1118

FUNCTIONAL MAPPING OF BRAIN STATE DURING QIGONG MEDITATION: AN ACTIVATION STUDY USING PET AND ^{15}O-WATER.

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Our aim was to introduce scientific imaging technology in order to describe the unique state of mind during qigong meditation by simultaneous recording of positron emission tomography and EEG. Regional cerebral blood flow (rCBF) images obtained by using ^{15}O-water were transformed onto the space of Talairach-Tournoux using a series of brain transformations, called the SPM. A statistical analysis of regional covariance between rCBF and EEG frequency fractions was examined to identify possible brain regions which related to qigong. Ten right-handed normal subjects as a control compared with ten qigong professionals.The slow EEG waves accompanied a general reduction of rCBF at resting condition of normal subjects and vice versa. However, EEG slow waves in qigong professional accompanied focal increases of rCBF in deep brain structures including the amygdala and hippocampus. This may be the first study to reveal that qigong meditation related to functional activation of the limbic brain while their neocortices remained relatively sirent.

1119

THE ACTIVATION INDUCED BY WALKING IS DECREASED IN PYRAMIS OF VERMIS IN OLIVOPONTOCEREBELLER ATROPHY.

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We studied regional cerebellar glucose metabolism associated with ataxic gait in 9 patients with olivopontocerebellar atrophy (OPCA). We used F-18-FDG and PET to evaluate glucose metabolism under two different conditions: 30 minutes' treadmill walking and supine resting. The two sets of PET images were three-dimensionally registered to the MRI in each subject. Then, the PET images were normalized by the global value. FDG uptake was obtained to calculate the activation ratio (AR, = [FDG uptake under walking]/[FDG uptake under resting]) for each region. We used unpaired t-test for statistical analysis to compare the OPCA patients with the normal control subjects. AR of OPCA patients was significantly decreased in the pyramis, and increased in the posterior lobe of cerebellar hemisphere. In the anterior lobe, activation of OPCA patients was equivalent to normals. We speculate that these findings reflect the abnormal cerebellar function during ataxic gait in the early phase of OPCA patients.

1121

PROGNOSIS OF PATIENTS WITH COMPROMISED CEREBRAL BLOOD FLOW (CBF) REACTIVITY

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To estimate the prognosis of patients with compromised CBF reactivity showed by acetazolamide(ACZ) challenge SPECT, we retrospectively investigated 67 patients with high grade occlusive lesions in major cerebral vessel. Mean follow up duration was 26.4 months.

In the medically treated group, the recurrence rate of the ACZ-positive group tended to be higher than that of the ACZ-negative group:3/14(21.4%) vs 1/15(6.7%),p<0.1;recurrence rate in the impaired hemisphere : 3/14(21.4%) vs 0/15(0%), p<0.1. Of 3 patients who developed recurrence , 2 patients had attacks within 3 months. In the ACZ -positive group, the recurrence rate of the medically treated group tended to be higher than that of the surgically treated group:3/14 (21.4%) vs 1/22(4.5%), p<0.1;recurrence rate of the impaired hemisphere:3/14(21.4%) vs 0/22(0%),p<0.1.

This study showed that recurrence in the impaired hemisphere tended to occur within several months after the first ischemic event, and surgical treatment might prevent early recurrence. It is suggested that strategies for identification and treatment in cases with compromised CBF reactivity must be implemented early, if these are provide maximal benefit.

1123

EFFECT OF CEREBRAL BLOOD VOLUME ON THE RATE CONSTANTS ESTIMATION IN A COMPARTMENT MODEL ANALYSIS.

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In the compartment model analysis of brain PET dynamic data, cerebral blood volume (CBV) is usually assumed to have a nominal value (4 %) or is estimated by means of least squares fitting. The effect of the CBV error on the rate constants estimation was investigated using both simulation data and clinically measured data in the 18F-FDG study. The simulation data was generated from the measured plasma time-activity curve and predicted rate constant values (K1=0.103, k2=0.132 k3=0.058) and CBV value (0 to 10%). One hundred simulation curves were generated for each random noise level of 1, 3, 5 and 10 % and CBV value. When the CBV contribution was ignored in case of CBV = 4%, the estimation of K1, k2 and k3 was 28%, 50% and 15% higher than the true value regardless of the noise level.