THALAMIC PROJECTION FIBER INTEGRITY IN DE NOVO PARKINSON’S DISEASE

P.J. Planetta¹, E.T. Schulze², E.K. Geary², J.G. Goldman³, D.M. Corcos³-⁶, D.M. Little⁷, D.E. Vaillancourt¹, 9, 10

¹Department of Applied Physiology and Kinesiology, University of Florida, Gainesville, FL, USA
²Department of Neurology and Rehabilitation, University of Illinois at Chicago, Chicago, IL, USA
³Department of Neurological Sciences, Rush University Medical Center, Chicago, IL, USA
⁴Department of Kinesiology and Nutrition, University of Illinois at Chicago, Chicago, IL, USA
⁵Department of Physical Therapy, University of Illinois at Chicago, Chicago, IL, USA
⁶Department of Bioengineering, University of Illinois at Chicago, IL, USA
⁷VISN 17 Center of Excellence for Research on Returning War Veterans, Waco, TX, USA
⁸Department of Psychiatry, Texas A&M Health Sciences and Scott & White Healthcare, Temple, TX, USA
⁹Department of Neurology, University of Florida, Gainesville, FL, USA
¹⁰Department of Biomedical Engineering, University of Florida, Gainesville, FL, USA

email: planetta@ufl.edu, web: lrlab.org

INTRODUCTION

The goal of this study was to examine the microstructural integrity of six thalamic regions in de novo Parkinson’s disease (PD) patients relative to healthy controls using diffusion tensor imaging (DTI). Post-mortem studies of advanced PD have revealed disease-related inclusion pathology in specific thalamic nuclei [1,2]. However, most studies utilizing DTI to investigate the thalamus in vivo have focused on the thalamus as a single entity, and have not evaluated the integrity of specific nuclei or the critical cortical-subcortical fibers that project from the thalamus [3-5]. Further, these studies examined relatively advanced PD patients who had been taking antiparkinsonian medication, thus making it unclear whether differences between the patients and controls were caused by the disease, medication, or a combination of both.

METHODS

Forty subjects (20 with early-stage, untreated PD and 20 age- and sex-matched controls) were studied with a high-resolution DTI protocol at 3 Tesla to investigate the integrity of thalamic nuclei projection fibers. Two blinded, independent raters placed seed voxels in six thalamic regions: anterior nucleus (AN), ventral anterior nucleus (VA), ventral lateral nucleus (VL), dorsomedial nucleus (DM), ventral posterior lateral nucleus (VPL)/ventral posterior medial nucleus (VPM), and pulvinar (PU). Fractional anisotropy (FA) values were then calculated from the fibers projecting from the seed voxels in each thalamic region.

RESULTS AND DISCUSSION

As shown in Figure 1, FA values were reduced significantly in PD patients compared to controls in the fibers projecting from the thalamic regions AN, VA, and DM, but not the VPL/VPM and PU. There was also a marginally significant reduction in FA values from the VL projections of the PD patients. These findings were consistent across both raters.

![Figure 1: Mean (± SEM) FA values from each of the six thalamic regions for the control and PD groups. Asterisks (*) identify a significant mean difference at an alpha level of .05.](image-url)
CONCLUSIONS

The present study provides preliminary in vivo evidence of thalamic projection fiber degeneration in de novo PD and sheds light on the extent of disrupted thalamic circuitry as a result of the disease itself. Specifically, we showed that nuclei involved in motor (VA and VL) and cognitive and affective (AN and DM) processes were disrupted, whereas those involved in sensory processes (VPL/VPM and PU) were relatively spared.

REFERENCES


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