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General Summary

Our research in 2007 was performed in the following areas: 1) dysosmia in Lewy body disease, 2) autonomic dysfunction in Lewy body disease, 3) neuroradiological studies with nuclear medicine, 4) neurophysiological studies on visual cognitive functions in Lewy body disease with dementia, and 5) motor neuron disease.

Research Activities

A simple screening test for dysosmia in Parkinson's disease

Dysosmia in Parkinson's disease (PD) was evaluated with a simple test using an incense stick. The subjects were 83 healthy controls and 60 patients with PD. The percentage of subjects with dysosmia was significantly higher among patients with PD than among the healthy controls. Among patients with PD, dysosmia was associated with a significantly longer duration of disease than was a normal response.

Lewy body in aging human olfactory bulb

We investigated the incidence and extent of Lewy body-related α -synucleinopathy (LBAS) in the olfactory bulb in 320 consecutive patients examined at autopsy. The incidence of LBAS in the aging human olfactory bulb was high. LBAS apparently extends from the periphery to the anterior olfactory nucleus and results in clinical manifestations of Lewy body disease. The result showed that the olfactory bulb is one of the first anatomical sites affected by LBAS, and its functional and morphological evaluation is useful for the diagnosis and clinical evaluation of Lewy body disease.

Cardiovascular autonomic dysfunction in neurological disorders

We studied the cardiovascular autonomic dysfunction in patients with Lewy body disease, such as PD or dementia with Lewy bodies. The autonomic function was evaluated with cardiac ^{123}I -metaiodobenzylguanidine (MIBG) scintigraphy, hemodynamic function testing with the Valsalva maneuver, the orthostatic tolerance test, and spectral analyses of heart rate and blood pressure. Reduced uptake of ^{123}I -MIBG in the heart and cardiovascular autonomic dysfunction was found in patients with early stage PD. We are also evaluating the relationship between reduced uptake of ^{123}I -MIBG in the heart and cardiovascular dysfunction with the Valsalva maneuver, orthostatic tolerance testing, and spectral analyses of heart rate and blood pressure in PD.

Sudomotor dysfunction in PD

We studied the relationship between sudomotor dysfunction and cardiovascular autonomic dysfunction in PD. Sudomotor dysfunction in PD evaluated with an evaporimeter affected the forehead and the upper and lower extremities. The characteristics of sudomotor dysfunction are different from cardiac sympathetic dysfunction in the clinical course of autonomic disturbance in PD.

Neuroradiological studies with nuclear medicine

We have made significant progress on the previously proposed research activities. Results of completed studies and preliminary data in support of ongoing experiments are summarized below.

1. Study of cardiac sympathetic dysfunction in 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP)-induced parkinsonian mice

Our study clearly showed that cardiac ^{125}I -MIBG uptake and the total number of binding sites of norepinephrine transporter are rapidly reduced after MPTP administration, followed by a partial recovery of ^{125}I -MIBG uptake and an even greater reduction after repeated MPTP administration, coincident with norepinephrine synthesis in mice hearts.

2. Clinical utility of myocardial ^{123}I -MIBG scintigraphy in parkinsonism and dementia
Myocardial ^{123}I -MIBG scintigraphy is useful for differentiating Lewy body disease from other neurodegenerative diseases.

3. ^{123}I -IMP brain single-photon emission computed tomography study in neurodegenerative disease

By reviewing both the decrease image and the increase image as with the Two-Tail View, 3-dimensional stereotactic surface projection may provide more information on the relative distribution of blood flow and metabolism and facilitate the differential diagnosis of parkinsonian disorders using photon emission tomography (PET).

4. Establishment of early differential diagnosis in parkinsonian and demented disorders using PET

PET investigation of presynaptic and postsynaptic nigrostriatal dopaminergic functions may provide clues to understanding the development and advancement mechanism of the disease and will aid in a more reliable early clinical diagnosis and prediction of drug effects.

Neurophysiological studies on visual cognitive functions in Lewy body disease with dementia

Visual information processing functions were assessed with visual event-related potentials in patients with dementia with Lewy bodies, Alzheimer's disease, and PD. The results were presented in part at the 48th annual meeting of the Japanese Society of Neurology. The lead author of these studies was invited as a guest speaker of a symposium at the 37th annual meeting of the Japanese Society of Clinical Neurophysiology. The results in these studies concerning the relationship between visual hallucinations and visual cognitive impairments were presented in the presidential lecture at the 10th annual meeting of the Japanese Pharmaco-EEG Society.

Clarifying the mechanism underlying the selective vulnerability of motoneurons

To clarify the mechanism underlying the selective vulnerability of motoneurons, we compared the membrane current responses to metabolic disturbances induced by NaCN and oxygen deprivation between neurons in the hypoglossal nucleus and those in the dorsal motor nucleus of the vagus nerve in brainstem slices from young rats. The results suggested that potentiation of N-methyl-D-aspartate receptor currents through facilitated glycine release by metabolic disturbance plays a role in the link between mitochondrial dysfunction and selective degeneration of motor neurons.

Publications

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