A new method, based on eye movement analysis to evaluate reading performance in patients with AMD

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Introduction: Reading difficulty is the most common complaint among individuals with decreased vision, especially patients with foveal/parafoveal scotomas. The main purpose of the study is to evaluate reading performance in patients with nAMD, using a new method, based on eye movement analysis.

Methods: A group of 7 patients (age range: 67-78 years) diagnosed with nAMD and who underwent a 3-month anti-VEGF treatment participated in the study. In addition, 12 subjects (age range: 57-75 years) served as controls. All participants were native Greek speakers, had similar education level and were examined at baseline and about 3-4 months following their first visit. Visual acuity was assessed using logMAR charts. Monocular reading performance was conducted using simple paragraphs of about 140 words each (0.4 logMAR print size at 40 cm distance). Eye movements were monitored using an infrared eyetracker (Eye-Link II, SR Research Ltd.). Data analysis included computation of reading speed, fixation duration, 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 were found to be statistically significant in reading speed (patients:57.8±21.3wpm vs. control:157.0±46.5wpm, $p<0.001$), in mean fixation duration (patients:422±105ms vs. control:270±49ms, $p<0.001$), in number of fixations per word (patients:1.6±0.4, control:1.1±0.3, $p=0,001$) and in ex-Gaussian parameter μ (patients:282±65ms vs. control:177±40ms, $p=0.001$). The difference in ex-Gaussian parameter τ (patients:149±76ms, vs. control:108±45ms, $p=0.185$) was not statistically different. Average monocular Visual Acuity was 0.42±0.08 decimal for patients and 0.17±0.06 decimal for controls. Moreover, reading speed improved after treatment for nAMD patients, and this was mainly due to the lower number of fixations; mean fixation duration was relatively stable.

Conclusions: Evaluating reading performance using analysis of eye movements seems to form a reliable process for assessing functional deficits in nAMD patients.