

## Visual system involvement in patients with newly diagnosed Parkinson's disease

*Changes in the visual system as detected by MRI may be an early indicator of Parkinson's disease. This article summarizes a recently published paper [1] showing that visual system alterations can be detected in the early stages of Parkinson's disease and that the entire intracranial visual system can be involved.*

Changes in the visual systems of newly diagnosed Parkinson's disease patients may provide important biomarkers for the early detection and monitoring of the disease, according to a recently published article [1].

Parkinson's disease is the neurodegenerative condition caused by neuronal loss in several brain structures. The disease is characterized by tremors, rigidity or stiffness throughout the body, and impaired balance and coordination.

*"Although Parkinson's disease is primarily considered a motor disorder, several studies have shown that non-motor symptoms are common across all stages of the disease,"* said lead researcher Alessandro Arrigo, M.D., a resident in ophthalmology at the University Vita-Salute San Raffaele of Milan, Italy. *"However, these symptoms are often undiagnosed because patients are unaware of the link to the disease and, as a result, they may be under-treated."*

Non-motor symptoms experienced by patients with Parkinson's disease include visual alterations such as an inability to perceive colors, a change in visual acuity, and a decrease in blinking which can lead to dry eye.

*"These non-motor Parkinson's symptoms may precede the appearance of motor signs by more than a decade,"* Dr. Arrigo said.

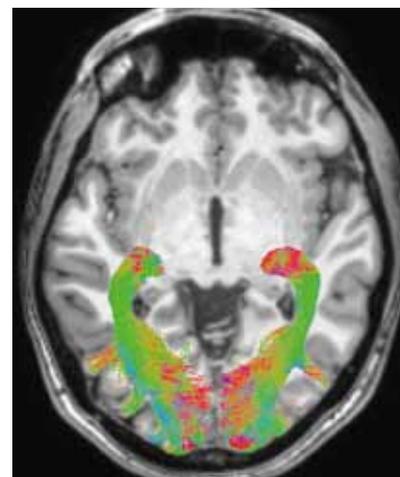
To assess intracranial visual system changes of newly diagnosed Parkinson disease in drug-naïve patients, the

Italian team of researchers carried out a study on 20 newly diagnosed and not yet treated patients (11 men, 9 women) with Parkinson's disease and 20 age- and gender-matched healthy controls. The study involved a multi-disciplinary team of researchers in ophthalmology, neurology and neuroradiology of the University of Messina, Italy. MRI was performed on both the healthy controls and the patients, who underwent imaging within four weeks of their diagnosis. The researchers used diffusion weighted imaging MRI to assess white matter changes and voxel-based morphometry (VBM) to investigate concentration changes of the brain's gray and white matter. All study participants also had ophthalmologic examinations.

### RESULTS

In the patients with Parkinson's disease, significant alterations were found in optic radiation connectivity distribution, with decreased lateral geniculate nucleus V2 density ( $F$  -8.28;  $P < .05$ ), a significant increase in optic radiation mean diffusivity ( $F$  7.5;  $P = .014$ ), and a significant reduction in white matter concentration. VBM analysis also showed a significant reduction in visual cortical volumes ( $P < .05$ ). Moreover, the chiasmatic area and volume were significantly reduced ( $P < .05$ ).

Thus, to summarize, the researchers found significant abnormalities within the visual system brain structures of Parkinson's disease patients, including alterations of optic radiations, a



**Figure 1.** Left and right optic radiation (OR) image in a representative subject overlaid onto a T1-weighted axial volume image of the same subject. OR images were obtained on the basis of diffusion-weighted volume images by means of constrained spherical deconvolution fitting and related tractography. Each bundle was automatically colored according to tract main directionality: red for left to right, green for anterior to posterior, and blue for inferior to superior

reduction of white matter concentration and a reduction of optic chiasm volume. The optic chiasm is the part of the brain where the left and right optic nerves intersect.

*"The study in depth of visual symptoms may provide sensitive markers of Parkinson's disease,"* Dr. Arrigo said. *"Visual processing metrics may prove helpful in differentiating Parkinsonism disorders, following disease progression, and monitoring patient response to drug treatment."* Dr. Arrigo added that future studies are needed to better understand the timing of degeneration along visual pathways, as well as the specific changes.

*"We're excited by our findings,"* he said. *"However, this is just a starting point."*

### REFERENCES

1. Arrigo A, Calamuneri A, Milardi D, Mormina E, Rania L, Postorino E, Marino S, Di Lorenzo G, Anastas GP, Ghilardi MF, Aragona P, Quartarone A, Gaeta M. Visual System Involvement in Patients with Newly Diagnosed Parkinson Disease. *Radiology*. 2017; 285(3): 885-895.