Supplementary Material

Validation of population-based average dentatorubrothalamic tracts

We compared the position of the slice-wise center of gravity (COG) of the average dentatorubrothalamic tracts (av-DRTT) to the slice-wise COG of individual DRTTs (ET-DRTT) in nine ET patients to validate the use of population-based, av-DRTTs in ET patients. These ET patients were not part of the study cohort and had received MRI and diffusion imaging in our center prior to deep brain stimulation surgery.

Image acquisition

MRI data were acquired on a 3-Tesla Philips Ingenia® Scanner (Philips, Amsterdam, The Netherlands) (T1-sequence: TR: 9.8 ms, TE: 4.9 ms, acquisition time: 6:13 min, voxel-size: 0.49 X 0.49 X 1.00 mm^3). For diffusion imaging a single shot 2D, spin-echo, echo-planar imaging pulse sequence was applied (TR: 8213 ms, TE: 103 ms, 40 gradient directions, b-value: 1000s/mm^2, acquisition time: 9:53 min, voxel-size: 2.0 X 2.0 X 2.0 mm^3).

Probabilistic fiber tracking

For further DTI data analysis we used the FMRIB software library (FSL) (FMRIB, Oxford, UK). As in the HCP dataset, diffusion data were corrected for susceptibility induced distortions using the topup-tool and corrected for head motion and eddy current distortion using the eddy-tool. Brain extraction of the b0-image was done using the BET-tool and distributions of diffusion vectors were estimated for each voxel using BEDPOSTX. The number of fibers per voxel was set to two. Probabilistic fiber tracking was performed separately for each DRTT with PROBTRACKX2 using modified Euler integration. For all other parameters the respective default settings were used. The same standard seed regions and waypoints, transformed from standard to diffusion space, were used as described in the study. The resulting fiber tracts were visually examined for anatomical accuracy, leading to 15 ET-DRTTs included for further analysis. Each individual track frequency map was transformed into a track probability map and transformed back to MNI space, as described in the main study.

Comparison of av-DRTTs and ET-DRTTs

Creation of the av-DRTTs and calculation of the COG for each transversal slice is described in the study. The position of the COGs of the av-DRTTs and the COGs of the ET-DRTTS was compared slice-wise in MNI space in the anatomical relevant region. This region was defined by the z-coordinate of the most ventral PSA contact (-8.6 mm in MNI space) and the z-coordinate of the most dorsal VIM contact (+2.4 mm). The mean Euclidean distance between the COG of the av-DRTT and the COGs of the respective ET-DRTTs was 2.41mm (±1.13mm). Additionally, the COG of the av-DRTT on average was 1.06mm (±1.06mm) more medial and 1.41mm (±1.69mm) more anterior than the COGs of the ET-DRTTs. Since those deviations are below the resolution of the diffusion imaging we conclude that our population-based average DRTT is a reasonable assumption in patients without individual diffusion imaging.