Relationship between foveal ellipsoid zone integrity and central visual function in age related macular degeneration

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Purpose: Lack of ellipsoid zone (EZ) hyper-reflectivity in high resolution optical coherence tomography (OCT) has been associated with poor retinal sensitivity at corresponding retinal loci measured by microperimetry. We investigated the relationship between EZ hyper-reflectivity over the foveal area and two measurements of central visual function: shape discrimination hyperacuity (SDH) and best corrected visual acuity (BCVA) in eyes at risk of developing late age-related macular degeneration (AMD).

Methods: Patients attending hospital to receive treatment for neovascular AMD (nAMD) to their first eye performed BCVA, SDH and Heidelberg Spectralis OCT with their fellow eye (study eye, SE), which was required to have no evidence of nAMD or central geographic atrophy. EZ hyper-reflectivity was assessed in all B-scans lines falling within the foveal area (1200µm in diameter) and measured using the software provided calliper. The sums of the lengths of each line where hyper-reflectivity was intact and abnormal /absent were calculated and transformed into a percentage of the total. A grade of "0" was given when the EZ was intact, "1" when <20% of the EZ was abnormal/absent and 2 when >20% of abnormal/absent EZ was present.

Results: Of 78 SEs [mean participant age 77±8 years (range 57 to 91); 49 females], 33 (42%) were graded as "0". For these, mean (95%CI) SDH and BCVA were: -0.62 (-0.68 to -0.57) and 0.06 (0.01 to 0.1) logMAR. For 17 eyes (22%) graded as "1" SDH and BCVA were -0.59 (-0.66 to -0.52) and 0.04 (0.02 to 0.1) logMAR respectively. For 28 (36%) graded as "2", SDH and BCVA were -0.50 (-0.56 to -0.45) and 0.06 (0.01 to 0.1) logMAR respectively. After adjusting for the effect of age, the EZ grade had a significant negative effect on SDH score [$F(2,74)=4.94$, $p=0.01$, Partial $\eta 2=0.12$] but not on BCVA [$F(2,74)=0.13$, $p=0.89$, Partial $\eta 2=0.003$]. Planned contrasts revealed that SDH was significantly decreased only when EZ was graded as 2 compared to 0 [$t(74)=-3.1$, $p=0.03$, $r=0.12$].

Conclusions: There was a small but still statistically significant decrease in SDH observed in eyes with greater EZ abnormality, which was not seen for BCVA. As these measurements of central vision are comparable in terms of ease of use and task simplicity, our results indicate that SDH might be a better marker of photoreceptor dysfunction in early/intermediate AMD than BCVA.

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