1.1 Clinical PET

The changes of glucose metabolism in the brain before and after antiviral therapy in patients with chronic hepatitis C and cirrhosis

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Abstract

Recently, PEG-IFN and ribavirin combination therapy as an antiviral therapy for chronic hepatitis is performed as a standard treatment. And this efficiency rate is getting increased.

However, the side effect of antiviral therapy is diverse, sometimes serious psychiatric and neurological abnormalities (insomnia, depression) to be expressed and it will force to suspend the treatment. Previously, we examined the dynamics of brain metabolism in patient with cirrhosis by using PET, MRI, MRS and various fields. We found out the glucose metabolism in the brain of patient with cirrhosis is depressed as compared to control.

Thus our AIM is to clarify the relationship between the glucose metabolism in the brain and the psychiatric and neurological dysfunction in cases of PEG-IFN and ribavirin combination therapy.

METHODS: We examine PET imaging of the brain using 2-(18F)- fluoro-2-deoxy-D-glucose, Neurological test, Auditory brain stem reaction and electroencephalogram, cytokine measurements in blood ,biochemical test in blood (peripheral blood, liver function and viral load) before antiviral therapy and 3 month after from the start of the therapy, 12month after (the therapy is finished),24month after(observation period).

And after the measurement, We analyzed the relationship between the various tests and other mental dysfunction and the glucose metabolism in the brain.

Comparison MRI findings and positron emission tomography of Creutzfeldt-Jakob disease with V180I mutation

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Abstract

We report MRI and positron emission tomography (PET) findings of a 78-year-old man of Creutzfeldt-Jakob disease with codon 180 mutation who was difficult to be differentiated from mitochondrial encephalo- myopathy, lactic acidosis and stroke-like episodes (MELAS). The patient showed slow progression of dementia including memory disturbance, aphasia, apraxia, and left hemispatial agnosia during several months. He was suspected of MELAS because of the high-intensity lesion in the occipital lobe by diffusion-weighted MRI (DWI), and elevation of lactic acid in cerebrospinal fluid and serum, while mitochondrial abnormality was not found in muscle biopsy and rCBF was decreased at the lesion by PET. Finally, genotype revealed familial CJD with V180I mutation. The cortical edema was progressed after 6 months and then reduced after 14 months, while high intensity area on DWI was expanding for entire cortex after 14 months. PET showed marked decrease in rCBF in earlier stage and the area was larger than DWI lesion by MRI. The result revealed that the decrease of rOEF and acid increase of lactic acid in the right occipital area anaerobic metabolism in the area suggesting that PET findings in conjunction with MRI are useful for differentiating patient with CJD.

Postoperative cortical neural loss associated with cerebral hyperperfusion and cognitive impairment following carotid endarterectomy: ^{123}I-iomazenil SPECT study

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Abstract

Background and Purpose

While cerebral hyperperfusion following carotid endarterectomy (CEA) often impairs cognitive function, magnetic resonance imaging does not always demonstrate structural brain damage associated with postoperative cognitive impairment. The purpose of the present study was to determine whether postoperative cortical neural loss, which can be detected by ^{123}I-iomazenil (IMZ) single-photon emission computed tomography (SPECT), is associated with cerebral hyperperfusion following CEA and whether it correlates with postoperative cognitive impairment.

Methods

In 60 patients undergoing CEA for ipsilateral ICA stenosis (> 70%), cerebral blood flow (CBF) was measured using *N*-isopropyl-*p*-[^{123}I]-iodoamphetamine SPECT before and immediately after CEA and on the third postoperative day. The distribution of benzodiazepine receptor binding potential (BRBP) in the cerebral cortex was assessed using ^{123}I-IMZ SPECT before and one month after surgery and was analyzed using three-dimensional stereotactic surface projection. Neuropsychological testing was also performed preoperatively and at the first postoperative month.

Results

Post-CEA hyperperfusion (CBF increase >100% compared with preoperative values) and postoperative cognitive impairment were observed in 9 patients (15%) and 8 patients (13%), respectively. Post-CEA hyperperfusion was significantly associated with postoperative hemispheric reduction of BRBP (95% CIs, 2.765 to 148.804; p = 0.0031). Post-CEA hyperperfusion (95% CIs, 1.183 to 229.447; p = 0.0370) and postoperative hemispheric reduction of BRBP (95% CIs, 1.003 to 77.381; p = 0.0496) were also significantly associated with postoperative cognitive impairment.

Conclusions

Cerebral hyperperfusion following CEA results in postoperative cortical neural loss that correlates with postoperative cognitive impairment.

Study for utilization of databases of CBF and metabolism

Comparison of the normal data among the Japanese Council of Nuclear Neuroimaging, NMCC 2D and NMCC 3D

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Abstract

Positron Emission Computed Tomography (PET) is widely used in clinical centers not only for diagnosis, staging and therapy monitoring in oncology, but also for brain studies such as functional imaging of cerebral blood flow (CBV) and oxygen metabolism. Most PET facilities obtain normal volunteers' data before applying PET study to patients. If those normal data are available to each other , it helps to reduce the number of healthy volunteers for PET study in all. There are PET database of CBF, oxygen extraction fraction (OEF), cerebral metabolic rate of oxygen (CMRO2) and cerebral blood flow(CBV) of healthy volunteers in Japan, and they are kept in the Japanese Council of Nuclear Neuroimaging(JCNN). The Purpose of this paper is to consider to utilize the JCNN database to check preciseness of the PET quantitative value in our facility. We compared 3types of PET quantitative database (the JCNN data, NMCC 2 Dimension (NMCC2D) data and NMCC 3 dimension (NMCC3D)data) and their standard deviations.

Method: We used the 3DSRT to set automatically the region of interest and analyzed the 3 types of database.

Result: Mean value's for superior frontal are as follows, CBF: JCNN=42.9, NMCC2D=39.1, NMCC3D= 38.0(ml/100ml/min), OEF: JCNN=0.41, MCC2D=0.44, NMCC3D=0.44, CMRO2: JCNN=3.3, NMCC2D=3.2,

NMCC3D=3.3(ml/100ml/min), CBV: JCNN=4.0, NMCC2D=4.3, NMCC3D=4.8(ml/100ml). There are significant differences in many areas for CBF, OEF and CBV while CMRO2 values are similar among 3 types of the database.

Conclusion: It seems difficult for us to directly quote CBF, OEF, CBV from JNCC, because our NMCC2D and NMCC 3D CBF quantitative values are lower, and OEF and CBV are higher than JNCC. But by comparing with JNCC data, we can recognize our data's inclination and variance, and this may serve to reduce the number of healthy normal volunteers for PET study.