Diffusion imaging of nigral alterations in early Parkinson's disease with dopaminergic deficits

Region of Interest Drawing

I-Wei Wu, BS[1, 2] and Norbert Schuff, PhD[1, 2]

[1] Center for Imaging of Neurodegenerative Diseases, San Francisco VA Medical Center, San Francisco, CA USA
[2] Department of Radiology and Biomedical Imaging, University of California, San Francisco, CA USA

Summary

Region of Interest (ROI) drawing was used as a technique in a study[1] reporting the baseline characteristics of diffusion tensor imaging data in Parkinson's disease (PD) patients and healthy control subjects from the Parkinson's Progression Markers Initiative. The main goals were to replicate previous findings of abnormal diffusion imaging values from the substantia nigra in a large multicenter cohort and determine whether nigral diffusion alterations are associated with dopamine deficits.

Method

Six regions of interest (ROIs), each around roughly 30 mm^3 in size, were manually drawn within the left and right SN by one experienced reader (I.W.), following closely the procedures outlined by Vaillancourt et al. [2] and further using simultaneously anatomical and tensor-valued images for guidance. Further details are described in the Supporting Information as well as in Schuff et al.[1]
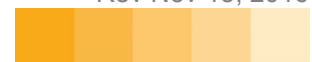
The single reader was kept blinded to subject-specific clinical information by a double layer of subject coding that also permitted evaluating consistency of readings over time. Reproducibility of the readings was initially established by marking the images from 15 subjects twice and evaluating variability of FA measurements, yielding a correlation coefficient of 0.85. The reading consistency over time was also monitored by having the reader unknowingly mark some datasets twice in regular intervals.

Two additional ROIs were drawn in the left and right cerebral peduncle for reference measures. The placement of the ROIs in the SN, covering the caudal, middle, and rostral aspects of the structure, as well as the placement of the two reference ROIs, is illustrated in Figure S2.

Measurement reproducibility of DTI was initially established by marking the images from 15 subjects twice and evaluating variability of FA measurements, yielding a correlation coefficient of 0.85. The measurement consistency over time was also monitored by having the reader unknowingly mark some datasets twice in regular intervals, e.g. about once every month. The consistency over time yielded a correlation coefficient of 0.74.
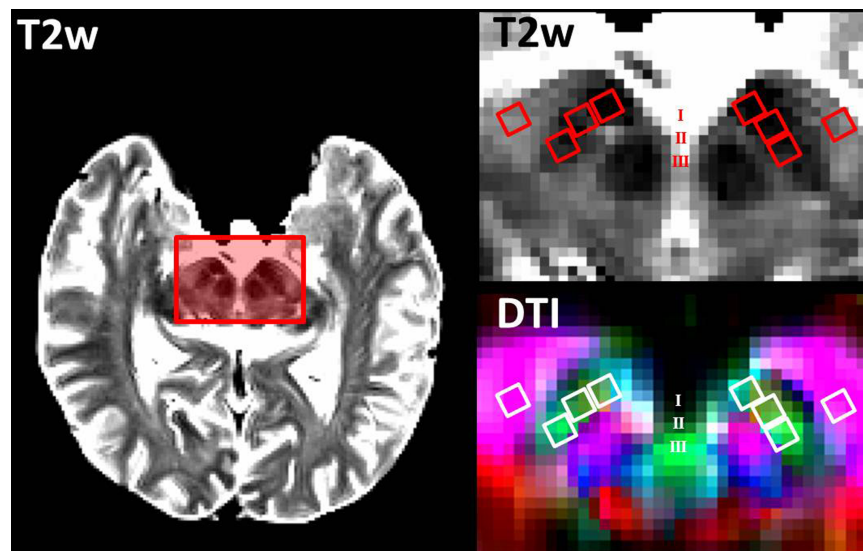
Figure S2: Region-of-interest (ROI) selection. The positions of the six ROIs within the left and right substantia nigra and the two reference region in the cerebral peduncle are indicate in the zoomed anatomical T2w map and the DTI directional map on the left. The ROI positions in the substantia nigra are I=rostral, II=middle, III=caudal.

References

1. Schuff, N., Wu, I.-W., Buckley, S., Foster, E. D., Coffey, C. S., Gitelman, D. R., Mendick, S., Seibyl, J., Simuni, T., Zhang, Y., Jankovic, J., Hunter, C., Tanner, C. M., Rees, L., Factor, S., Berg, D., Wurster, I., Gauss, K., Sprenger, F., Seppi, K., Poewe, W., Mollenhauer, B., Knake, S., Mari, Z., McCoy, A., Ranola, M. and Marek, K. (2015), Diffusion imaging of nigral alterations in early Parkinson's disease with dopaminergic deficits. Mov Disord., 30: 1885–1892. doi:10.1002/mds.26325
2. Vaillancourt DE, Spraker MB, Prodoehl J, *et al.* High-resolution diffusion tensor imaging in the substantia nigra of de novo Parkinson disease. Neurology 2009;72:1378-1384.
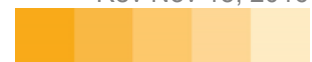
About the Authors

This document was prepared by I-Wei Wu, BS; Center for Imaging of Neurodegenerative Diseases, San Francisco VA Medical Center and the Department of Radiology and Biomedical Imaging, University of California, San Francisco.

For more information please contact Dr. Duygu Tosun-Turgut by email at Duygu.Tosun@ucsf.edu.

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