Association of Cognitive Function With Amyloid-β and Tau Proteins in the Vitreous Humor

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OBJECTIVE To evaluate levels of amyloid beta (Aβ) and tau protein in human vitreous humor and investigate the clinical predictive role of these proteins as early diagnostic markers of Alzheimer's disease (AD).

PURPOSE The purpose of this study was to evaluate levels of beta amyloid-β (Aβ40, Aβ42), phosphorylated tau (pTau), and total tau (tTau) in human vitreous humor and investigate the clinical predictive role of these proteins as early diagnostic markers of Alzheimer's Disease (AD).

METHODS A prospective, single-center, multi-surgeon cohort study. Vitreous humor samples from 80 eyes of 80 individuals were measured quantitatively for known biomarkers of AD: Aβ40, Aβ42, pTau, and tTau. Serum apolipoprotein E (APOE) allelic determination and Mini Mental State Exam (MMSE) was performed on all individuals. Linear regression was used to test associations between MMSE score, APOE genotype, and AD biomarker levels with adjustment for age, sex, and education level of patients.

RESULTS Lower MMSE scores were significantly associated with lower levels of vitreous Aβ40 (p=0.015), Aβ42 (p=0.0066), and tTau (p=0.0085), and these biomarkers were not associated with any pre-existing eye conditions. Presence of the ε4 allele and the ε2 allele approached significance with reduced Aβ40 level (p=0.053) and increased p-Tau level (p=0.056), respectively.

CONCLUSION Patients with poor cognitive function have significantly lower vitreous humor levels of AD-related biomarkers Aβ40, Aβ42, and tTau. These biomarkers do not correlate with

underlying eye conditions, suggesting their specificity in association with cognitive change. Results suggest ocular proteins may have a role for early dementia detection in individuals at-risk for AD.

HUMAN RESEARCH Yes: Approved by institutional review board

Optical Coherence Tomography Angiography in Patients With Cystoid Macular Edema Associated With Retinitis Pigmentosa

- Young Hee Yoon, MD, PhD
- Joon Hyung Yeo, Dr.

OBJECTIVE To investigate the microstucture of cystoid macular edema (CME) in retinitis pigmentosa (RP) patients and its association with vascular changes using optical coherence tomography angiography (OCTA).

PURPOSE The underlying pathogenesis of RP-associated CME remains uncertain. The advent of spectral domain (SD) OCT and OCTA enabled a closer observation of microstructural and microvascular changes within individual retinal layers. This study was performed to describe these morphological characteristics of RP-associated CME, for better understanding of disease mechanism.

METHODS This was a retrospective study. Patients with CME associated with RP who underwent both SD-OCT and OCTA were included. Using SD-OCT, spatial distribution and retinal layer where the CME existed were investigated. Optical density ratio (ODR) of the largest cyst to the vitreous humor was also measured. En face OCTA images of the superficial capillary plexus (SCP) and deep capillary plexus (DCP) were obtained for each eye, using AngioVue (Optovue Inc.). Foveal and parafoveal flow density (FFD and PFD) were measured. The SD-OCT images were compared with OCTA findings.

RESULTS Forty-two eyes of 21 RP patients were included (14 females, 66.7%). Mean age was 42 ± 15 years (range, 13-65 years). Among them, CME was present in 32 eyes (76.2%). CME was

located within the inner nuclear layer (INL) in all CME eyes, and was extended to the outer nuclear layer (ONL)/ganglion cell layer (GCL) in 12 eyes (37.5%). Spatial distribution was parafoveal (32 eyes), circumferential (17 eyes), and central macula (15 eyes). ODR was 1.69 ± 0.61, which was lower than that of diabetic macular edema in our previous study. RP eyes had a lower PFD in the SCP and DCP ($P < 0.001$, $P < 0.001$, respectively) than normal control eyes. Compared with RP eyes without CME, RP eyes with CME did not show a significant difference in FFD or PFD in both SCP and DCP. Focal vascular disruption in the DCP was not detected around the CME in OCTA.

CONCLUSION Compared with RP eyes without CME, RP eyes with CME did not show a significant difference in flow density or in extent of focal disruption within individual retinal layers, especially in the DCP. Our findings supports the hypothesis that pathogenesis of RP-associated CME is different from that of retinal vascular CME which was triggered by compromised DCP.

HUMAN RESEARCH Yes: Approved by institutional review board

Is the Choroid Driving the Development of Cystoid Macular Edema in Eyes With Retinitis Pigmentosa?

- David Sarraf, MD
- Claudio Iovino
- Adrian Au
- Michael Gorin, MD, PhD
- Sara Violanti

OBJECTIVE To determine if choroidal thickening is associated with cystoid macular edema (CME) in patients with retinitis pigmentosa (RP).

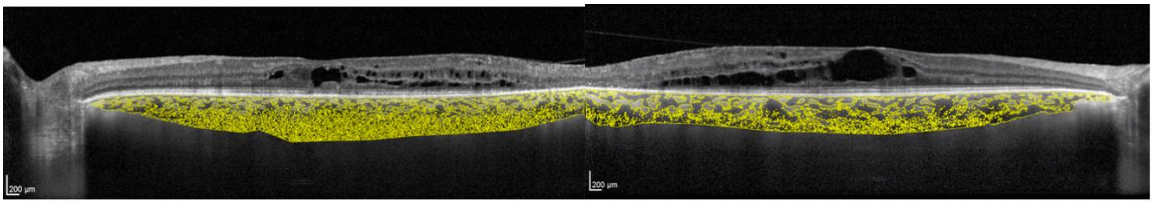
PURPOSE To analyze and investigate the choroidal features associated with the presence of cystoid macular edema (CME) in eyes with retinitis pigmentosa (RP).

METHODS Fifty patients with a diagnosis of RP were divided into two groups based on the presence (43 eyes) or absence (57 eyes) of CME. Data collected and analyzed included best correct visual acuity (BCVA), fundus autofluorescence (FAF), and enhanced depth optical coherence tomography (EDI-OCT). Central macular thickness (CMT) and subfoveal choroidal thickness (CT) were measured by EDI-OCT. The choroidal vascularity index (CVI) was calculated in all study eyes using external software (Image J 1.50) processing of imported images. Total choroidal area (TCA), choroidal lumen area (LA) and stromal choroidal area (SCA) were also quantitated in all study eyes.

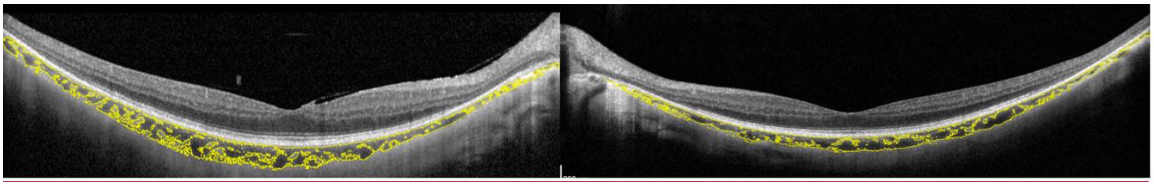
RESULTS The average age was 50.72±14.34 years in the RP group with CME and 46.02±15.46 years in the RP group without CME (p=0.12). LogMAR VA was 0.4±0.6 (Snellen equivalent 20/50) versus 0.3±0.5 (Snellen equivalent 20/40) in the RP group with and without CME, respectively (p=0.11). Mean CMT was 331.0 µm ± 83.3 µm in RP group with CME and 242.4 µm ± 38.0 µm in the RP group without CME ($p < 0.001$). Subfoveal CT was significantly increased in

the RP group with CME versus the RP group without CME (359.9 µm ± 83.4 µm versus 237.0 µm ±93.6 µm, respectively, p <0.001). In RP patients with CME, the CVI was significantly decreased (p <0.001) and the TCA, LA, SCA were all significantly increased (p<0.01).

CONCLUSION In patients with CME associated with RP, the choroid exhibited robust features of choroidal thickening including significantly increased choroidal thickness with EDI-OCT and greater total choroidal area with choroidal vascularity index analysis. The choroid may be a significant causal factor in the development of CME in eyes with RP which may have therapeutic implications.



Choroidal vascularity index analysis in left and right eye of patient with retinitis pigmentosa and cystoid macular edema. Note the increased choroidal thickening and increased total choroidal area.



Choroidal vascularity index analysis in right and left eye of patient with retinitis pigmentosa and and no evidence of cystoid macular edema. Note the decreased choroidal thickening and decreased total choroidal area.

HUMAN RESEARCH Yes: Approved by institutional review board