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Citation: Higgins, B. E., Montesano, G., Balaskas, K., Naskas, T., Kee, F., Chakravarthy, U., Hogg, R. E. & Crabb, D. P. (2020). Structure-Function Model for Intermediate Age-Related Macular Degeneration Microperimetry Data. Investigative Ophthalmology & Visual Science (IOVS), 61(7), ISSN 0146-0404

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Structure-Function Model for Intermediate Age-Related Macular Degeneration Microperimetry Data | IOVS

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ARVO Annual Meeting Abstract | June 2020

Structure-Function Model for Intermediate Age-Related Macular Degeneration Microperimetry Data

Investigative Ophthalmology & Visual Science June 2020, Vol.61, 3241. doi:

Abstract

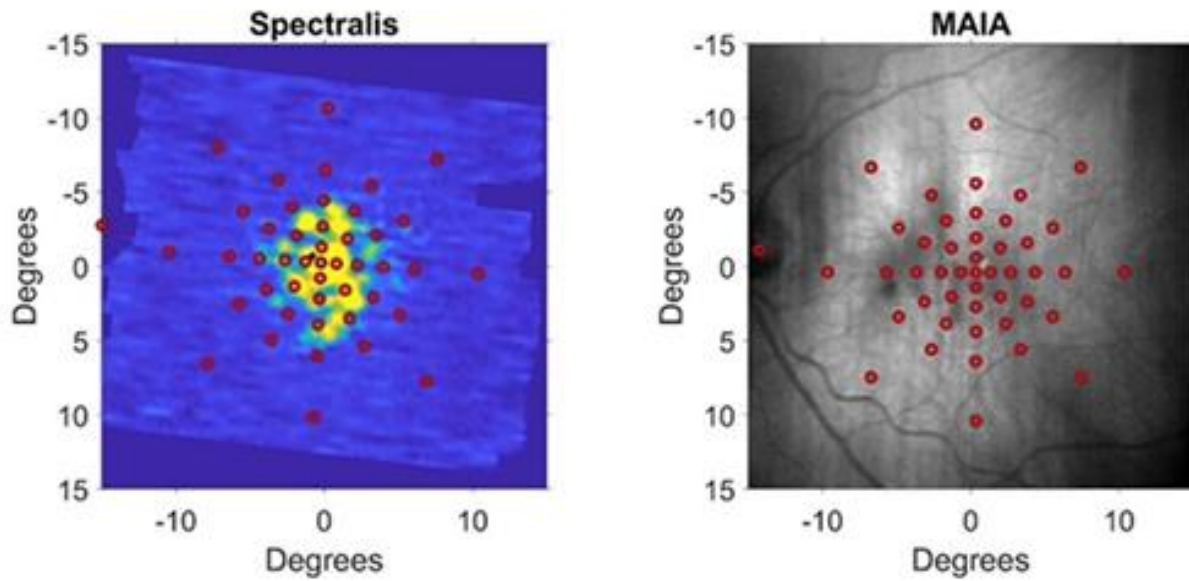
Purpose : Better methods for detecting subtle changes in intermediate age-related macular degeneration (iAMD) are needed for trials of new therapies for the condition. One idea is to improve the precision of measures of visual function from Microperimetry (MP) by using structural information acquired by Optical Coherence Tomography (OCT). We test the hypothesis that structural parameters such as drusen thickness and reflectivity of photoreceptors can be used to model MP sensitivity in people with macular drusen.

Methods : Analysis of mesopic MP (MAIA, CenterVue) and OCT (Spectralis, Heidelberg Engineering) data collected as part of the Northern Ireland Sensory Ageing Study was completed in 83 people with drusen ($>85\ \mu\text{m}$). Retinal Pigment Epithelium (RPE) and Bruch's Membrane were segmented using a semi-automated algorithm. Fundus images from MP and the OCT device were registered to map sensitivity values onto the OCT structural data (Fig 1). Average RPE elevation (taken here as drusen thickness) and photoreceptor reflectivity were calculated for each MP test location. The structure-function relationship was analysed using a multivariate linear mixed effect model correcting for location eccentricity and age.

Results : Subjects had a median (interquartile range [IQR]) age and visual acuity of 75 (52, 82) years and 81 (69, 90) letters respectively. Both drusen thickness and photoreceptor reflectivity were significant predictors of MP sensitivity ($p < 0.001$ for both). Mean Absolute Error for prediction was 2.32 dB for the full model, 2.33 dB for photoreceptor reflectivity alone and 2.38 dB for drusen thickness alone (Fig 2).

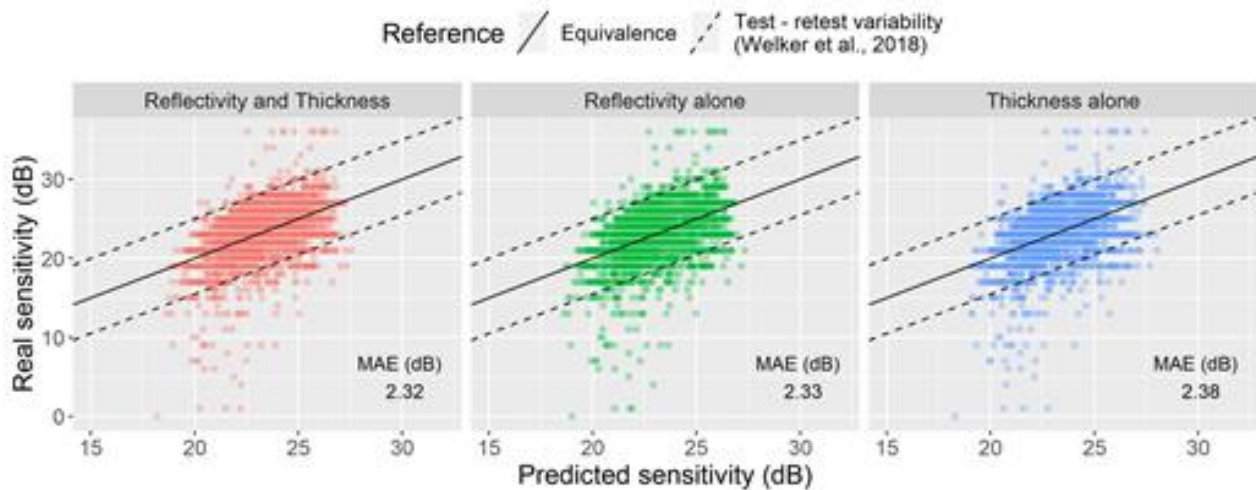
Conclusions : This model allows structural parameters to predict MP sensitivity in people with drusen. With implementation, this structure-function model has the potential to build structural information into functional testing of disease progression in iAMD.

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Figure 1. Example of RPE elevation map (left panel, thicker locations in yellow). The location tested with microperimetry (right panel) are reported as red circles.



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Figure 2. Predictive ability of the structure-function model. Horizontal and vertical axes show predicted and actual sensitivity values respectively. The solid line of unity represents the ideal perfect agreement (not regression line). The dashed lines represent published the 95% test-retest intervals for MP.

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