

146

CEREBRAL CIRCULATION IN BRAIN TUMORS.

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The cerebral blood flow (CBF) was studied on twenty-four patients with use of ring type single photon emission CT (SPECT), following interavenous injection of Xe-113 and I-123 isopropylidoamphetamine (IMP). Case materials included fourteen meningiomas, nine gliomas, and one primary malignant lymphoma. Evaluation was performed with emphasis on the following points; 1) Influence of tumors on the normal brain tissue, 2) Correlation of the flow data within tumors to the angiographic tumor stains, 3) Correlation of degree of peripheral edema and the flow data of the affected hemispheres, 4) Image of brain tumors by IMP.

The results revealed that there was significant correlation between data within tumors and angiographic tumor stains. Influence of tumors on the normal tissue was greater in meningiomas than in gliomas. Correlation was not demonstrated against edema and mCBF of the affected hemispheres. Scanning of brain tumors with IMP did not reveal uptake of isotopes.

It has been concluded that the measurement of CBF in brain tumors is valuable method in preoperative evaluation.

147

DYNAMIC SCAN OF CEREBRAL BLOOD FLOW SPECT USING I-123-IMP. H.Hoshi, S.Jinnouch, K.Onoe and K.Watanabe. Department of Radiology, Miyazaki Medical College. T.Ueda and K.Kinoshita. Department of Neurosurgery, Miyazaki Medical College, Miyazaki. N.Yamaoka. Shimadzu Corporation, Kyoto.

Dynamic scans of I-123-IMP cerebral blood flow SPECT were studied in 3 normal cases and in 17 cases with brain tumor and arterio-venous malformation (AVM). Instruments used were circular-detector array emission tomograph (SET-020, Shimadzu) and minicomputer system (ECLIPSE S-120, Japan Datageneral). Each case received 1mCi of IMP intravenously and scanning was carried out 0min after injection. Data collection time were 6min x 10 frame in normal cases and 2min x 10 frame in cases with cerebral disease. Tumor activity to cerebral cortical activity in opposite side (T/N ratio) was calculated in each time. In normal cases, activity in cerebral cortex and basal ganglia increased rapidly in early stage (60-70% in 15min 90% in 30min 100% in 60min). Activity in white matter is about 80% in 60min. T/N ratios in cases with astrocytoma, metastatic brain tumor, pituitary tumor and pineal tumor were constant in 0-20min after injection (40-100%). T/N ratios in cases with meningioma and AVM were high in 0-4min. Good correlation was observed between T/N ratios in 2min and those of rCBF image obtained by Xe-133 gas inhalation method in all cases (correlation coefficient is 0.97).

148

MEASUREMENTS OF REGIONAL CEREBRAL BLOOD FLOW, OXYGEN CONSUMPTION AND BLOOD VOLUME IN PATIENTS WITH BRAIN TUMORS BY POSITRON EMISSION TOMOGRAPHY.

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Nine patients with brain tumors, including 4 meningiomas and 3 glioblastomas, were examined by positron emission tomography (PET). Measurement of rCBF, rOEF and rCMRO₂ were performed by continuous administration of O-15 CO₂ or O-15 H₂O, and O-15 O₂ and rCBV was measured by single inhalation of C-11 CO or O-15 CO.

All patients showed decreased rOEF, ranging from 0.17 to 0.40. In patients with meningiomas, increased rCBF and slightly increased or unchanged rCMRO₂ were observed. Increased rCBF and decreased rCMRO₂ were seen in 2 patients with glioblastomas. In another patient with glioblastoma, which had large necrotic area, rCBF decreased. Abnormal findings in non-tumorous area were seen in 6 patients. These abnormalities included decreased rCBF in marginal region of the tumor in 2 patients, decreased rCBF in ipsilateral hemisphere in 4 patients and contralateral cerebellar diaschisis in 2 patients. PET study is a useful modality to evaluate cerebral blood flow and metabolism in tumor and its effects to non-tumorous areas.

149

C-PYRUVATE METABOLISM OF THE BRAIN TUMOR -POSITRON EMISSION CT STUDY. T.Tsukiyama and T.Tsubokawa. Nihon Univ., T.Hara and M.Iio. National Chest Hosp. Tokyo.

It is well known about Lactic acid production in the malignant cell. And its reason has been thought that Pyruvate metabolism was disturbed in Mitochondria. Six cases of brain tumor were studied by Positron emission tomography (PET). We attempted to visualize brain tumor lesion of patients as positively delineated zone in PET after i.v. injection of "11C-PYRUVATE". PET scan was done by continuous dynamic scan (5 min, 15 min, 30 min). PET images were generated by a Shimadzu Headtome II scanner. The brain tumor tissue in X-ray CT retained the 11C activity for a long period. And the location was just same as that of the X-ray CT. In an anaerobic environment, "11C-PYRUVATE" cannot be metabolized effectively by the oxidative pathway. It is converted preferentially to 11C-lactic acid by promotion of the increased NAD/NADH ratio. The transport of lactic acid into the blood is relatively slow, and consequently theradioactivity is retained in the tissue for a rather long period.