Is ^{123}I -MIBG cardiac scintigraphy a surrogate marker for Parkinson's disease?

Hidenao Fukuyama

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Why do we use cardiac scintigraphy in the diagnosis of an intracranial disorder? In Parkinson's disease, the Braak hypothesis suggests that Lewy bodies accumulate starting from the medulla and spreading upward to the cerebral cortex. During this evolution, the accumulation of Lewy bodies in the midbrain damages the dopaminergic cells and leads to dysfunction of the dopaminergic projections from the midbrain to the striatum (mesostriatum), limbic system (mesolimbic), and the cerebral cortex (mesocortical). Finally, deposition of Lewy bodies on the cerebral cortex produces dementia with Lewy bodies [1]. As well as this dopaminergic dysfunction, Parkinson's disease is associated with widespread damage to the nervous system. This is not specific to Parkinson's disease, but is also seen in other neurodegenerative disorders, such as Alzheimer's disease and amyotrophic lateral sclerosis (ALS). These neurodegenerative disorders have similar metabolic tendencies (except ALS), and abnormal protein deposition (Lewy bodies in Parkinson's disease, and amyloid protein and neurofibrillary tangles in Alzheimer's disease) are the main pathological processes. These abnormally accumulated proteins damage not only neurons but also astrocytes.

With regard to Parkinson's disease, noradrenergic neurons (mainly located in the locus caeruleus) and serotonergic neurons (in raphe nuclei) are damaged and produce symptoms of the syndromes associated with deficiency of these neuro-

transmitters. For example, noradrenalin has a strong influence on the sympathetic functions, resulting in Wallenberg's syndrome (lateral medullary infarction) which may include Horner's syndrome due to dysfunction of the sympathetic downward innervation to the pupil as well as the face.

In this context, cardiac sympathetic innervation is disturbed in relatively advanced stages of Parkinson's disease, and accordingly noradrenergic dysfunction will not appear in the early stages of Parkinson's disease. This trend is discussed in the article in this issue by Ishibashi et al. [2] and in another report [3], in which careful consideration was given to the heart/mediastinum ratio. Similar disorders, such as multiple system atrophy, also reveal sympathetic nerve degeneration [4]. These disorders with parkinsonism may be a contamination and hindrance to the correct diagnosis of Parkinson's disease.

In the 1990s, pandysautonomia, a variant of Guillain-Barré syndrome affecting mainly the autonomic nervous system, was found to be associated with various kinds of autonomic dysfunction, and it was found that cardiac scintigraphy showed a marked decrease in MIBG accumulation [5]. This syndrome includes mainly autonomic failure, relatively sudden onset, dysuria, orthostatic hypotension, hypohidrosis, and impotence. MIBG is suitable for diagnosing these kinds of systemic autonomic dysfunction.

Originally, MIBG was used in the diagnosis of damaged tissue of the heart. Muscles with sympathetic innervation are also damaged in cardiac muscle disorders and reduced uptake of MIBG from the sympathetic nerve terminals is regarded as indicating cardiac tissue damage [6]. Therefore, in the diagnosis of autonomic nervous system dysfunction using MIBG we have to assume that the patient has intact heart muscles, i.e. no infarcted or ischaemic areas in the heart or myocardial problems, such as cardiomyopathy. Furthermore, from a technical point of view, it is not easy to

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H. Fukuyama (✉)
Human Brain Research Center,
Kyoto University Graduate School of Medicine,
54 Shogoin Kawahara-cho, Sakyo-ku,
Kyoto 606-8507, Japan
e-mail: fukuyama@kuhp.kyoto-u.ac.jp

determine the cardiac shadow on planar images in cases of generalized low uptake of MIBG in the heart, which is required for the diagnosis of systemic sympathetic dysfunction, namely Parkinson's disease.

Taking all these considerations together, MIBG is not regarded as the first and best choice of diagnostic aid for Parkinson's disease, especially in the early stages. We should pay careful attention to the above-mentioned points, if we are trying to diagnose Parkinson's disease or diffuse Lewy body disease using MIBG.

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