Heart Disease with Pulmonary Hypertension in Relation to Indication for Operation

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In recent years, pulmonary scintiscanning in congenital heart diseases with pulmonary hypertension was studied to detect the derangement of the distribution pattern of pulmonary arterial flow and some interesting informations were obtained, by which the indication for radical operation could be given. 23 patients of ventricular septal defect, 7 patients of ventricular septal defect with patent ductus arteriosus, 9 patients of patent ductus arteriosus, and 3 patients of atrial septal defect, with pulmonary hypertension more than 50 per cent of Pp/Ps were studied by the use of lung scintiscanning.

Human serum albumin labelled with ^{131}I was injected interavenously for these patients, in order to obtain pulmonary scintigrams, U/L ratio in the distribution pattern of pulmonary blood flow and total body linear scanning. The deranged pattern of the dis-

tribution of pulmonary blood flow in lung scitigram was found 26 cases of the 42 patients. The same change of it was revealed in all cases of the patients with eisenmengerization and in 83 per cent of the patients with pulmonary hypertension associated more than 75 per cent of Pp/Ps.

And then, right to left shunt shown by total body linear scanning was observed in 16 patients, 25-33 per cent shunt in the cases with eisenmengerization, 10-25 per cent in the cases without eisenmengerization.

In addition, U/L ratio in the distribution pattern of pulmonary blood flow might remarkably relate to the mean pulmonary pressure. U/L ratio of 1.33-1.52 was obtained in Eisenmenger group. The decrease of pulmonary pressure and value of Rp/Rs were not found in the patients with U/L ratio of 1.10-1.30 postoperatively.

RI Angiocardiography Using a Scintillation Camera with a Video System

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The dynamic studies of heart and large vessels could be researched morphologically and functionally respectively by scintiphoto sequence and RI dilution curve by means of RI angiocardiography using a scintillation camera with a video system. We used Pho/Gamma Data Store/Play Bach system as a video system which is an accessory to Pho/Gamma III and has an "area-of-interest(AOI)" mode, and through which RI dilution curve of AOI was written by rate recorder. Studies have been made in left anterior oblique projection after the intravenous injection of 10 to 20 mCi and 1 to 2 ml in volume of $^{99\text{m}}\text{Tc}$ -pertechnetate.

In left anterior oblique projection, hemodynamics from superior vena cava to thoracic aorta could be observed separately, and right and left ventricle were clearly separated by sash-like split of radioactivity which was considered the interventricular septum.

Applying RI dilution curves of AOI of right ventricle(R), left ventricle(L) and left lower lung field(P), blood circulation times were measured and curve patterns investigated. Central circulation times between peaks of the curves were prolonged in heart disease, especially valvular disease, and heart failure but hyperthyroidism, and in control as fol-

lows: R to L, 5.6 ± 0.6 sec; R to P, 3.1 ± 0.4 sec; P to L, 2.4 ± 0.4 sec. R to P was usually longer than P to L, and this ratio was 1.3 though half cases with intracardiac shunt were less than 1.0 and one case bearing obvious R to L shunt was greater than 6.0. Curve pattern could distinguish between aortic and other valvular disease, and show any findings of

intracardiac shunt. The pattern of heart failure due to various cancers was resemble control.

Scintiphot sequence exposed less than 1sec referring the dilution curve could clearly demonstrate not only shape and size of every cardiac chamber but abnormal flow attributable to intracardiac shunt.

Measurement of Total Myocardial Blood Flow with ^{43}K and Scintillation Camera

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It is the primary purpose of the present report to demonstrate the feasibility and reliability of using ^{43}K with a scintillation camera to measure the total myocardial blood flow as well as its imaging of flow distribution.

The method was based on the indicator fractionation principle, that the uptake of the radioactive potassium or rubidium by the heart muscle equals the fraction of cardiac output supplying the myocardium after single intravenous injection of the tracer. Thus, combining the myocardial uptake and the total amount of injected dose in the term of the external counting rate, the myocardial blood flow can be obtained as a fraction of cardiac output.

The recent availability of ^{43}K and scintillation camera can facilitate the complete delineation of the myocardial region separating from the surrounding region and attain the relative independence from the uncertainty of the geometrical problem.

Ten dogs were injected intravenously with

^{43}K and the rapid passage of the initial bolus recorded by serial frames collected every 0.6 seconds by a scintillation camera with a numerical distribution matrix. The accumulation of the radioactive material in the myocardium was determined by the collection of similar distribution matrices every minute and delineating the area identified on the scan as the heart border.

Following the in vivo measurement the entire heart was excised and compared with an aliquot of the injected dose. Finally the total content of the myocardium was assayed by a well scintillation counter.

Reasonable agreement has been achieved between estimation of the fraction of dose in the myocardium determined in vivo and the measurement of myocardial uptake on the excised heart. Because of difficulties in ascertaining the heart border on the scans, a deconvolution program has been applied to the matrices to sharpen the transition between country levels.