## Dual Camera Biplane Studies with Computer Simultaneous Acquisition and Processing of Data (II). Application for Brain Dynamic Studies

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The brain dynamic studies were performed using dual scintillation camera simultaneous data acquisition and its process by the computer system. As our previous report (JRS annual meeting on May, 1977) it was found to be able to apply this method to the dynamic studies technically.
The new computer programs have been developed; 1) the time frame image display. 2) the operator selectable 1 to 72 ROI set. 3) ROI histogram curve making and their function parameters calculations.

About 20 patients brain studies were performed with 2 camera placed against the right and left lateral of the patients. The data from both camera were passed as soon as intravenous infusion of 20 mCi of 99m-pertechnetate and then processed by the computer programs mentioned above. ROI could be set to observe the same area in same size of the brain both from the right and left lateral.

In the 15 normal cases aged from 30 to 60, no significant differences were found. In the case of patient with the thrombosis in the left frontal lobe, some parameters were different between the right and left in the region including the disease. The functions from the left; 22.5% lower in maximum count, 2 seconds delay in peak appearance time and and 5 seconds delay in MTT compared with the right. In the case of a patient with the fresh thrombosis in the left lateral, the maximum activity from the left corresponding ROI area were 70.7% of the one from the right, though the peak appearance time and MTT were not different.

By the mechanical structures of the 2 cameras, when placed at right angles against each other like biplane studies in X-ray, it could not be expected to get the good data. Therefore, we are planning to introduce the mobile type scintillation camera having a smaller size ditector for the routine studies.

## Optimal Sampling Condition Applining Compartmental Analysis in RI Dynamic Studies

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The output of the tracer kinetic process is expressed by a sum of decaying exponentials. The compartment analysis is a method by which the pertinent parameters ($A_i$, $\alpha_i$) as well as number of compartment(p) are determined.

The optimal time scale interval ($\tau$) and sample size(m) in a definite set of observation in RI dynamic study were obtained to minimize the variance of the parameter ($A_i$, $\alpha_i$). The best unbiased estimators of variance of the parameters were obtained by the Fisher information and the Cramér-Rao inequality. Since the expectation value in the $j$-th observation $\langle n_j \rangle$ is represented by

$$\langle n_j \rangle = \int_{tj-1}^{t} \sum_{i=1}^{p} A_i \exp(-\alpha_i t)\alpha t$$

in RI dynamic study, the information matrix can be defined by $A_i$, $\alpha_i$, $\tau$ and m.

Moreover, in RI dynamic study, dynamic curves obtained from any organ were modified by two factors such as dead time loss in measurement and background surrounding the organ. In this