The flow value at rest state and vasuclar reactivity of individual Xtales were displayed as functional images as well as numerical print outs. The functional images facilitate immediate evaluation of regional abnormality of cerebral hemodynamics.

Application of Minicomputer for System 70 Gamma Camera

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System 70 gamma camera is suitable for the radioisotope cardio dynamic study.
This system is original equipment manifature (OEM) with 20 programs.

Dead time and uniformity correction are convenient in clinical use.
In the quantitative measurement it needs another computer, magnetic disc and teletype.

Current Status and Future of RI Data Processing in Cardiovascular System

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Data processing is applied for both static and dynamic RI studies for the diagnosis of cardiac diseases.

In static studies, attempts were made to improve myocardial images by a digital computer and to quantitize the scan-data of the myocardium. Images of $^{131}$Cs myocardial scintigrams were improved by a blur restoration technique with a digital filter. Production of functional images of the myocardium was attempted by subtracting blood pool from serial $^{131}$Cs scintigrams. The auto-correlation analysis was available for the quantitzation of homogeneity of the myocardial scintigram. By this analysis, the degree of sparseness of a myocardial scintigram in congestive cardiomyopathy was evaluated quantitatively. With these processings, the accuracy of myocardial scintigram in diagnosis was improved.

Furthermore, the application of newly developed radioactive tracers for myocardial scanning is desired.

In dynamic studies with scintillation camera, two types of data processing systems were adopted; one was “programming scintiphotocardiography (ECG gated scintiphotocardiography)” and the other was videotape data play back system. The
former was a electrocardiographically gated records of RI images of the heart at end-diastole and end-systole. The latter was a system to record images throughout a cardiac cycle, but possess a major disadvantage of RI counting loss.

Our system is consisted of the Anger scintillation camera interfaced to a 16K digital computer and a magnetic tape. With this system, images of any phase in a cardiac cycle can be collected onto a magnetic tape by ECG gating. Using these data, end-diastolic volume, end-systolic volume and ejection fraction are calculated by the counting method or the area length method. In calculation of the left ventricular volume by the area length method, an objective delineation of RI image contour of the left ventricle is required. For this purpose, we developed a digital computer program for the satisfactory delineation of the left ventricle by differentiating the counts of RI images and by displaying the points above the threshold defined.

In the future, collection of images and ECG signals throughout a cardiac cycle without any counting loss is desired. Then, a more accurate left ventricular volume can be obtained. For this purpose, a larger computer system is needed.

Clinical Use of An On-line Minicomputer System and Its Problems

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Our clinical experiences with a joint system of a gamma camera and an on-line minicomputer were presented.

On-line computer system in our laboratory, DAP 5000N, is composed of CPU of TOSBAC-40 (32KB), magnetic disc, magnetic tape, teletype, CRT display with light pen, high speed tape reader and X-Y recorder. Various assembler programs devised by ourselves have been applied to a variety of clinical fields.

In static studies, iterative approximation was utilized for image enhancement especially to detect focal defects. Subtraction scintigraphy was applied to pancreas imaging.

In dynamic studies, functional imaging appears to be one of the most clinically useful data processing techniques by which a specific regional function of an organ system is displayed on an image.

Functional imaging of the thyroid using $^{99m}$Tc O$_4^-$ as a tracer and "Sum Tc 10 Ratio" as a parameter showed a characteristic regional function of the thyroid. ($\text{Sum Tc 10 Ratio} = \sum_{i=1}^{10} (C_{10}/C_{i}) - 1$). Mean value for Sum Tc 10 Ratio over the thyroid area correlated well with $^{131}$I uptake ($r=0.80$, $p<0.005$). In addition, a negative display which represents negative values for the ratio appears useful for the evaluation of malignant cold nodules.

Functional imaging of the kidney was also useful for the evaluation of malignant mass lesion using $^{99m}$Tc-DTPA as well as chronic pyelonephritis and other obstructing diseases using $^{131}$I-Hippuran. In these studies we tried several parameters of $T_{max}$, $T_{1/2}$, up slope and others as used in the diagnosis of the renogram.

In the radioisotope angiocardiology using $^{99m}$Tc-HSA, an iterative approximation method was applied to the correction of time-activity curves on all the elements of matrix, which had been distorted in consequence of delayed injection.