

Department of Internal Medicine

Division of Neurology

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General Summary

Our research in 2008 was conducted in the following areas: 1) dysosmia in neurodegenerative diseases, 2) neuroradiological studies with nuclear medicine, 3) neurophysiological studies of diabetic polyneuropathy, and 4) basic research on motor neuron disease.

Research Activities

A study of dysosmia in Parkinson disease and Alzheimer disease

In this study, dysosmia in Parkinson disease and Alzheimer disease was evaluated with a simple method using an incense stick. The rate of dysosmia was significantly higher among patients with Parkinson disease and Alzheimer disease than among healthy control subjects.

Cliniconeuropathological evaluation of the olfactory bulb in Parkinson disease

We investigated the incidence and extent of Lewy body—related alpha-synucleinopathy (LBAS) in the olfactory bulb of 320 consecutive patients examined at autopsy. Paraffin sections were immunostained with antibodies against phosphorylated alpha-synuclein, tyrosine hydroxylase, phosphorylated tau, and amyloid beta. LBAS was found in the central nervous systems of 102 patients and in the olfactory bulb of 85 patients. All 35 patients who had LBAS with pigmentation loss in the substantia nigra had LBAS in the olfactory bulb. LBAS in the amygdala was more strongly correlated with LBAS in the anterior olfactory nucleus than with LBAS in the olfactory bulb periphery. These results indicate a high incidence of LBAS in the aging human olfactory bulb; they also suggest that LBAS extends from the periphery to the anterior olfactory nucleus and results in clinical manifestations of Lewy body disease.

Neuroradiological studies with nuclear medicine

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

1. Clinical utility of myocardial ^{123}I -metaiodobenzylguanidine scintigraphy in parkinsonism and dementia: Myocardial ^{123}I -metaiodobenzylguanidine scintigraphy (MIBG) is clinically useful for differentiating Lewy body disease from other neurodegenerative diseases.
2. ^{123}I -isopropylidoamphetamine brain single-photon emission computed tomography

study in neurodegenerative disease: By reviewing both the decrease image and the increase image, as in 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 positron-emission tomography.

3. Clinical utility of myocardial ^{123}I -MIBG scintigraphy and the Odor Stick Identification Test for the Japanese in parkinsonism and dementia

4. Direct comparison of *in vivo* accumulation of 2 amyloid imaging probes [^{11}C] Pittsburgh Compound-B and [^{11}C]BF227 in Alzheimer disease: The purpose of this study was to directly compare the characteristics of 2 amyloid probes, [^{11}C] Pittsburgh Compound-B (PIB) and [^{11}C]BF227, in the same patients. The sensitivity of [^{11}C] PIB for detecting amyloid beta accumulation may be much higher than that of [^{11}C] BF227. However, the difference in the distribution of the 2 probes presumably reflects the difference in the specificity for amyloid beta and/or the difference in the affinity to the different stage of amyloid beta aggregation in the senile plaque generation process.

Neurophysiological studies of diabetic polyneuropathy

The clinical utility of nerve conduction studies and neurological examination of the feet with newly established techniques was assessed in patients with diabetic polyneuropathy, in collaboration with the Department of Diabetes, Metabolism and Endocrinology. The findings of the study suggest that neurological examinations and nerve conduction studies of the feet are useful for detecting early changes in diabetic polyneuropathy.

Elucidation of 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 the dorsal motor nucleus of the vagus nerve in brainstem slices from young rats. The results suggest that potentiation of N-methyl-D-aspartate receptor currents through facilitated glycine release by metabolic disturbance might play a role in the link between mitochondrial dysfunction and selective degeneration of motor neurons.

Selective vulnerability of motor neurons

We compared the effects of chemical anoxia on membrane currents and postsynaptic currents in different motor nuclei. In all nuclei, NaCN induced a persistent inward current accompanied by a marked and robust increase in action potential-independent synaptic inputs. Strychnine was more potent in attenuating the NaCN effect in cranial nerve nuclei XII and VII than in nuclei III, in which picrotoxin was more potent.

Publications

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