Virtual MRI-derived SPECT for the visual analysis of the early stage of Parkinson’s disease

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Diagnosis in early phases of the disease difficult but crucial

Activity values (average and SD) from coregistered SPECT to obtain the same colour scale of real SPECT

Voxel size reduction from MRI to SPECT

Convolution with SPECT measured spatial resolution (x,y,z → 0.9 mm x 0.9 mm, 0.8 mm)

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Tracer of DAT: \(^{123}\)I-Ioflupane (\(^{123}\)I-FP-CIT)

Dopamine transporter (DAT) imaging (SPECT) is a sensitive early diagnostic tool for PD. The absence of radiotracer uptake in basal ganglia (putamen and caudate) has been established as a characteristic sign of PD.

Not easy to see the difference between normal and abnormal uptake values because of:

- low spatial resolution of the gamma camera and partial-volume effects (PVE)
- person to person differences in basal ganglia morphology, both in shape and dimension (\(\sigma_{\text{VOLUME}} / \text{VOLUME} \approx 20\%\))

Pathological Normal

Observation by DaTSCAN

First clinical symptoms

Dyskinesia

Coregistration (mutual information algorithm)

Deferred SPECT image

- Double-headed gamma camera
  - 80 projections, 30 sec/projection,
  - \(320 \times 128\)
- Voxel Size 2.947,2.947, 2.947 mm\(^3\)
- Reconstruction method: FBP
- Chang attenuation correction

Proton density weighted MRI

- SENSE sequence,
- \(T_E \ 4.1\) ms, \(T_R \ 25\) ms,
- Voxel size 0.898x0.898x1.5 mm\(^3\)

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