The Impact of Ageing on Dopamine Transporter Imaging

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Objectives: The nigrostriatal and dopaminergic system is one of the most age-sensitive neurotransmitters. Given the more widespread use of DaT-SPECT outside controlled clinical trials, we aimed to explore the age-induced loss of dopamine transporter binding in normal subjects on a larger scale.

Material and Methods: In a mono-centric setting, 382 patients with clinically uncertain parkinsonian syndrome underwent DaT-SPECT after IV administration of 3-5 mCi ^{123}I-Ioflupane. Two experienced nuclear medicine physicians, blinded to the clinical status and diagnosis, performed a visual evaluation of all scans independently. Binary reporting was performed by qualitative analysis of tracer uptake and morphology within the putamen and caudate in each hemisphere. For exploration of age-dependent loss of DaT binding, only patients with normal results by both observers and the findings of a fully automatic semiquantitative evaluation method (Xeleris, 4.0, GE Healthcare) were analyzed. Pearson correlation and linear regression analysis were performed to explore the effect of age on ^{123}I-Ioflupane binding ratio.

Results: Of the 382 investigated subjects, 133 patients (34.8%, 66 females, median age, 63y, range, 41y-80y) were rated normal by both observers (distribution over decades: {41-50y: n=18}; {51-60y: n=30}; {61-70y: n=49}; {71-80y: n=36}). Pearson correlation showed a significant inverse correlation between age and ^{123}I-ioflupane binding ratio in the striatum (correlation coefficient -0.38; p<0.001), putamen (correlation coefficient -0.39; P<0.001) and caudate (correlation coefficient -0.3; P<0.001). Linear regression of all investigated subjects demonstrated an average decrease of 0.19 per decade in the striatal binding ratio, within the age group of 41-80 years (6.6% loss {95% CI= 3.7- 9.5%}, per decade).

Conclusions: Investigating a potential age-induced loss of dopamine transporter binding on a larger scale, a 6.6% decrease per decade of life in striatal dopamine transporter binding was recorded. Further studies targeting towards functional consequences of age-induced dopamine transporter binding loss might pave for the way for a deeper understanding in motor impairment in the eldery population.
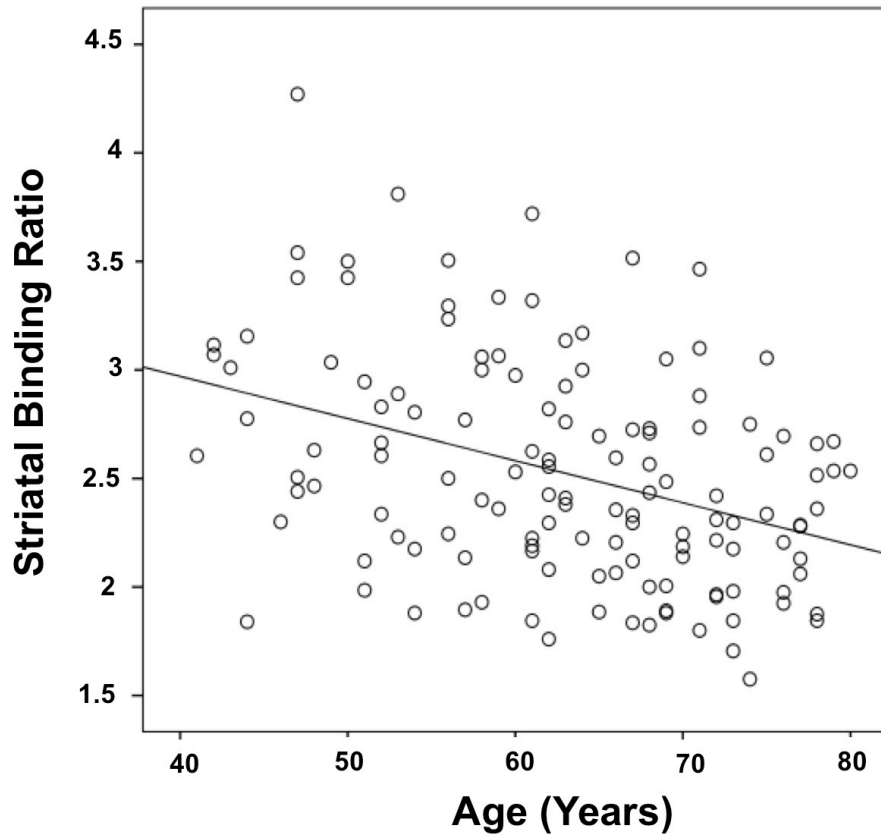
Correlation between striatal binding ratio and age (in years) in 133 subjects rated normal by two observers (correlation coefficient -0.38; P<0.001). An average decrease of 6.6% per decade in the striatal binding ratio was recorded.