IS IMAGING OVER-USED IN DIAGNOSING MOVEMENT DISORDERS? YES

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Single Photon Emission Tomography (SPECT) with radioligands binding selectively to striatal dopamine nerve terminals allows an objective and reproducible measurement of the status of nigrostriatal dopaminergic system. Available pre-synaptic ligands for SPECT bind selectively to the dopamine transporter (DAT) making this a target for diseases affecting the nigrostriatal pathway. All successful DAT imaging agents belong to a group of tropane derivatives, which share a similar backbone structure of cocaine. The first successful DAT imaging agent for SPECT was [^{123}I]β-CIT and results reported in the early 1990s suggested a strong correlation between the putaminal abnormalities and PD symptoms. Over time several other tracers have been developed for this purpose and in recent years [^{123}I]FP-CIT was first registered in Europe and later also in the USA for early diagnosis of parkinsonism and in the differential diagnosis with essential tremor. Studies indicate that [^{123}I]FP-CIT/SPECT is cost-effective in the differential diagnosis between essential tremor and PD with a specificity of 95% and a sensitivity of 80%.

DAT-Spect cannot differentiate PD from atypical parkinsonian disorders (APDs) (e.g. multiple system atrophy, MSA or progressive supranuclear palsy, PSP) considering that these disorders all share similar degree of degeneration of nigral dopamine neurons. However, reduced midbrain [^{123}I]β-CIT uptake was found in patients with multiple system atrophy (Parkinson variant: MSA-P) and allowed a correct classification of 95% patients with MSA-P or PD. It is also helpful in the assessment of psychiatric patients developing parkinsonism during neuroleptic therapy as it can separate those purely drug induced (normal uptake) from other with underlying dopamine neuron degeneration.

SPECT imaging of dopamine D2 receptors has no clinical value in confirming the diagnosis of PD. The main clinical application for post-synaptic SPECT imaging is the differential diagnosis of PD from APS but [^{123}I]IBZM SPECT cannot discriminate among different APS.

Interest has recently developed also on the use of metaiodobenzylguanidine (MIBG), an analogue of noradrenaline. MIBG can be labelled with ^{131}I ([^{123}I]MIBG). MIBG is actively taken up across the membrane of adrenergic cells by the sodium-dependent and energy-dependent human norepinephrine transporter and is secreted after stimulation of the neurons with acetylcholine. Thus, [^{123}I]MIBG acts as a tracer not only for the localization but also for the functional integrity of the catecholaminergic structures.

APDs and vascular parkinsonism show normal or only mild reduction of cardiac [^{123}I]MIBG uptake as opposed to PD where uptake is significantly reduced or absent. The main drawback of [^{123}I]MIBG/SPECT is a low specificity (37.4%) while its sensitivity is relatively high (87.7%). One study directly compared [^{123}I]MIBG and [^{123}I]FP-CIT in PD subjects (Hoehn and Yahr stage 1) showing higher sensitivity for [^{123}I]FP-CIT (83% vs 72%).

In conclusion imaging is helpful in supporting clinical diagnosis of degenerative parkinsonism. More specifically Datscan is indicated in presence of significant diagnostic uncertainty and particularly in patients presenting atypical tremor manifestation.