Evaluation of the effectiveness of therapeutic intervention in patients with AMD; reading behaviour and eye movement analysis

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Aim: Reading difficulty is the most common complaint among individuals with visual deficits, especially in patients with foveal/parafoveal scotomas. The main purpose of the study is to evaluate the effectiveness of therapeutic intervention in patients with nAMD, using a new method, based on eye movement analysis in comprehensive reading.

Material & Methods: A group of 20 naive and relapsed nAMD patients (age range: 59-78 years) who underwent anti-VEGF treatment participated in the study. Another group of 20 participants (age range: 56-75 years) with normal vision served as controls. All were native Greek speakers and had similar education level. Both groups were examined at baseline and about 3 months following their first visit. So far, 15 patients and 20 controls have undergone both visits. Visual acuity was assessed using logMAR charts. Reading performance was evaluated using simple paragraphs of about 140 words each (0.4 logMAR print size at 40 cm distance). Eye movements were monitored with an infrared eyetracker (Eye-Link II, SR Research Ltd). Data analysis included computation of reading speed and fixation duration, the number of fixations, and percentage of regressions. Moreover, frequency distributions of fixation durations were analysed with an ex-Gaussian fitting, a convolution of a normal (with μ as the mean) and exponential (with τ as the mean) distribution, linked to visuo-motor vs. cognitive components, respectively.

Results: Differences among groups in monocular reading were found to be statistically significant in reading speed ($p<0.01$) and in all eye fixation parameters apart from the percentage of regressions and ex-Gaussian parameter τ. nAMD patients showed higher reading speed following treatment (mean difference=33 wpm, $p=0.023$), mainly due to the lower number of fixations (mean difference=0.4 fixations per word, $p=0.047$). Ex-Gaussian parameter μ was also decreased by 39ms but failed to reach statistical significance while ex-Gaussian parameter τ remained stable (mean difference=0.0 ms, $p=0.982$). Mean near visual acuity in nAMD patients improved by 0.14 logMAR after treatment ($p=0.05$). Monocular near VA in controls showed an average difference of 0.04 logMAR between the two visits ($p=0.064$).

Conclusion: Evaluating reading performance using eye movement analysis seems to form a reliable outcome for assessing the effectiveness of therapeutic approaches in nAMD patients.