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DIAGNOSIS OF DISTURBANCE OF CEREBRAL FUNCTION WITH SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY (SPECT). K.Hisada and H.Matsuda Dept.of Nucl.Med.,School of Medicine, Kanazawa University

To diagnose the disturbance of cerebral function precisely, the knowledge of detailed functional map of the brain is needed. For this purpose two-dimensional cerebral blood flow measurement has been performed by  $^{133}\text{Xe}$  inhalation method using multiple probes system. But this method shows the image of poor resolution and can not disclose the blood flow change in the deeper region. Newly developed agent, N-Isopropyl-p- $^{123}\text{I}$ Iodoamphetamine is easily trapped by the brain tissue and remains there long enough to be imaged by rotating gamma camera SPECT system.

Regional cerebral blood flow changes during left finger movement (Motor Sequence Test) and reading aloud, obtained by  $^{123}\text{I}$ -IMP intra-venous injection method were compared with those obtained by  $^{133}\text{Xe}$  inhalation method in normal right-handed subjects.  $^{123}\text{I}$ -IMP injection method showed that left finger movement was accompanied by focal increases in prefrontal cortex, both supplementary motor areas, right primary sensorimotor hand area and right central gray matter, and that reading aloud was accompanied by focal increases in primary visual cortex, visual striate cortex, prefrontal cortex, both supplementary motor areas, left prefrontal eye field, Broca's area, Wernicke's area and left angular gyrus.

On the other hand,  $^{133}\text{Xe}$  inhalation method could neither distinguish focal increase in supplementary motor area from that in primary sensorimotor hand area during left finger movement, nor detect any focal increase other than that in occipital and left postero-superior temporal regions' during reading aloud.  $^{123}\text{I}$ -IMP injection method is superior in both spatial resolution and accuracy to  $^{133}\text{Xe}$  inhalation method, and is useful in evaluating regional cerebral blood flow changes during physiologic activations.

Forty-two regional cerebral blood flow (rCBF) measurements were performed on 36 patients with cerebrovascular disorders. While ischemic areas were depicted on 35 measurements (83.3%) by laterality index method of  $^{123}\text{I}$ -IMP study, low density areas were detected only on 18 (42%) X-ray CT studies.

SPECT is thought to be useful also on the objective evaluation of psychic function of mental diseases. Three-dimensional rCBF study of schizophrenic patients using Headtome II and  $^{133}\text{Xe}$  gas inhalation method revealed significant decrease of rCBF at the right frontal area and significant increase at posterior part of central gray matter comparing age-matched control group.

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FUTURE PROSPECT OF EMISSION COMPUTED TOMOGRAPHY IN NEUROLOGICAL DISORDER: COMPARISON OF SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY AND POSITRON EMISSION COMPUTED TOMOGRAPHY. Yoshiharu Yonekura and Shuji Tanada. Kyoto University School of Medicine, Kyoto.

The diagnostic approach in neurology has been changed tremendously by recent developments of various kinds of imaging techniques, such as X-ray computed tomography, nuclear magnetic resonance imaging and emission computed tomography (ECT). ECT includes single photon emission computed tomography (SPECT) and positron emission computed tomography (PET). The major advantages of PET are better performance characteristics of the system and possibility to label various compounds with short-lived positron emitting radionuclides, which provides regional measurement of physiological and biochemical process in vivo. PET, however, requires a medical cyclotron and chemical synthesis system in the hospital, and it is hardly applied for the routine clinical use.

On the other hand, SPECT has been studied in many hospitals. N-isopropyl-p-(I-123)iodoamphetamine (IMP) was introduced for the assessment of regional cerebral blood with SPECT. We have compared the distribution of IMP measured by SPECT with regional cerebral blood flow (RCBF) and oxygen metabolism (CMRO<sub>2</sub>)

determined by PET with inhalation of O-15 labeled gases. In chronic cerebrovascular disease, the early distribution of IMP was well correlated with RCBF. However, the discrepancy between IMP distribution and RCBF was observed in a few cases with cerebral infarction in the subacute stage. The contrast between normal and diminished uptake region decreased in the late scan in cerebrovascular disease without infarction.

These data suggest that although SPECT with IMP is a valuable diagnostic tool for the assessment of cerebrovascular disease, IMP distribution may not be determined only by RCBF but also by some other factors. Further studies are needed to clarify the kinetics of this compounds in normal and diseased states. SPECT in future depends upon the advancement of the equipment, software for the better quantification, and radiopharmaceuticals.