

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. (Sum Tc 10 Ratio = $\sum_{t=1}^{10} [(C_{10}/C_t) - 1]$). 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 angiocardigraphy 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.

Reconstructed images after the correction represent such images that radioisotope were injected in a form of ideal bolus. An illustrative images obtained from a patient with ASD were demonstrated in which interatrial L-to-R shunt was clearly visualized.

Other interesting clinical application includes the determination of ejection fraction, evaluation of pulmonary mean transit time and diagnosis of malignant mass lesion using functional imaging.

There are many kinds of limitation concerning clinical use of on-line mini computer systems. For

example, small capacities of magnetic core memory of CPU inevitably limit the programming technique. There needs frequent transfer of data between CPU and peripheral storage systems, prolonging the calculation time. However, in any of above mentioned studies, processing time was about 10 to 15 minutes including calculation time, photography procedures and others.

We believe an on-line minicomputer system will come to be intensively utilized in wider fields of daily clinical studies in the future.