Assessment of Disease Severity in Patients with Parkinson's Disease Using [123I]ß-CIT SPECT

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[123I]ß-CIT [2ß-carbomethoxy-3ß-(4-iodophenyl)tropane] labels dopamine transporter located presynaptically on dopaminergic nerve terminals and is, therefore, a marker of neurons which degenerate in Parkinson's disease (PD). The aim of the present study was to evaluate the correlation between SPECT measures of [123I]ß-CIT binding and motor symptoms in patients with PD and to validate the use of simplified ratio method for the assessment of [123I]ß-CIT binding by comparing with a more complete tracer kinetic approach.

Sixty-two patients with PD underwent either 15 serial SPECT scans over a 24 hr period or 2 scans at 12 hr and 24 hr following i.v. injection of 185-370 MBq [123I]ß-CIT. [123I]ß-CIT binding in the striatum was estimated using two quantitative procedures: radioactivity ratio of striatum to cerebellum-1 (specific binding ratio: SBR) and k_3/k_4 (forward/ dissociation rate) ratio (binding potential: BP) as measured by kinetic modeling.

The striatal SBR at 24 hr p.i., the peak SBR, which occurred either 12 hr or 24 hr p.i., and the BP were significantly correlated with disease duration ($r=-0.42$, $p<0.05$; $r=-0.43$, $p<0.05$; $r=-0.57$, $p<0.05$, respectively), Hoehn-Yahr stage ($r=-0.46$, $p<0.05$; $r=-0.50$, $p<0.05$; $r=-0.45$, $p<0.05$), total score of UPDRS ($r=-0.53$, $p<0.01$; $r=-0.55$, $p<0.01$; $r=-0.70$, $p<0.01$), motor score of UPDRS ($r=-0.50$, $p<0.05$; $r=-0.51$, $p<0.05$; $r=-0.68$, $p<0.01$), and activities of daily living score of UPDRS ($r=-0.48$, $p<0.05$; $r=-0.53$, $p<0.01$; $r=-0.60$, $p<0.05$). There was an excellent correlation between the peak striatal SBR and the BP ($r=0.98$, $p<0.0001$). Correlation between the SBR at 24 hr p.i. and the BP was also shown to be excellent ($r=0.97$, $p<0.0001$).

The results suggest that [123I]ß-CIT may be a useful marker of disease severity in PD. The simplified tissue ratio obtained at 24 hr p.i. may be feasible for the assessment of [123I]ß-CIT binding, avoiding repeated scanning and complicated modeling procedures. [123I]ß-CIT SPECT may be clinically useful for the early diagnosis and serial monitoring of PD.