OSV-62

Retinal Microvascular Biomarkers on Optical Coherence Tomography Angiography as Indicators of Subclinical Emotional Distress in Young Adults: A Cross-Sectional Study

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This cross-sectional study explored whether retinal microvascular parameters measured by optical coherence tomography angiography (OCTA) can serve as early, non-invasive biomarkers of emotional distress in psychiatrically undiagnosed young adults. Sixty-six participants (18–35 years) reporting stress, anxiety, or poor sleep underwent standardized assessment using DASS-21 and PSQI, followed by high-resolution macular OCTA (3×3 mm). Superficial and deep capillary plexus vessel density, foveal avascular zone (FAZ) area, and perfusion symmetry were quantified. Biometric parameters (axial length, central corneal thickness, anterior chamber depth) were measured with IOLMaster 700 to control for ocular confounders. Statistical analysis (SPSS v26) showed a significant inverse correlation between deep capillary plexus vessel density and DASS-21 stress scores ($r = -0.53$, $p < 0.01$) and between perfusion density and PSQI scores ($r = -0.47$, $p < 0.05$). Participants with moderate-to-severe emotional distress demonstrated significantly larger FAZ areas ($p = 0.003$). Based on these findings, we developed the novel Emotional Retina Index (ERI), which showed strong discriminative ability (AUC = 0.87; 87% sensitivity, 82% specificity) in identifying high-risk individuals. Our results suggest that the retina may serve as a dynamic, non-invasive biomarker of psychological well-being, paving the way for integrative psych-ophthalmology screening strategies.

Keywords: Emotional Retina Index, OCTA, Psych-Ophthalmology, Retinal Biomarkers, Subclinical Emotional Distress

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