

DO WE NEED PERIMETRY?

As glaucoma advances, visual field testing provides valuable insight.

BY MURRAY FINGERET, OD



With ophthalmic imaging technologies such as optical coherence tomography (OCT) rapidly evolving and as resolution and analysis software improve, it is natural to reassess the role of automated visual field testing in glaucoma management. Patients often remark that they dislike

perimetry, and studies tracking the clinical use of diagnostic testing have shown that fields are not done as often as recommended in preferred practice pattern documents.¹

Do eye care providers still need to perform perimetry in order to manage glaucoma patients? I believe the answer is a clear yes.

THE FLOOR EFFECT

Monitoring patients for both structural and functional change over time is important, but the usefulness of structural and functional change analyses varies over the course of a person's lifetime. Structural change—particularly progressive thinning of the neuroretinal rim or alteration in the retinal nerve fiber layer (RNFL)—is associated with the onset of glaucoma.² OCT imaging of the RNFL and optic nerve measurements are highly reproducible, and they change rapidly in early disease.³

The total range of RNFL thickness measurements is approximately 105 to 55 μm . Owing to what is known as the *floor effect*, OCT measurements of RNFL thickness do not go much below 50 μm , partially because of limitations in current retinal segmentation algorithms but also because considerable glial and fibrous tissue remains after most of the RNFL has been lost.⁴ What may be less apparent is that mean RNFL thickness measurements commonly approach this floor in patients who still have significant amounts of visual field. In other words, monitoring such individuals for further change with OCT will not help eye care providers, whereas visual field testing can continue to be informative (Figure 1).

ASSESSING CHANGE

Qualitative Review

There are a number of methods of evaluating visual field change. The simplest way is to qualitatively review series of single fields on the perimeter's overview report by comparing, for instance, the number of points flagged in the pattern deviation plots of each test. Even in such

qualitative evaluations, a minimum of three tests is needed to reliably gauge if change has occurred. Changes in global indices such as mean deviation (MD) or pattern standard deviation (PSD) can be misleading. Worsening MD may simply be the result of developing cataracts, with or without concurrent loss due to glaucomatous progression. PSD is sensitive to localized visual field change in early to moderate glaucoma, but PSD peaks at an MD of approximately -11 dB and then declines back in the direction of normality as field damage progresses.

Event Analysis

My own preferred application for tracking visual field change is the Guided Progression Analysis (GPA) found on the Humphrey Field Analyzer (Carl Zeiss Meditec). The GPA module offers two parallel analytical approaches, event analysis and trend analysis (Figure 2). The former was developed by Anders Heijl, MD, PhD, and colleagues for use as one of the endpoints in the Early Manifest Glaucoma Trial (EMGT). The event analysis looks for change from baseline at individual test points and flags those that have changed by more than the expected testing variability. Significance limits for expected variability were derived for each test point in a multicenter clinical trial in which glaucoma patients were each tested four times over the course of 1 month.^{5,6} A certain amount of intertest variability is



AT A GLANCE

- Monitoring patients for both structural and functional change over time is important, but the usefulness of structural and functional change analyses varies over the course of a person's lifetime.
- Visual field testing can provide valuable information on glaucomatous change after the retinal nerve fiber layer has become too thin for measurement by optical coherence tomography.
- Whereas event analysis can alert eye care providers that real change has happened, trend analysis can help them decide if the observed rate of progression is great enough to require a change in therapy.

WATCH IT NOW

Murray Fingeret, OD, addresses the limitations of reference databases used with optical coherence tomography devices.



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common in all individuals undergoing serial perimetry; variability has been found to grow with increasing field loss, however, and it is larger in the periphery than in the center of the visual field.^{7,8} Small triangles flag test points that change by more than the 95th percentile for variability seen in patients having similarly damaged fields.⁶

The software compares each successive follow-up to the average of two baseline tests in order to identify test points that show repeatable change. When the same three or more points are flagged on two consecutive tests, the GPA report notes “possible progression.” When the same three points are flagged on three consecutive follow-up tests, a message saying “likely progression” is seen. In other words, pointwise change must be confirmed on successive tests for disease progression to be considered a reliable finding. A finding of likely progression has been reported to have very high specificity.⁹

I should note that change from baseline analyses assumes that the baselines chosen are relevant to the patient’s current status. The eye care provider must periodically confirm that the baselines used are both reliable and relevant to the clinical situation. For instance, if therapy has changed significantly, new baseline tests must be established. The good news is that the perimeter is programmed to remember which tests the operator has chosen as baselines and will use them in future analyses until told to do otherwise.

Trend Analysis

GPA’s trend analysis complements the event analysis by quantifying the rate at which a series of fields is changing. The software performs a linear regression analysis of the visual field index (VFI), a parameter that summarizes each test in terms of a single number, with the VFI metric going from 100% in

normal fields to 0 in a perimetrically blind eye. Once five tests have been performed, the software presents a slope and rate of change. The trend line is shown against the x-axis of a person’s age, and the eye care provider may adjust therapy with the goal of reducing the rate of progression to acceptable levels.

Whereas event analysis can alert providers that real change has happened, trend analysis can help them decide if the observed rate of progression is great enough to require a change in therapy. For example, what may be an acceptable rate of disease progression in an elderly patient with early glaucomatous field loss may not be acceptable in a younger patient with moderate visual field damage. The development or progression of small scotomata may not noticeably affect summary parameters like VFI and MD, so it is best to use trend analysis findings in combination with the event analysis when deciding if someone requires an escalation in therapy.

CONCLUSION

Eye care providers must carefully observe glaucoma patients to identify the significant minority who require more aggressive therapy. Both structural and functional tests are needed over a person’s lifetime. Although change on OCT is useful early in the disease course, perimetry is needed as glaucoma advances. ■

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