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Retinal structural and vascular changes as biomarker in Parkinson's disease

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Introduction: Parkinson's disease (PD) is a common neurodegenerative disorder characterized by bradykinesia, resting tremor, and muscle rigidity. Visual disturbances have been described among non-motor features.

Objective: We aimed to investigate the structural and vascular changes in retinal and choroidal vascular networks, and to evaluate any relationship with motor and non-motor symptoms (NMS) in patients affected with PD.

Methods: A total of 48 eyes from 24 PD patients and 50 eyes from 25 controls (Ctrl) were assessed. Ganglion cell complex (GCC), retinal nerve fiber layer (RNFL) and subfoveal choroidal thickness (SFCT) were examined using Spectral Domain-Optical Coherence Tomography (SD-OCT). The vessel density (VD) of retinal and choriocapillary (CC) vascular networks in macular area and the foveal avascular zone (FAZ) area were evaluated by OCT Angiography (OCTA). All patients underwent clinical evaluation using motor section of Unified PD Rating Scale (UPDRS-III) and Hoehn and Yahr (HY) scale.

Results: At SD-OCT, GCC and RNFL were significantly thinner in patients compared to Ctrl. At OCTA exam, PD subjects showed lower values in VD of superficial capillary plexus (SCP) and radial peripapillary capillary plexus in comparison to Ctrl, whereas FAZ area resulted significantly increased in patients. We found a negative correlation between the age at onset and VD of SCP, and between HY score and RNLF thickness and FAZ area. UPDRS-III score was negatively correlated with VD of deep capillary plexus (DCP). Interestingly, we observed a negative relationship between SCOPA-AUT questionnaire score and VD of DCP, between Hamilton-Anxiety score and RNFL thickness, and between Epworth Sleepiness Scale score and FAZ area. Parkinson Fatigue Scale-16 score was negatively related to VD of SCP and DCP, and RNFL thickness.

Conclusions: The impairment of retinal structure and microvascularization suggests the role of the SD-OCT and OCTA measurements as potential valid biomarkers for disease severity and progression in PD.