Dopamine Integrity Imaging of Parkinson's disease and Rem Sleep Behavior Disorder

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Background: Dopamine Integrity Imaging (DII) with a Dual PET tracer protocol is used for evaluating the integrity of the cerebral dopamine system in the basal ganglia.
PE2I PET is a marker for degeneration of dopamine function when diagnosing PD, but PE2I is not specific in the early Pre-PD RBD patients. PE2I examines the amount of active presynaptic Dopamine reuptake complexes (DAT). Dopaminergic neurons are lost in PD classically starting in the posterior part of the basal ganglia, and at the late stage also in the nucleus caudatus. in early PD DAT is actively downregulated to increase dopamine activity in the surviving synapses.
F-DOPA is another marker for dopamine activity reflecting the activity of the enzyme DOPA-decarboxylase (responsible for the formation of dopamine) and the storage capacity of dopamine in the presynaptic neuron. It is known that the amount of active DOPA-decarboxylase in early PD is actively upregulated to increase dopamine activity in the surviving synapses[1]. This hides the loss of neuronal integrity in early PD.
Methods: In this study we combine PE2I and F-DOPA PET to not only asses the loss of neurons in RBD but also to asses the span between the increased F-DOPA signal and the decreased PE2I signal. We can therefore asses the neuronal integrity of the dopamine system in the basal ganglia. A total of 45 patients were examined, 15 had early PD (Clinical confirmed PD and PD on isolated PE2I), 30 had iRBD (No clinical PD, No PD on isolated PE2I, confirmed RBD by PSG). We have named this Dopamine Integrity Imaging (DII). In DII we can subtract PE2I images from F-DOPA images, by this the compensatory actions stand out.
Results: We found our expected compensatory increase in F-DOPA signal in RBD and early PD. This correlated to loss of PE2I signal op to a point. After the development of clinical PD, the compensation diminishes. DII may be a useful protocol for examining early neurodegeneration before changes can be seen on isolated PE2I or other imaging techniques.
Conclusions: DII is a strong candidate as a marker for disease progression and may be useful in the testing of neuroprotective medication.