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Cardiac Sympathetic Neuroimaging in Dementia with Lewy Bodies

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Researchers in neuroimaging and practitioners who manage patients with dementia may be surprised to learn that imaging of the heart can help distinguish Lewy body disorders from other causes of neurodegeneration. Over the past dozen years, a remarkably consistent neuroimaging literature has emerged indicating that cardiac noradrenergic denervation characterizes Parkinson disease (PD), pure autonomic failure, and dementia with Lewy bodies (DLB), in contrast with usually normal findings in multiple system atrophy, which can resemble PD clinically, and Alzheimer's disease, the most common cause of dementia in the elderly. Post-mortem neuropathologic studies have generally confirmed these distinctions [1].

The recent introduction of the Pittsburgh compound B (PiB) compound for amyloid imaging is seen as a major advance in the area of Alzheimer's disease [2]. As summarized in the meta-analysis by Treglia and Cason [3], the literature about ¹²³I-metaiodobenzylguanidine (¹²³I-MIBG) scintigraphy in DLB supports the view that imaging of sympathetic innervation of the heart may provide a sensitive, specific means to diagnose DLB differentially from other forms of dementia, by detecting catecholaminergic denervation associated with intraneuronal deposition of alpha-synuclein.

Cardiac sympathetic neuroimaging by ¹²³I-MIBG scanning has been used extensively in Japan, to a lesser extent in Europe, and hardly at all in the United States. The dearth of American studies seems to be the result of a vicious cycle involving lack of insurance coverage because of lack of clinical trials because of lack of availability because of lack of insurance coverage. ¹²³I-MIBG scanning is available at many centers in the US, but for diagnostic evaluation of pheochromocytoma, since third party payers generally cover this application. Recognition that cardiac sympathetic neuroimaging can be a valuable part of testing of patients with suspected Lewy body disorders may help break this cycle.

Loss of cardiac sympathetic innervation progresses over years in patients with PD [4], and cardiac sympathetic denervation can precede the onset of the movement disorder [5]; however, in PD the severity of striatal dopaminergic denervation in individual patients is independent of the severity of cardiac noradrenergic denervation [6]. It remains to be seen

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whether cardiac sympathetic denervation can identify early DLB. This is an important issue for future research. Considering that there seems to be an association between retrograde, centripetal alpha-synucleinopathy and cardiac sympathetic denervation in Lewy body diseases [7], future studies should focus especially on relationships between alpha-synuclein deposition and possible “dying back” of catecholaminergic neurons in DLB.

The literature seems sufficiently robust to justify cardiac sympathetic neuroimaging having a Current Procedural Terminology (CPT) code for identifying Lewy body disorders in selected patients with clinical evidence of central neurodegeneration. Obtaining a CPT code enables billing for procedures, but the decision about third party payment is up to the payer. The most appropriate CPT coding category seems to be Category III, which is for emerging technology. Successful application for Category I CPT coding for cardiac sympathetic neuroimaging as a diagnostic test will depend on accumulation of sufficient experience with the procedure at multiple academic medical centers in the US to support FDA approval. Such approval will probably require demonstration projects supported by industry. It is hoped that the present meta analysis may motivate manufacturers of ^{123}I -MIBG to support this avenue or research. In particular, the finding of loss of cardiac noradrenergic innervation as assessed by sympathetic neuroimaging may identify Lewy body diseases such as PD and DLB in a pre-symptomatic phase, when neuroprotective or neurorescue treatments would be expected to be most effective.

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Abbreviations

DLB	dementia with Lewy bodies
MIBG	metaiodobenzylguanidine
PD	Parkinson disease

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