Disease Detection With Visual Fields

Benefits of the OCULUS Easyfield® C in clinical practice.

BY MICHAEL CHAGLASIAN, OD

Visual field testing is a required part of disease evaluation and management. Ocular diseases, such as glaucoma and optic nerve disease, and many neurological diseases that produce hallmark visual field defects can be diagnosed with automated perimetry. My practice is specifically focused on patients with glaucoma or suspect glaucoma, and a lot of them are referred to me for further testing and evaluation. The Easyfield® C (OCULUS) is an invaluable tool for imaging the characteristic visual field losses and defects that are typical in these patients. It helps me identify the location of the ocular or neurological disease based on the appearance of the visual field defect.

AN OVERVIEW ON PERIMETRY

The most common reasons to test the visual field are medically driven. Examples include glaucoma and glaucoma suspect; the presence of tumors and proptosis; and patients with a history of stroke, head trauma, and frequent headaches. Visual field testing can also be part of a general screening protocol to test for mobility, visual function in daily activity, and field loss impact on lifestyle, and it can be used to identify driving restrictions and for the fitting of low-vision devices.

Perimetry is used to determine two main things: (1) the absolute limits of the field of vision and (2) how well the eye sees at various points within the limits of the field of vision. Historically, perimeters tested the central 60º of the visual field. Anatomically, however, the central 30º of the visual field represents 66% of the retinal ganglion cells and 83% of the visual cortex. Thus, nearly all optic nerve pathologies are associated with loss of sensitivity in the central 30º. Today, static thresholding devices that concentrate on the central 30º are used to detect visual field loss. The Easyfield® C does a very good job of identifying defects in this region (Figure 1).

CHOOSING A TEST PATTERN

When test patterns for visual field devices were developed almost 40 years ago, a 30-2 fixed grid pattern of light emitting diodes was standard, with 76 test points in an even grid distributed over the central 30º of the patient's visual field. Over time, smaller fixed grid patterns were developed to shorten test times and improve accuracy and reliability. Today, the 24-2 grid pattern is the most common pattern for automated visual field testing.

The Easyfield® C offers a 30-2, 24-2, and even a 10-2 fixed grid pattern (Figure 2) to accurately identify the defects that are most common with ocular and neurological diseases, including arcuate scotoma, central scotoma, paracentral scotoma, and nasal step scotoma. The 24-2 pattern tests the central 20º and the 10-2 pattern the central 10º (Figure 3). The latter is an important test for glaucoma suspect patients.

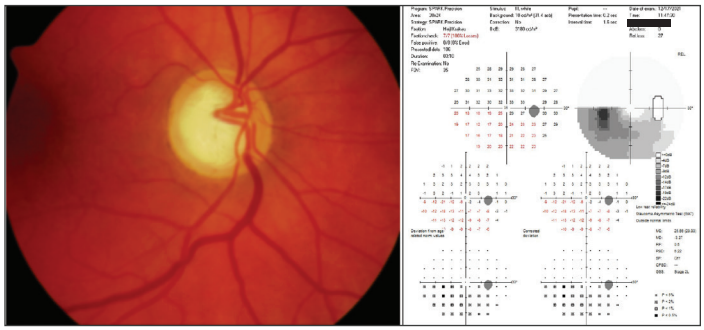

Figure 1. Glaucoma patient with an arcuate and central defect as detected on the Oculus Easyfield.

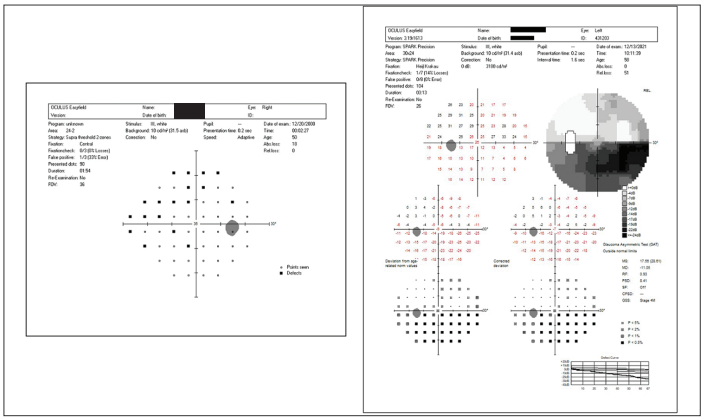

Figure 2. The Easyfield includes multiple testing pattern options.

With the Easyfield® C, you can also test individual hemispheres and quadrants and examine any combination of individual points. The test patterns are modular, allowing all patterns to be examined using any standard strategy.

TEST STRATEGIES

A traditional threshold program is meant to quantify in decibels the amount of loss in the patient's visual field, but the test can take a long time. When automated visual field testing was first being developed, the initial test time for each eye was between 7 and 10 minutes. Screening tests were subsequently developed as a quicker way to identify significant visual field defects. Now, the Easyfield® C also uses threshold-related supra-threshold examination strategies to provide the examiner with a meaningful overview of the tested area during the shortest examination time possible.

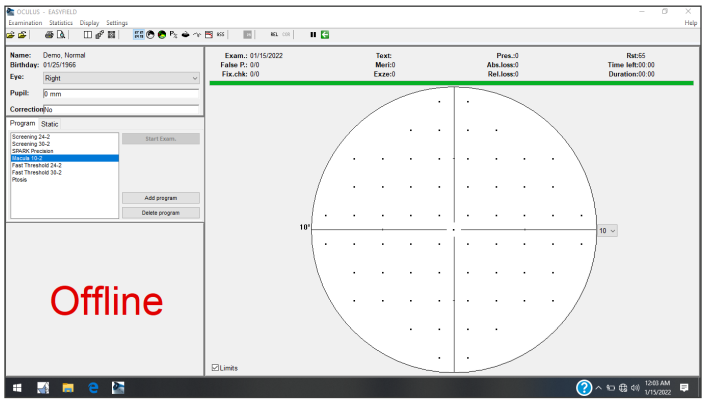

Figure 3. The 10-2 test of the Easyfield.

Multiple test strategies are available on the Easyfield® C to evaluate the numeric values of the sensitivity thresholds.

Fast Threshold. This strategy reduces test duration through implementing improvements of the classic 4-2 stem method.

CLIP. This strategy uses a new type of stimulus presentation to achieve a similar speed performance.

SPARK. This novel strategy provides rapid and reproducible threshold measurements specifically developed for glaucoma detection. The examination time is independent of the patient, including those with badly affected visual fields. Glaucomatous defects in the visual field do not occur isolated. Locations along the same nerve fiber bundle have correlated sensitivity values, and neighboring locations also tend to have similar threshold values. SPARK describes the average sensitivity along a given nerve fiber bundle by choosing representative locations. After preliminary tests for deep scotomas are performed, SPARK is used to test representative locations of all areas. The procedure is repeated to eliminate artifacts and obtain final threshold values. Defect values in all other locations are determined using multiple linear regression formulas. SPARK has about 40% fewer fluctuations compared to other strategies.1

SPARK is also useful for progression analysis using threshold noiseless trend (TNT) to objectively evaluate the changes in visual field results over time. It presents a prediction about the expected visual field for a chosen patient age. TNT displays a concise report of the progression analysis with a summary of the most relevant parameters, including mean deviation slope and P values (Figure 4).

TNT automatically selects all exams performed on the same area with the same strategy. The operator can choose to include or exclude individual exams, which is particularly useful to display the effects of a specific treatment.

A TOOL FOR STANDARD SCREENING

The three threshold strategies of the Easyfield® C provide better information in about the same time—approximately 1 minute—as a screening test option. I therefore recommend using one of the threshold-related suprathreshold examination strategies as a standard screening strategy rather than a standard screening test. These newer, faster, thresholding options are now my go-to tests.

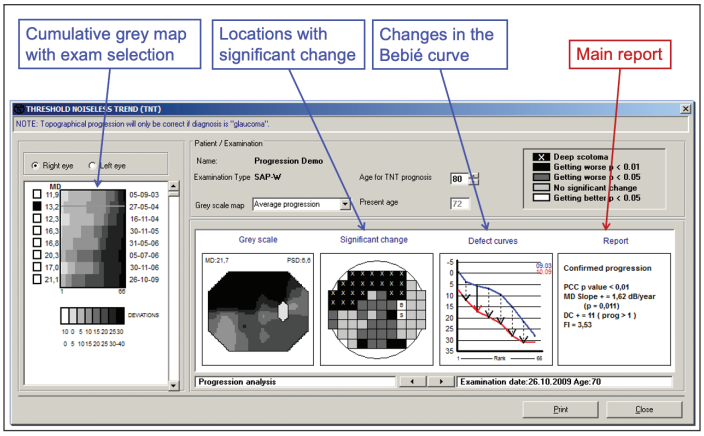

Figure 4. The main display of the Progression Analysis TNT report.

Additionally, the Easyfield® C includes a set of predefined programs for the most common examination routines of the central visual field and macular area. This list can be extended according to specific requirements by combining the available test patterns and strategies.

A VERSATILE DEVICE

The Easyfield® C can be placed in almost any location, including an examination lane or pretest area, because of its small size (only 14 x 18.5 inches) and minimal environmental requirements—the use of an eye patch or a dark room are not needed. This is attractive to patients because it is easy and fast for them to undergo testing. My patients find the adjustable double chin rest and translucent eye shields very comfortable, and I find the operation of it smooth, easy, and efficient.

The results with the Easyfield® C are comparable with other visual field instruments that I use. The software is based on validated data, and the literature supports its accuracy and reliability.2,3

CONCLUSION

The Easyfield® C visual field screener and threshold perimeter has a lot of options for testing patterns and strategies, ensuring accurate and reliable testing results in every patient. The threshold-related suprathreshold examination strategies such as SPARK provide meaningful visual field analysis in the shortest time possible, and the device's Progression Analysis helps me follow my glaucoma patients' disease progression over time. ■

1. de la Rosa MG, Gonzalez-Hernandez M. A strategy for averaged estimates of visual field threshold: SPARK. J Glaucoma. 2013;22(4):284-289.
2. Nazareth T, Rocha J, Scoralick ALB, et al. Retinal sensitivity thresholds obtained through Easyfield and Humphrey perimeters in eyes with glaucoma: a cross-sectional comparative study. Clin Ophthalmol. 2020;14:4201-4207.
3. de la Rosa MG, Gonzalez-Hernandez M, Sanchez-Garcia M, et al. Oculus-Spark perimetry compared with 3 procedures of glaucoma morphologic analysis (GDx, HRT, and OCT). Eur J Ophthalmol. 2013;23(3):316-323.

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