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Monitoring macular pigment in geographic atrophy using FLIO

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Abstract

Purpose : The pathophysiology of geographic atrophy (GA) is not yet fully understood and prognostic factors are still under discussion. Little is known about how the macular pigment (MP) changes during the progress of the disease. Monitoring fundus autofluorescence (FAF) lifetimes in GA using Fluorescence-lifetime-Imaging-Ophthalmoscopy (FLIO) may lead to novel insights, especially since FLIO can detect MP.

Methods : Using FLIO (Heidelberg-Engineering, Heidelberg, Germany), time-resolved FAF of 20 eyes with GA has been recorded in two spectral channels (ch1: 498-560nm; ch2: 560-720nm) and approximated by a series of three exponentials, resulting in three lifetimes: (τ1-τ3). Their amplitude-weighted mean (τm) per channel and pixel was utilized as the main parameter for statistical analysis. A FAF image was acquired with each measurement; OCT scans and fundus photography were obtained.
τm was averaged over the standardized ETDRS grid and the area of the fovea (diameter 0,1mm). Of special interest were differences between the fovea and the Inner Ring (IR) of the grid. These differences (τm (IR) minus τm (fovea)) were correlated to the best corrected visual acuity (BCVA).

Results : Mean FAF lifetimes in GA differ according to the individual progression of the disease. Additionally to hypo- and hyperfluorescent regions detectable with FAF, FLIO visualizes differences within these regions: The presence of MP results in shorter FAF lifetimes (250-400 ps) compared to other atrophic regions (>700 ps) (figure 1). These short FAF decays are often related to a spared fovea.
The τm differences between the IR and the Fovea (τm (IR) minus τm (fovea)) correlate with the BCVA (r:0.6; $p<0.01$ for both channels).

Conclusions : Whereas conventional FAF images only show differences in the fluorescence intensity, FLIO can additionally distinguish between different atrophic areas, better showing the presence of MP, resulting in different lifetimes and possibly detecting spared regions.
FLIO is a new imaging method to monitor GA. If FLIO can provide information on the GA progression needs to be further evaluated.

This is an abstract that was submitted for the 2016 ARVO Annual Meeting, held in Seattle, Wash., May 1-5, 2016.

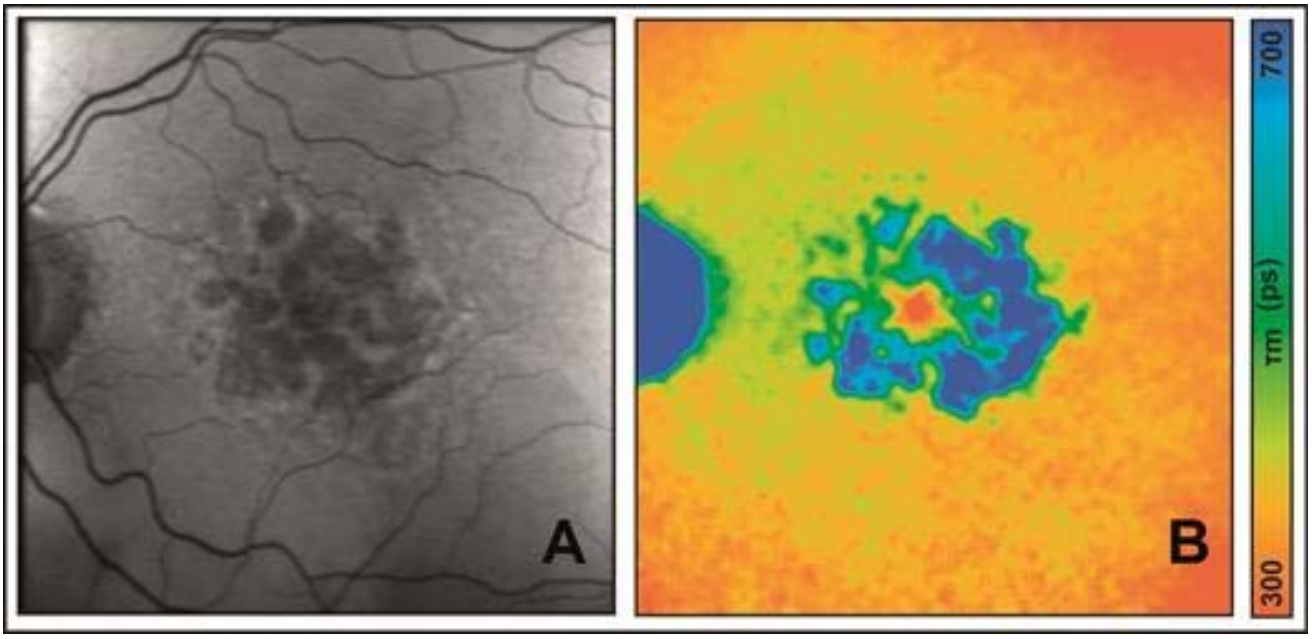

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Figure 1: FAF intensity (A) and lifetime (B) image of one eye with geographic atrophy. Differences in τm of the atrophic area are visible with high contrast.