Reliability of a Novel Computer-Based Metamorphopsia Categorization Tool

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Purpose

Metamorphopsia as a symptom for macular pathology can be assessed qualitatively or quantitatively. Metamorphopsia categorization using the App MacuFix® was compared to metamorphopsia measurement with AMD - A Metamorphopsia Detector®.

Methods

71 eyes of 39 women and 32 men were examined between June and October 2019 in this clinical observational study. The average age was 71± 10 years. Inclusion criterion was metamorphopsia in an Amsler Grid in at least one eye. Exclusion criterion was BCVA < 20/200. All participants signed informed consent according to the declaration of Helsinki prior to the study. Statistical analyses were performed with the statistical software "R" (http://www.R-project.org). All patients performed Metamorphopsia categorization with the App MacuFix® (patent pending) and metamorphopsia measurement with the software AMD - A Metamorphopsia Detector® [1]. To assess the reliability the intraclass correlation coefficient ICC was calculated [2].

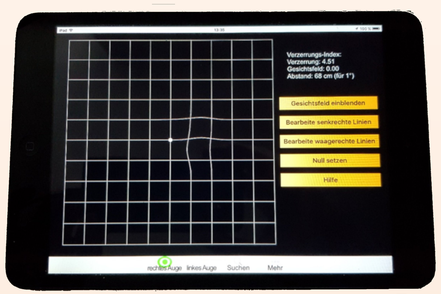

Fig. 1: AMD - A Metamorphopsia Detector®

AMD - A Metamorphopsia Detector® offers metamorphopsia measurement with recording of a Metamorphopsia Index (MI) consisting of magnitude, eccentricity and area of metamorphopsia.

Literature

1. Claessens, D. and A.K. Schuster, Correlation of Quantitative Metamorphopsia Measurement and Central Retinal Thickness in Diabetic Macular Edema and Age-Related Exsudative Macular Degeneration. Klin Monbl Augenheilkd, 2019. 236(7): p. 877-884.
2. Shrout, P.E. and J.L. Fleiss, Intraclass correlations: uses in assessing rater reliability. Psychol Bull, 1979. 86(2): p. 420-8.
3. Ferris, F.L., 3rd, et al., Clinical classification of age-related macular degeneration. Ophthalmology, 2013. 120(4): p. 844-51.
4. Parfitt, A., et al., Patient-reported reasons for delay in diagnosis of age-related macular degeneration: a national survey. BMJ Open Ophthalmol, 2019. 4(1): p. e000276.
5. Razavi, H., et al., Gaming to improve vision: 21st century self-monitoring for patients with age-related macular degeneration. Clin Exp Ophthalmol, 2018. 46(5): p. 480-484.
6. Wightman, A.J., et al., Presymptomatic Retinal Sensitivity Changes in Intermediate Age-Related Macular Degeneration Associated With New Retinal Fluid. Transl Vis Sci Technol, 2019. 8(6): p. 3.
7. Domalpally, A., et al., Imaging Characteristics of Choroidal Neovascular Lesions in the AREDS2-HOME Study: Report Number 4. Ophthalmol Retina, 2019. 3(4): p. 326-335.

MacuFix displays 4 x 4° grids with distorted lines, one standing out due to stronger distortions. In > 10 scenes with varying distortion differences, the patient selects the grid he perceives most distorted. The test is performed monocularly with appropriate near correction. An algorithm determines the smallest detectable distortion difference categorized as MacuFix Class (MC). Results are displayed for monitoring. Additionally encrypted results can be sent to the ophthalmologist for monitoring and/or feedback, e.g. invitation for a re-examination.

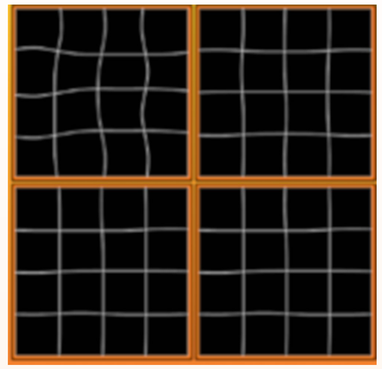

Fig. 2: MacuFix®

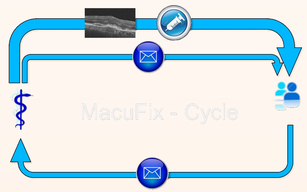

Fig. 3: MacuFix - cycle: encrypted communication between patient and opthalmologist / reading centre

Results

Diagnoses [3] were early AMD in 8, intermediate AMD in 24, late AMD in 8, non-AMD-macular edema in 8, vitreoretinal interface pathologies in 13 eyes. 10 eyes had no macular pathology.

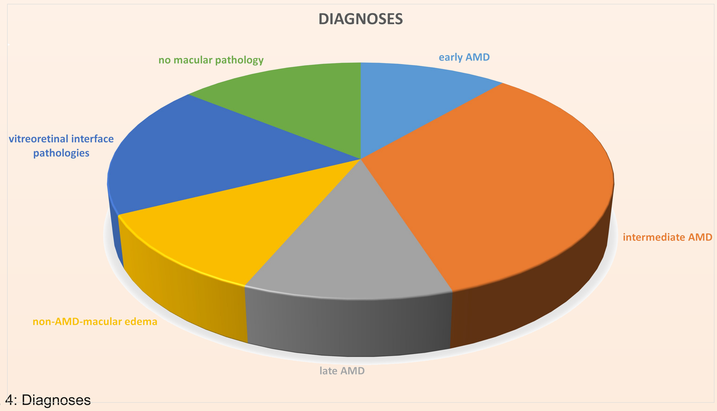

Fig. 4: Diagnoses

42 eyes had metamorphopsia (M+) when tested with the Amsler grid, 29 eyes did not perceive any metamorphopsia.
When examined with AMD - A Metamorphopsia Detector® 4 eyes reported M+ exclusively inside of 4°, 12 eyes only outside of 4°, 24 eyes inside and outside of 4°, 31 eyes revealed a Metamorphopsia Index of 0.
The average best corrected visual acuity was 20/100 (median 20/80). Average test time per eye was 94 seconds.

Intraclass correlation coefficient ICC as a reliability measure

Intraclass correlation coefficient of MI and MC was excellent for eyes with metamorphopsia in the central 4° degrees only (ICC 0.98 (confidence interval CI 0.65; 1.0; p< 0.01), moderate regarding all eyes (ICC 0.67 (CI 0.47; 0.79; p< 0.01) and eyes with M+ inside and outside of 4°(0.64 (CI 0.17; 0.85; p< 0.01) and low for eyes with M+ exclusively outside of 4°(ICC 0.22 (CI 1.71; 0.78; p= 0.34).

Area of Metamorphopsia	ICC	Confidence Interval	p
central 4° degrees only	0.98	0.65; 1.0	< 0.01
inside and outside of 4°	0.64	0.17; 0.85	< 0.01
exclusively outside of 4°	0.22	0.78; 1.71	0.34

Tab. 1: Intraclass correlation coefficient of Metamorphopsia Index and MacuFix Class

Discussion

Chronic macular disease places a high demand on the patient. Home tests can support compliance and adherence and enhance awareness [3] for symptoms of macular diseases, especially if they are fun to play due to a gaming character [4, 5]. Macufix is low- threshold compared to alternatives [5, 6] and can do without fixation control. The app offers a quick and easy to perform option to detect and categorize metamorphopsia in the central 4° of the visual field. Patients benefit from the fact that they remain master of their data (privacy policy).

Conclusion

Reliability of Macufix was excellent when metamorphopsia exist exclusively inside the central visual field of 4° and moderate when metamorphopsia were additionally present outside of 4°. MacuFix may offer a quick and easy to perform option to categorize central metamorphopsia as a patient-reported outcome (PRO) with this low-theshold home-test.

Commercial Relationships Disclosure

Ronald Krüger: Commercial Relationship(s);app4eyes GmbH & Co. KG:Code I (Personal Financial Interest);app4eyes GmbH & Co. KG:Code C (Consultant)
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