Symposium I.
Present Status of RI Diagnosis of Central Nervous System

New Diagnostic Approach to the Brain Diseases in Nuclear Medicine
—Logical brain scan diagnosis and combined radioisotope examination—

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Brain scanning has become important screening test for suspected brain lesions. In our experience, however, it's accuracy has not been sufficient and it has been hard to differentiate lesions from each other as to its true pathologic nature. In nuclear medicine, two different ways could be used for resolving the problems. One is application of logical diagnosis by digital computer into brain scan diagnosis and the other is a combined radioisotope examination which is consisted of multiple radioisotope studies, such as brain scanning, radioisotope angiography, sequential scanning, cisternography, tumor scanning with ^{67}Ga-citrate and cerebral circulation studies.

1. Logical diagnosis of brain scanning by digital computer

Two hundred positive brain scans were chosen for this study. Scan findings and proved diagnosis of these cases were coded and stored as digital data onto the magnetic tape. About one hundred different scan informations such as number of lesions, location, shape of lesions, frontal lucency sign etc., which could be important for differential diagnosis, were picked up and the correlation coefficient between these informations and brain diseases were calculated by statistical method. The likelihood method was done as logical diagnosis by FACOM-230/35 computer.

In our studies, the likelihood method gave about 85 per cent agreement between logical diagnosis and proved diagnosis in the diseases such as infarct, meningioma, glioblastoma, metastatic tumor, acoustic neurinoma and subdural hematoma.

This method, however, gave a poor result in A-V malformation, intracerebral hematoma and other rare diseases.

2. Combined radioisotope examination

In 150 patients, where brain scans showed abnormal or suspicious findings or where there was a high index of clinical suspicion, several additional radioisotope studies were obtained.

Radioisotope angiography could improve the accuracy of detection and differentiation of the

cerebral vascular diseases such as A-V malformation and infarct.

Lesions adjacent to or superimposed on normal anatomic structures was separated by sequential scanning. The tumor scan with ^{67}Ga-citrate was able to exclude postcraniotomy bone-flap activity as seen on ^{99m}Tc brain images. Therefore it was proven helpful in differentiating recurrent intracranial tumor from the craniotomy site. Cisternography could make easier to detect the tumors in the region of posterior fossa and cranial base and also be useful for planning of therapy in meningitis.

Although, brain scanning is not specific study, it could be possible to improve accuracy of differential diagnosis of brain diseases by digital processing of scan data. Each radioisotope study contains rather poor information, however, if the combined study is systematically done, many useful informations could be obtained.

Regional cerebral Blood Flow Studies in the Acute Phase of Subarachnoid Hemorrhage

—Preoperative study—

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Abnormal cerebral blood flow has been found in the patients with subarachnoid hemorrhage (SAH). The present studies were to discuss the alteration of cerebral blood flow and regulation of cerebral blood vessels in the relation to the duration from the onset and to the arterial spasm.

Method and Materials: Fourty one patients with SAH of preoperative cases were examined. Except one case, cerebral aneurysm was detected by 4 vessels serial angiography.

rCBF studies were carried out using a 6 channel system with ^{133}Xe clearance method, In the first stage, rCBF of the rest stage was measured, and then, the response of rCBF to hypercapnea induced by 5% CO_2 inhalation and hypotension induced by Regitin was examined.

Regional cerebral blood flow of each region was calculated by digital computer with height over area method to estimate the rest state rCBF and initial slope method to the functional studies. During these examinations, $PaCO_2$, PaO_2, pH and blood pressure of internal carotid artery were measured.

All subjects were examined by serial angiography of ipsilateral carotid artery on the same day.

Results: On the patients of SAH at the acute stage, dynamic changes of hemispheric CBF, regional distribution of CBF, regulation of cerebral blood vessels and arterial spasm were ob