Presentation Number: 2375

Dynamics of metamorphopsia characteristics during progression from intermediate to late age-related macular degeneration

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Purpose

Do specific metamorphopsia patterns reflect conversion to late age-related macular degeneration?

Methods

35 patients with intermediate age-related macular degeneration (i-AMD) were followed in a prospective, longitudinal study from 2015-2017.

Eyes were classified[1] as

- non-progressors (np) when intermediate AMD did not proceed to late AMD
- progressors (p) when neovascular AMD (n-AMD) or
- geographic atrophy (GA) when geographic atrophy developed.

The first eye converting to late AMD was included. In binocular np - cases one eye was randomly included.

Inclusion criteria: intermediate AMD

Exclusion criteria: ancillary macular pathology

Zero (alternative) hypothesis: progression to n-AMD or GA does not (resp. does) change metamorphopsia value and pattern.

Metamorphopsia[2,3] measurement was performed with AMD – A Metamorphopsia Detector® (app4eyes)[4,5] documenting magnitude (d), localization (ε), area (a), local frequency (d/a) of metamorphopsia and global metamorphopsia index (MI). The software is based on the Amsler grid and uses the conception of a negative image: distorted lines can be straightened with the mouse.

Guideline compliant ophthalmological exams were performed. This research adhered to the tenets of the Declaration of Helsinki and was approved by the ethics commission in charge. Prior to the study all participants signed informed consent.

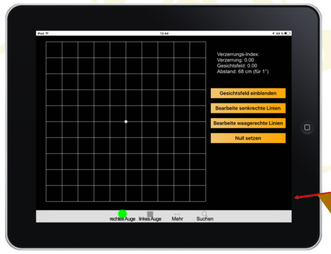

Fig. 7: AMD - A Metamorphopsia Detector(TM)

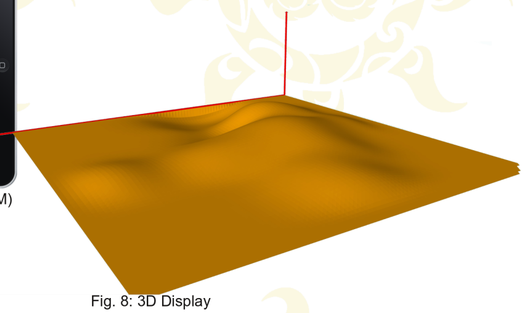

Fig. 8: 3D Display

Literature

1. Ferris, F.L., 3rd, et al., Clinical classification of age-related macular degeneration. Ophthalmology, 2013. 120(4): p. 844-51.
2. Midena E, Vujosevic.S., Metamorphopsia: An Overlooked Visual Symptom. Ophthalmic Res, 2015. 55(1): p. 26-36.
3. Crossland, M., Rubin, G., The Amsler chart: absence of evidence is not evidence of absence. Br J Ophthalmol. 2009 Dec 3, 2007 Mar. 91(3): p. 391–393.
4. Claessens, D., Krüger, R., AMD-A Metamorphopsia Detector. ARVO Association for Research and Vision in Ophthalmology, 2015.
5. Claessens,D., Schuster, A.K., Correlation of Quantitative Metamorphopsia Measurement and Central Retinal Thickness in Diabetic Macular Edema and Age-Related Exsudative Macular Degeneration: DOI 10.1055/s-0043-125080 Klin Monatsbl Augenheilkd

Disclosure Codes: I, C (app4eyes); P (DE 10 2015 215 557)

Results

Mean change of metamorphopsia index was significantly higher in progressors (5.80, SD 2.71, 95% confidence interval (CI) [3.93; 7.68]) compared to non-progressors (2.18, SD 2.02, CI [1.27; 3.08]), t-test, $p < 0.05$. A t-value of 7.73 lead to rejection of the zero hypothesis.
7 patients were lost to follow-up. In this cohort (28 eyes: 8 men, 20 women) mean age was 74 (SD 4.2) years in the p-/GA-group and 75 (SD 5.1) in the np-group. Mean study period was 10.0 months (SD 4.0) in the p-/GA-group and 10.7 months (SD 6.1) in the np-group.
19 eyes (68%) remained stable (i-AMD), 9 eyes (32%) progressed to late AMD: 8 eyes (28.5%) developed neovascular AMD, 1 eye (3.5%) developed geographic atrophy.

Statistical Distribution

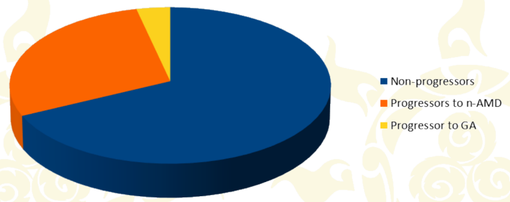

Fig. 1: Statistical Distribution

Mean change of Subindices

Mean change for d, ε, a and d/a was 3.34 (SD 1.45) / 1.44 (SD 1.22) / 0.26 (SD 1.25) / 1.59 (SD 0.76) in the p-group and 1.10 (SD 1.14) / 0.62 (SD 1.10) / 0.47 (SD 0.71) / 0.87 (SD 0.73) in the np-group. In GA the difference of d, ε, a and d/a was 2.60, 1.33, 0.83 and 0.66.

Mean Change of Subindices

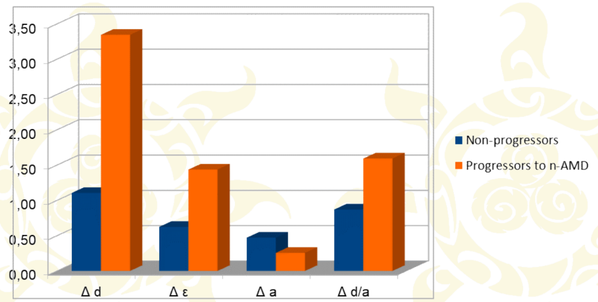

Fig. 2: Mean Change of Subindices

Mean Change of CFT

Mean change of CFT was +40 µm (SD 60) in the p-group, -33 µm in GA and -3 µm (SD 63) in the np-group.

Mean Change in Central Foveal Thickness

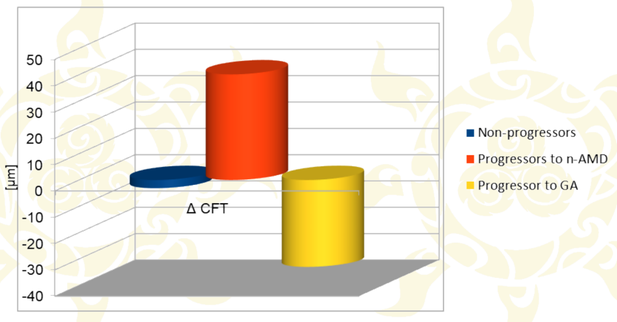

Fig. 3: Mean Change of Central Foveal Thickness

Mean Change of Metamorphopsia Index

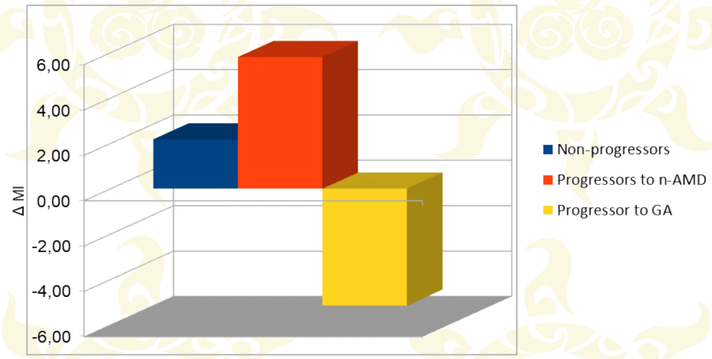

Fig. 4: Mean Change of Metamorphopsia Index

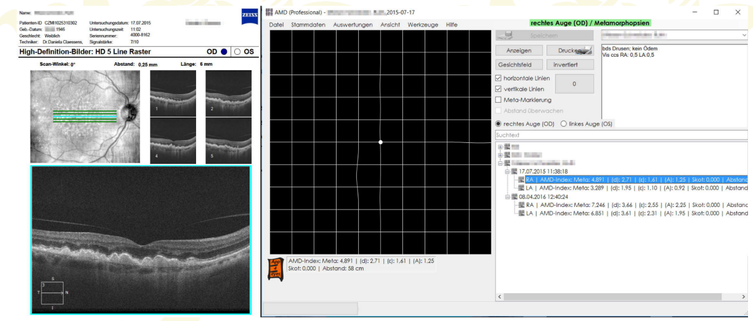

Fig. 5: i-AMD

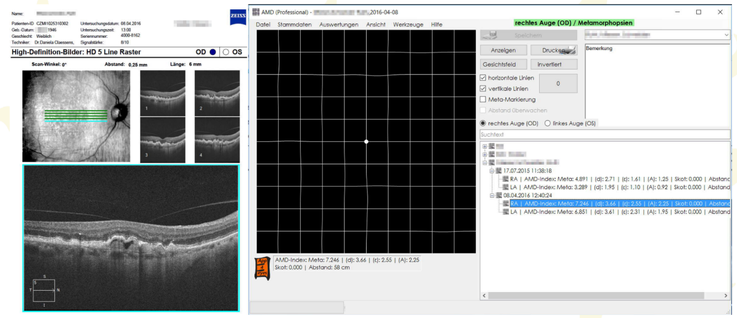

Fig. 6: same eye: progression to n-AMD

Conclusion

The results support the hypothesis that progression from intermediate to neovascular age-related macular degeneration is accompanied by an increase of metamorphopsia index.

Discussion

- The conclusion that conversion is accompanied by an increased metamorphopsia index is applicable for neovascular AMD due to dominance of progressors to n-AMD in this study.
- Only one patient developed geographic atrophy, accompanied by decrease in metamorphopsia index and development of central scotoma. Vision-related quality of life might reveal the impact of metamorphopsia or central scotoma respectively.
- Long-term studies could evaluate the role of metamorphopsia measurement as a biomarker for conversion from intermediate to neovascular AMD and the suitability of AMD – A Metamorphopsia Detector® as a (home) monitoring test.