BY MICHAEL HARRIS, MD

Finding Glaucoma Before It's Too Late

Innovative technology helps identify glaucoma's functional impacts years before structural damage is visible.

For my entire career, I have been diagnosing glaucoma based on structural change. When I saw a patient with high pressures and thin corneas, I tested the patient using visual fields and performed retinal tomography. I waited until I saw structural damage to start treatment. The only exception being IOPs over 30.

Using that approach, patients may have had glaucoma for five years before I started treatment. By the time I could see the structural damage, patients had already permanently lost a high percentage of receptors. It was a tremendous frustration.

Today, my goal is to diagnose patients who have had glaucoma for five months, not five years. I don't want to wait for abnormal optic nerve appearance or visual field evidence that might mean a patient has lost half of his healthy nerve cells — I want to diagnose and treat patients *before* they suffer significant structural damage.

Michael Harris, MD, is Director of Livingston Eye Associates, LLC, a comprehensive medical and surgical ophthalmic practice in Livingston, N.J.

Early detection and early treatment is the goal, with diagnosis prior to structural damage.

Uncovering Glaucoma Early

OCT has long been the gold standard of glaucoma testing. Unquestionably, it shows us cell death that occurs later in glaucoma's disease process. Visual field testing doesn't show loss of function that precedes structural damage, but visual electrophysiology — visual evoked potential (VEP) and electroretinography (ERG) — shows functional loss earlier.

I use the Diopsys® NOVA VEP and ERG Vision Testing System to measure function when other testing is normal or borderline and I still have questions about the patient's status.

ERG detects early changes in ganglion cell function by measuring the cells' reaction to stimuli. A five-year study sponsored by the National Institutes of Health showed that ERG can detect functional changes eight years before a patient has 10% loss of the optic nerve.[1] VEP testing measures the function of the entire visual pathway. It helps to separate eye disease from central nervous system defects. It also tests the magnocellular pathway that is impaired early in glaucoma.

These tests are not a competing technology with OCT and visual field testing. They are different in that they are useful at an earlier stage in glaucoma's disease process. As we continue to push for earlier diagnosis and treatment, I think visual electrophysiology will become the new paradigm. Technologies are always growing and improving to help us make diagnoses earlier and prevent serious cell damage to improve our patient's quality of life.

Better Information Sooner

I use visual electrophysiology to monitor patients with multiple risk factors, such as thin cornea, family history of glaucoma, pigmentary dispersion syndrome, large cups, ocular hypertension, pseudoexfoliation, asymmetric cups, or asymmetric pressures. When patients have two or three of these factors, but normal OCT and visual field, visual electrophysiology testing is a way to get useful information on assessing the risks of following without intervention. I will also use these tests to monitor therapy. OCT and visual field being normal in this category of patient are less useful for monitoring, but can be done as well.

The value of this technology is not for obvious cases. When we see serious optic nerve damage and a bad visual field, we hardly need more information to confirm a diagnosis. But the presence of glaucoma and other disorders is not always clear, particularly early in the disease process. More information in these cases is better. More information helps us confirm or rule out diagnoses before a patient has significant, permanent structural damage.

Reference

1. Banitt MR, Ventura LM, Feuer WJ, et al. Progressive loss of retinal ganglion cell function precedes structural loss by several years in glaucoma suspects. *Invest Ophthalmol Vis Sci.* 2013 Mar 28;54(3):2346-52. (Accessed: http://www.ncbi.nlm.nih.gov/pubmed/23412088)

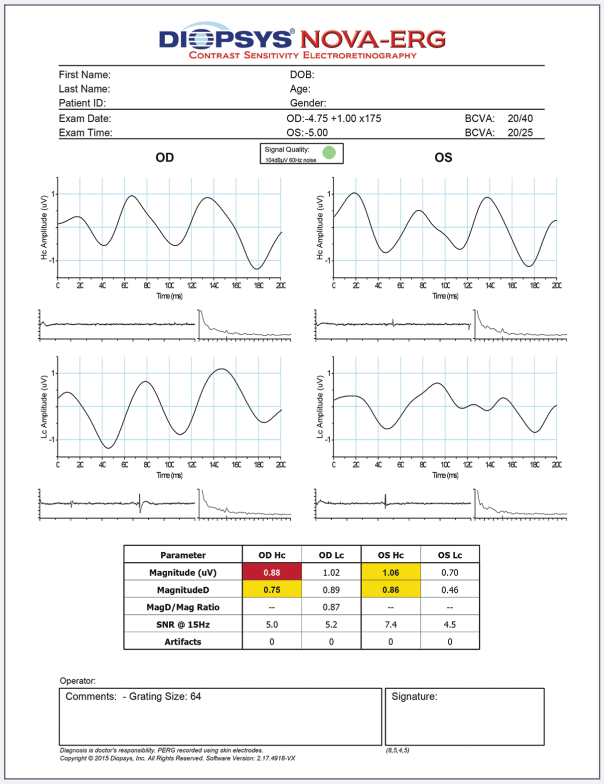

Figure 1. Before treatment, the patient's ERG results were abnormal.

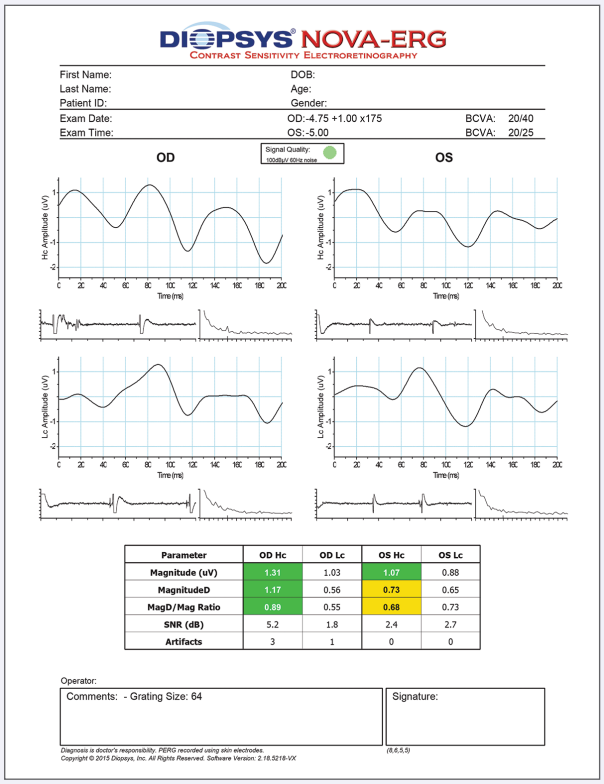

Figure 2. Post-treatment, ERG results showed significant improvement.

Case Study:
A Senior Patient with Rising IOP

Background

A 65-year-old female patient was seen yearly for comprehensive checkups and contact lens services. The patient had a family history of glaucoma, so as part of her annual exam, topographic imaging was obtained and compared against previous tests. Through the years, these images remained stable. Her IOPs ranged between 14 and 19 and were equal in both eyes, and PACH was 535ou.

In August 2014, the patient presented for her annual exam. At this time, her IOPs were recorded at 22 OD and 21 OS — a noticeable increase from previous visits. To keep an eye on her IOP, the patient was asked to return in three months. At the next checkup, her IOPs had increased again, this time measuring 25 OD and 24 OS.

A Proactive Approach

The patient's ocular hypertension was concerning, so she was asked to return once more for a visual field testing, optic nerve tomography, and a pattern ERG using the Diopsys® NOVA-ERG. The patient's IOPs were 26 OD and 23 OS; the visual field test was full with nonspecific misses; and the Pattern ERG was abnormal (**Fig. 1**), with the right eye more abnormal than the left.

Although visual field and optic nerve tomography showed no structural nerve damage, the abnormal results of the pattern ERG, coupled with her family history, led me to believe that this patient was at an increased risk of developing glaucoma. I decided to intervene and treat the patient's ocular hypertension rather than waiting for documentation of structural evidence of glaucoma damage.

On March 17, I performed a selective laser trabeculoplasty (SLT) at 180 degrees OD. Six weeks later, the patient's IOPs had dropped in both eyes to 17ou. I explained to the patient that the bilateral response is evanescent, and we would check her again in six weeks.

On August 3, the patient's IOPs were 16 OD and 21 OS. As I predicted, pressure increased again in the left eye. I recommended a second SLT treatment, this time to the left eye. To monitor her progress, I scheduled a follow-up visit three weeks later to perform another pattern ERG. The results showed a significant improvement in her retinal functioning as depicted in the colorized results (**Fig. 2**). This patient will require close monitoring to track her progress.

Early Detection is Key

The diagnosis of glaucoma is not difficult to make once there are structural signs of damage. Early diagnosis, prior to structural damage, using electrophysiologic testing offers the patient a better prognosis. Specialty testing with the Diopsys® NOVA-ERG detected the earliest of changes in an otherwise asymptopatic patient. As a result, I was able intervene in the pre-glaucoma stage, helping not only to delay or minimize the development of glaucoma, but also to closely monitor her progress throughout time.

The Diopsys® NOVA is an electrophysiology device that generates photic stimuli, and records, processes, and analyzes the resultant signals to provide information about the visual system. This article and case study represent the experiences and opinions of Dr. Michael Harris. Physicians should make medical decisions based on the individual facts and history of each patient.

For more information, please visit www.diopsys.com/Harris or call Diopsys directly at (973) 244-0622.