THE CHANGING LANDSCAPE OF GLAUCOMA MANAGEMENT

Plus, a case demonstrating the utility of the ZEISS Integrated Diagnostic Imaging platform for efficient test correlation.

BY MURRAY FINGERET, OD, FAAO

Structural and functional tests are integral to the diagnosis of glaucoma and the monitoring of affected individuals for change over time. Structural testing involves optical coherence tomography (OCT) and analysis of the optic nerve with photography. Perimetry, or visual field testing, assesses function. Advancements in both types of testing are aimed at accurate clinical evaluations.

VISUAL FIELD TESTING EVOLVES

The automated Humphrey Field Analyzer (HFA) originally used a full threshold testing algorithm. The duration of the test was 8 to 10 minutes for a healthy eye and longer for an individual with glaucomatous field loss. The Swedish Interactive Thresholding Algorithm (SITA) was introduced in 1995. SITA Standard reduced the testing time by half from full threshold, and SITA Fast reduced the testing time as compared to FASTPAC. For many years, ZEISS recommended use of the SITA Standard test, while SITA Fast remained on the sidelines.

Studies have shown that SITA Fast is similar to SITA Standard, particularly for detecting glaucomatous progression, but SITA Fast takes 3 to 5 minutes, which is too long for some patients.[1,2] Efforts to make visual field testing more efficient resulted in SITA Faster. This test has the potential to reduce testing time by 30%, possibly without a loss of accuracy, which may make it the field test of choice, once validation studies are complete.

NEW TEST PATTERN

An issue that has plagued clinicians is the realization that we often see structural loss in the retinal nerve fiber layer (RNFL), optic nerve, and macular region, using optic nerve evaluation and OCT analysis before we see visual field loss. Some literature has shown that central field loss may appear very early as glaucoma is developing.[3,4]

Recently, Donald C. Hood from Columbia University championed testing the central region to detect visual field loss earlier.[3,4] This would include testing the macular region with OCT, as well as with perimetry.

For visual fields, the 10-2 pattern became the test of choice, because it assesses 65 points in the central 10 degrees with 2-degree spacing, compared with 6-degree spacing with the 24-2.[5] Clinicians have had to grapple with several questions regarding these two test patterns. Which is more important? And, if they are going to perform both tests, when should they perform them?

Reimbursement issues also arise when multiple tests are performed on the same day and when testing patients with multiple tests at most visits. Thus, the question is not how applicable the 10-2 is to practice, but rather how to make the 10-2 and the 24-2 work in a practical, clinical sense.

The new 24-2C test pattern incorporates the 10 most commonly

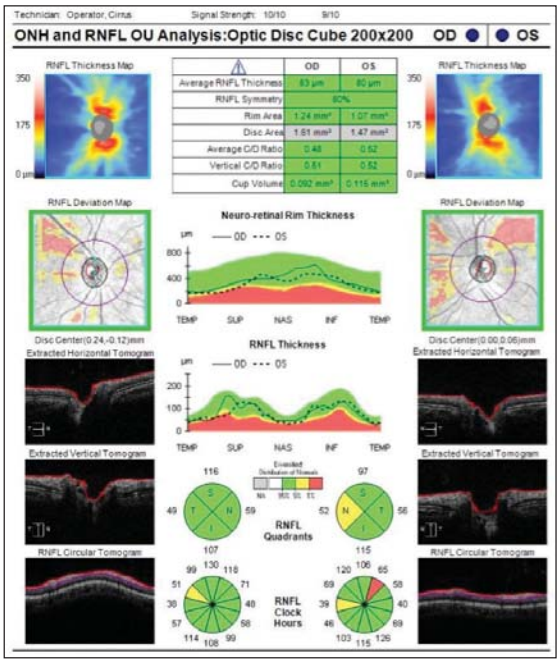

Figure 1. The patient's most recent OCT scan shows excellent image quality. The optic nerve is centered and evenly illuminated, and the B-scans are within the defined area with no segmentation errors present.

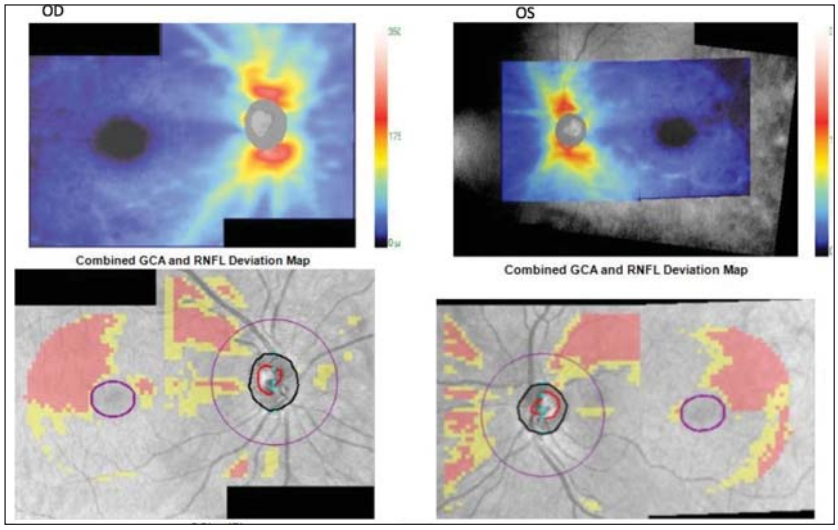

Figure 2. The Pano maps allow the RNFL and ganglion cell complex maps to be overlaid, providing a wide area for review.

flagged points on the 10-2 and the 24-2 patterns. The hope is that clinicians will need to run only one test pattern to evaluate the central region, as well as the regions previously tested with the 24-2. Studies are needed to document how well this performs, but there is optimism that this may become the default test pattern. The 24-2C runs under the SITA Faster mode, so testing takes the same time as the 24-2 SITA Fast.

LIQUID LENS

In perimetry, trial lenses provide the refractive correction needed so the patient can see clearly during the test. This is an inefficient method, as the trial lenses may be in the wrong position, leading to artifacts, or you may not have the correct power.

In the Humphrey Field Analyzer 3 (HFA3; ZEISS), the old manual process has been replaced with a Liquid Trial Lens, which automatically delivers the appropriate refractive correction using measurement information entered into the instrument. This eliminates the need for trial lenses and creates a more efficient testing environment.

STREAMLINING WORK FLOW

The following case illustrates some of the advances in glaucoma diagnostics that are streamlining work flow, making these technologies faster, more efficient, and better able to detect loss, possibly at an earlier point in time.

CASE: STABLE OR PROGRESSING?

- 47-year-old black female
- Primary open-angle glaucoma of 4 years duration
- Family history of glaucoma
- Initial therapy: latanoprost; switched to bimatoprost (Lumigan, Allergan); currently using brinzolamide/brimonidine tartrate (Simbrinza, Alcon)
- IOPs: 14 mm Hg OD, 15 mm Hg OS
- Pachymetry: 508 µm OD, 509 µm OS
- Gonioscopy: open angles with ciliary body visible 360°

Figure 1 shows the patient's most recent OCT scan. The RNFL deviation maps show loss superior temporal in both eyes. The average RNFL is 83 µm OD and 80 µm OS, with sectors flagged in the right eye (yellow at 10 o'clock) and the left eye (red at 1 o'clock). The TSNIT curve shows superior temporal thinning.

The PanoMap allows the RNFL and ganglion cell complex maps to be overlaid, providing a wide area for review (Figure 2). The loss extends superior temporal from the optic disc in both eyes to beyond the fovea.

The question for this patient is not whether glaucoma is present, but whether the disease is stable or worsening.

DISCUSSION

With the FORUM (ZEISS) software, also called the Integrated Diagnostic Imaging platform, data from the HFA3 and the CIRRUS HD-OCT (ZEISS) are displayed together on one screen, facilitating comparison of structure and function tests.

Figure 3 shows two different views of how the Structure-Function Guided Progression Analysis (GPA) is displayed. On the left at the top,

Figure 3. Two different views of how the Structure-Function Guided Progression Analysis is displayed.

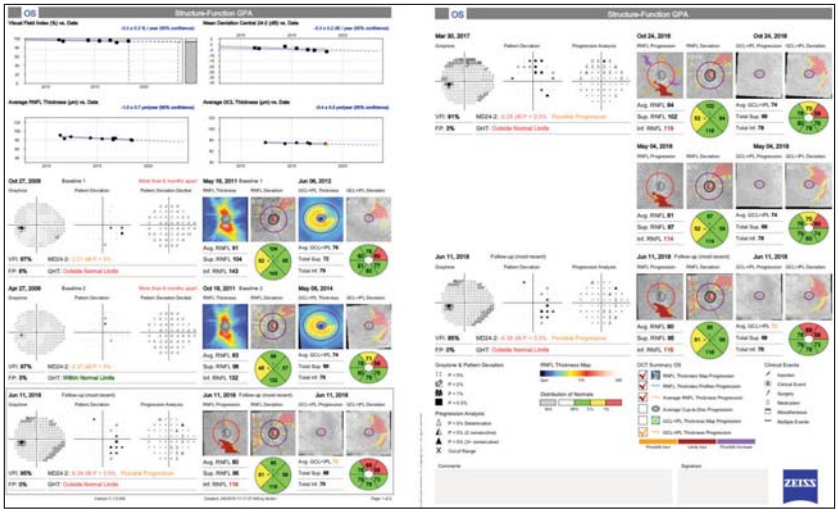

Figure 4. The OCT change analysis for the left eye shows a defect has enlarged inferior temporal, which is in addition to the defect already present superior temporal.

the trend analysis for the visual field's Visual Function Index (VFI) and mean deviation (MD) is shown. A small amount of change is noted (dip) toward the end of both lines. Just below this is the trend analysis for average RNFL and average ganglion cell layer thickness. In particular, the RNFL line (OD) is going down over time, indicating progression at a rate of 2.1 µm per year. This is a significant loss that has been confirmed by the colored circles on this trend line.

Below that, fields on the left show a recent loss superior. Adjacent to this are OCT printouts from 2011 to 2018 with an inferior temporal RNFL defect that was not present in 2011. The average RNFL value has decreased from 103 µm in 2011 to 83 µm in 2018. On the right are views of the progression analysis with relative stability from 2016 to 2018. Note that in 2016, brinzolamide/brimonidine tartrate was added to bimatoprost, further lowering the eye pressure.

Figure 4 shows the Structure-Function GPA for the left eye. On the left, both the MD and the VFI show little change, with the OCT average RNFL changing 1 µm per year. The OCT change analysis for the left eye shows a defect has enlarged inferior temporal, which is in addition to the defect already present superior temporal. The GPA for the visual fields shows progression inferior, which correlates with the superior RNFL defect. The majority of change occurred between 2011 and 2016, at which time a change to the medical regimen reduced IOP. Since then, visual fields and OCT appear stable also in the left eye.

SUMMARY

This case shows the utility of the Integrated Diagnostic Imaging platform (ZEISS) Structure-Function GPA in which the OCT and visual fields are shown side by side, allowing changes to be correlated between tests. Because structural and functional losses often do not occur at the same time, it is useful to see them both on one screen to better understand the temporal relationships. ■

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