The Macular Mapping Test 2.0

Objectives of the test

1. Early detection of first signs of maculopathy

Assessment of visual performance within the macula up to 10° eccentricity for early detection of first signs of maculopathy.

At early stages of the disease the clients often does not recognize a loss of visual acuity and may not be aware of a beginning eye disease.

2. Determination of residual vision

Determination of residual macular vision due to retinal diseases, along with the topographical description of a central scotoma to support visual rehabilitation.

3. Documentation

Documentation of disease progression and monitoring the effects of therapy.

Preparation:
Installing the MMT software and the test setup

Calibration
Before starting to use the MMT2.0, the size of the “wagon wheel” display needs to be calibrated. To do this, click on the “Calibration” button, then use a ruler to measure the diameter of the display area and enter this value in cm.

Lighting conditions
Please place the screen in such a way that no reflections are caused by interfering light sources. All measurements are taken in daylight (photopic lighting conditions) and with maximum screen brightness.

Office address
You can specify your company or office address on the test report. To do this, click the “office address” button and enter the address.

The measuring process:
How the test is conducted

The measurement is quite simple: the client is sitting as comfortably as possible and views the screen at a distance of 40 cm. The head can be stabilized by a chin rest to better control the viewing distance. During the measurement, a stimulus, e.g. a letter, is briefly displayed in a location that cannot be predicted by the client.

The client's task is to recognize the stimulus and to communicate it to the examiner. The type of the stimulus can be pre-selected in the test settings: single letters or Landolt rings. The examiner enters the answer on the keyboard, which triggers the appearance of the next stimulus.

The examination at 33 places in the central visual field takes about 3 minutes. After completion of two complete measurements (at 100% and 10% contrast), the test report can be saved and/or printed.

The measuring procedure:
Instructions to the subject

Maximum accuracy of the test results can be ensured if the clients are able to keep their gaze as stable as possible during the test procedure. Since people with a loss of foveal vision often have unstable fixation, they need specific instructions from the examiner to control and stabilize their gaze. The following procedure has proved to be helpful:

The examiner asks:
“Do you have any idea where the center of the circular display area (the “wagon wheel”) is?”
Usually, the patient answers this question with “Yes”.

Examiner:
“Please direct your gaze on this center and keep it there as stable as possible.”

1. Detailed Objectives (A)

Detection of early signs of a maculopathy

The early detection of a degenerative retinal disease is achieved by performing the test monocularly twice, once at full contrast (approx. 100%) and a second time at reduced contrast (approx. 10%). By comparing the performance levels in the two runs, you can determine whether the performance reduction at the lower contrast was caused by age alone, which would be normal, or whether it was caused by a maculopathy.

This measurement is necessary for early detection, because clients usually do not notice early deficits in their vision themselves. This happens especially if the fovea has not been affected so far, so that the client still has a relatively high visual acuity (ring scotoma). In case like this, the MMT2.0 proves to be very sensitive by combining a detection task with placement of stimuli in parafoveal regions.

2. Detailed Objectives (B)
Determination of residual vision

The program is based on the fact that central visual field loss caused by maculopathies shows topographical variations. This means that the shape, extent and location of the disease-related visual field damage varies between individuals.

In addition, patients with central scotoma have to learn to live with the loss of foveal vision. They can do this by using a technique called "eccentric fixation" (EF). For this purpose, they can move the gaze (and the scotoma), so that the image of an object to be recognized falls onto a still intact region of the retina in the near periphery.

To achieve best results, they also need to learn which retinal locus is most suitable for the intended purpose. It is assumed that appropriate steps of low vision care (e.g. magnification) have already been taken to compensate for the loss of spatial resolution (visual acuity) in the retinal periphery. Scientific studies, as well as practical experience with the rehabilitation of visually impaired persons, have shown that eccentric fixation can be trained with the guidance of a specialist.

It is important that people with maculopathies, especially age-related macular degeneration (AMD) understand the nature and effects of their disease, which cannot be assumed. The MMT2.0 demonstrates the individual variations of central visual field performance to the clients and their relatives. This promotes the understanding of the disease and a positive attitude towards vision rehabilitation.

3. Detailed Objective (C)
Documentation

The success of a therapeutic intervention (e.g., intravitreal injections, etc.) can and should be documented. Here too, it is of advantage to include parafoveal areas, since the conventional visual acuity measurement tests only foveal performance. For this purpose, it is very useful to be able to express a client's overall performance by a single number that is automatically available at the end of each measurement.

Literature regarding MMT2.0
Part 1

Eisenbarth W., Richert J., MacKeben M. (2015) Testing Macular Letter Recognition - Reliability and Influence of Refraction Errors. Clinical and Experimental Optometry. in Press

Eisenbarth W., Feucht N., Enders C., Maier M., Lohmann C.P., MacKeben M. (2015) Parafoveal contributions to retinal function during ranibizumab therapy for age-related macular degeneration. Can J Ophthalmol. 50(1):37-43.

Eisenbarth, W. (2009) Ausgewählte Methoden der Gesichtsfelduntersuchung für Netzhaut-Screening und Low-Vision Versorgung, Die Kontaktlinse, 6:2-8.

Hahn GA, Messias A, Mackeben M, Dietz K, Horwath K, Hyvärinen L, Leinonen M, Trauzettel-Klosinski S. (2009) Parafoveal letter recognition at reduced contrast in normal aging and in patients with risk factors for AMD. Graefes Arch Clin Exp Ophthalmol. 247(1):43-51.

Eisenbarth, W., MacKeben, M. (2008) „Macular Mapping“ – AMD Screening für Augenoptiker, DOZ, 7:32-36.

MacKeben M. (2008) Topographic mapping of residual vision by computer. J. Visual Impairment & Blindness (Special Issue on AMD), October, Vol. 102, No.10, 649-6.

Literature regarding MMT2.0
Part 2

Trauzettel-Klosinski S, Biermann P, Hahn G, Weismann M. (2003) Assessment of parafoveal function in maculopathy: a comparison between the Macular Mapping Test and kinetic Manual Perimetry. Graefes Arch Clin Exp Ophthalmol. 241(12):988-95.

MacKeben,M. & Colenbrander, A. (2000) Topographic measurements of low contrast letter recognition as a tool for diagnosis and vision rehabilitation. Vision Rehabilitation (C.Stuen et al., eds), Swets & Zeitlinger, Lisse, pp. 158-160.

MacKeben M., Colenbrander, A. & Gofen, A. (1999) Use your PC to quickly map remaining vision after foveal vision loss. Perimetry Update 1998/1999 (M.Wall & J.M.Wild, eds.), pp.307-316, Kugler Publications, The Hague

MacKeben, M., Colenbrander, A.. and Schainholz,D. (1994) Comparison of Three Ways to Assess Residual Vision after Macular Vision Loss. In: “Low Vision – Research and New Developments in Rehabilitation”, Kooijman AC et al. (Eds.), IOS Press, Amsterdam, pp. 51-58.

MacKeben, M. and Colenbrander, A. (1994) Mapping the topography of residual vision after macular vision loss. In: “Low Vision – Research and New Developments in Rehabilitation”, Kooijman AC et al. (Eds.), IOS Press, Amsterdam, pp. 59-67.

The Macular Mapping Test 2.0

The history

The Macular Mapping Test (MMT) was originally developed by Manfred MacKeben, Ph.D. and August Colenbrander, M.D. at the Smith-Kettlewell Eye Research Institute in San Francisco, CA, USA.

A new concept was developed in 2015 under the direction of Prof. Dr. Werner Eisenbarth, Munich University of Applied Sciences, based on an ongoing cooperation with Dr. MacKeben. The aim was to adapt the Macular Mapping Test to the practical day-to-day requirements of optometry and ophthalmology.

The result is the new Macular Mapping Test 2.0 (MMT2.0).