SUPPLEMENTARY MATERIAL

Reconstruction of Quantitative Susceptibility Mapping and Susceptibility Map-Weighted Imaging

The k-space data of the multiecho data image combination images were transferred to a personal computer. For quantitative susceptibility mapping (QSM) reconstruction, the STI Suite software package[1,2] was used with error tolerances of 0.01 and a threshold for a binary mask of the ill-conditioned k-space region of 0.1. The mask for the STI suite was automatically determined using an active contour algorithm.[3] Susceptibility map-weighted imaging (SMWI),[4] which is a recently proposed susceptibility contrast enhancing method that multiplies a QSM-generated mask with a magnitude (or root sum of squares of multi-echo magnitude) image, was reconstructed using the QSM and magnitude images. This approach has demonstrated to provide an improved contrast to noise ratio of the nigrosome-1. More detailed data processing and reconstruction parameters can be found elsewhere.[4] SMWI was used for visual assessment of the substantia nigra (SN).

The reconstructed QSM images were transferred to a multimodality solution (Syngo.via version VA30, Siemens Healthcare, Forchheim, Germany) for reslicing of the images at an increment of 0.5 mm. As not all of the QSM images were symmetric due to the participant's head shape and/or position, they were repositioned to be as symmetric as possible at the level of the lower border of the red nucleus. This procedure was done to help investigators draw the regions of interest (ROIs) by comparing each side, particularly in healthy subjects.

For normalization of the QSM susceptibility values, an oval ROI greater than 10 mm^2 was placed in the region of the decussation of the superior cerebellar peduncle on each resliced QSM images. This region is presumed to be located in the center of the midbrain at the level of inferior tip of the SN, which was determined by comparison with sagittal magnetization-prepared rapid gradient-echo imaging (Supplementary Fig. 2 in the online-only Data Supplement). We chose this region because it was close to the SN and is less affected by magnetic susceptibility anisotropy due to its horizontal direction.[5] Normalization was achieved by subtracting the mean susceptibility values measured in the decussation of the superior cerebellar peduncle.

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