294

TRANSAXIAL TOMOGRAPHIC OBSERVATION OF REGIONAL CEREBRAL BLOOD FLOW (rCBF) IN THE PATIENTS WITH ISCHEMIC CVD BY Kr-81m AND HEADTOME.

K.Uemura, S.Takahashi, Y.Kawata, I.Kanno, S.Miura and Y.Miura. Division of Radiology, Research Institute of Brain and Blood Vessels, Akita.

Three diemntional regional cerebral circulation can be evaluated by tomographic imaging using the Headtome and continuous intracarotid infusion by Kr-81m solution. I. Tomographic imaging of rCBF in the patients with ischemic CVD: Seventeen patients with ischemic CVD were studied. The results: 1) the advantage of the method was visualization of 3-D-rCBF distribution in the brain with excellent spatial resolution; 2) distribution of ischemic areas observed clearly on all the subjects; 3) the study consistently detected hypoperfusion in broad zone that appeared to be structurelly normal.
II. Calibration of mean CBF by the Xe-133 clearance study: One of the disadvantage of the Kr-81m infusion method has been considered that the method did not provide any flow value of the brain. For the relationship curve between Kr-81m counts of the brain tissue and the rCBF. average ECT-value of the whole slices is calibrated by the mean hemispheric CBF which is obtained by the Xe-133 intracarotid injection. With the calibration, rCBF value of the each pixel of the Kr-81m ECT is estimated. Quantitative tomographic mapping of rCBF on the patients with CVD were presented.

295

SINGLE PHOTON ECT OF r-CBF WITH THE Kr-81m EQUIBRIUM METHOD—COMPARISON STUDY WITH Xe-133 CLEARANCE METHOD AND X-CT.

T.Maeda, H.Matsuda, N.Tonami, H.Mori, K.Hisada, M.Hayashi and H.Fujii. Kanazawa University, Kanazawa.

A new clinical application of the single photon emission tomography is the evaluation of regional cerebral blood circulation on the cross section images, which has been developed by Fazio et al and Uemura et al. We performed this examination in 27 patients and compared it's results with X-ray CT images and/or the functional maps of r-CBF determined from Xe-133 clearance method. The transverse section images of the head were obtained using Tomogscanner II (J & P Engineering Co., England). In the phantom studies it has been confirmed that the count rate linearity was good and the resolution and the thickness of the slice at each depth were nearly constant. The resolution of the reconstructed images at each depth was about 2.0cm in the FWHM. The conventional r-CBF studies by the intracarotid injection of Xe-133 were performed using a Toshiba gamma camera combined with a DAP 5000N minicomputer. The X-ray CT scans were performed using EMI scanner. The cross section images of Kr-81m showed more avid activities at the basal ganglia and the gray matter than those at the white matter and the watershed area in patients who showed normal distribution pattern of the r-CBF with Xe-133. Single photon emission CT studies were more useful in the estimation of the area of decreased r-CBF than the X-ray CT and the conventional Xe-133 studies.

296

POSITRON CT IMAGES OF THE HEAD FOLLOWING INTRAVENOUS ADMINISTRATION OF N-13-AMMONIA AND INHALATION OF C-11-CARBONMONOXIDE.

F.Shishido, Y.Tateno, Y.Suda, M.Endo, T.Iinuma, R.Iwata, T.Ido, K.Tamate, T.Takashima, A.Yamaura and H.Ikehira. National Institute of Radiological Sciences and Chiba University Chiba.

A cerebral positron CT system (Positologica) was used for obtaining tomographic brain images following intravenous injection of N-13-ammonia and inhalation of C-11-carbonmonoxide. The images of normal volunteers revealed high accumulation of N-13-ammonia in gray matter and a little uptake of N-13-ammonia in white matter. Large vascular structures of the brain were clearly seen in tomographic images with C-11-carbonmonoxide gas. Deficit of N-13-ammonia images obtained from a patient with old cerebral infarction appeared to be larger than the low density areas on the XCT image. The images of a patient with cerebral infarction revealed high accumulation of N-13-ammonia in the lesion. This finding probably showed "luxury perfusion syndrome" In the case of meningioma N-13-ammonia was markedly taken up. The reduced uptake of C-11-carbonmonoxide was in the center of the tumor, though the high uptake of C-11-carbonmonoxide was in the peripheral region of the tumor. From these preliminary results, it is suggested that tomographic images of N-13-ammonia and C-11-carbonmonoxide provided the pathological information about hemodynamics.

297

HEADTOME-II: CHARACTERISTICS OF A COLLIMATOR SYSTEM.

Y. Hirose, H. Hattori, I. Kanno. S. Miura. Y. Miura and K. Uemura. Medical systems Div. Shimadzu Corporation Kyoto, Research Institute of Brain and Blood Vessels, Akita.

A single photon collimator system for multislice hybrid emission computed tomograph (HEADTOME-II) was investigated. The collimator consists of a few hundreds of 0.5 mm thick tungsten blades which are circularly arrayed like a turbofan. The angle between the blades and the direction from the center line varies linearly with the angular position of the blade. The angle ranges from -30° to +30°. As the collimator rotates inside the detector ring, the direction of incident photons varies as if the collimator were swinging in front of each detector. Two types of the collimator, high resolution and high sensitivity, are prepared. As each collimator blade is fixed in a different angulation, a shape of a line spread function is dependent on the portion of the collimator assembly. The line spread functions of a several portions of the high resolution collimator were calculated, and 11.2 mm FWHM and 6.1 mm FWHM were obtained at the center of the FOV and at the periphery, for the angular position of the blade being 0°. The FWHMs tend to be less in accordance with the angulation of the blade. The measurement of the line spread function by using Tc-99m was also done in air to compare with a calculated value. The measured line spread functions agreed well with calculated one.