Optic Nerve Head Drusen and Glaucoma

BY LILY IM, MD, AND LEON W. HERNDON, MD

CASE PRESENTATION

A 64-year-old white female presented to our glaucoma clinic in September 2004. Her local ophthalmologist had referred the patient for possible glaucoma diagnosis in the presence of longstanding drusen of the optic nerve head. Upon presentation, the patient complained of slow, progressive vision loss in her left eye. Her past medical history was significant for hypertension, gastroesophageal reflux disease, and osteoporosis. The patient was taking multiple daily oral medications, including nabumetone, hydrochlorthazide, Toprol (AstraZeneca LP, Wilmington, DE), Nexium (AstraZeneca LP), and Miacalcin (Novartis Pharmaceuticals Corporation, East Hanover, NJ). Her ocular medications included Alphagan (Allergan, Inc., Irvine, CA) OU b.i.d., Timoptic XE 0.5% OS q.d. (Merck & Co., Inc., West Point, PA), and Xalatan (Pfizer Inc., New York, NY) OU q.h.s. The patient had a sulfa allergy that induced hives, and her family history was significant for a mother who was blind due to glaucoma.

The patient's bilateral optic drusen were first documented in 1961. At that time, her IOP was 21 mm Hg OU by Schiotz tonometry. Visual defects were recorded in 1999, and topical therapy with Alphagan and Xalatan began that lowered her IOP from 21 to 18 mm Hg OU. Despite treatment that lowered the IOP by 14%, clinical examination in 2001 showed visual field progression in her left eye. Two argon laser trabeculoplasty procedures of 180° each on this eye reduced the IOP to 15 mm Hg OU. After the subsequent addition of Timolol to the topical regimen for the patient's left eye, her IOP remained stable at 12 to 13 mm Hg OS and 13 to 15 mm Hg OD for 1 year. Her most recent visual field showed progression in her left eye (Figure 1).

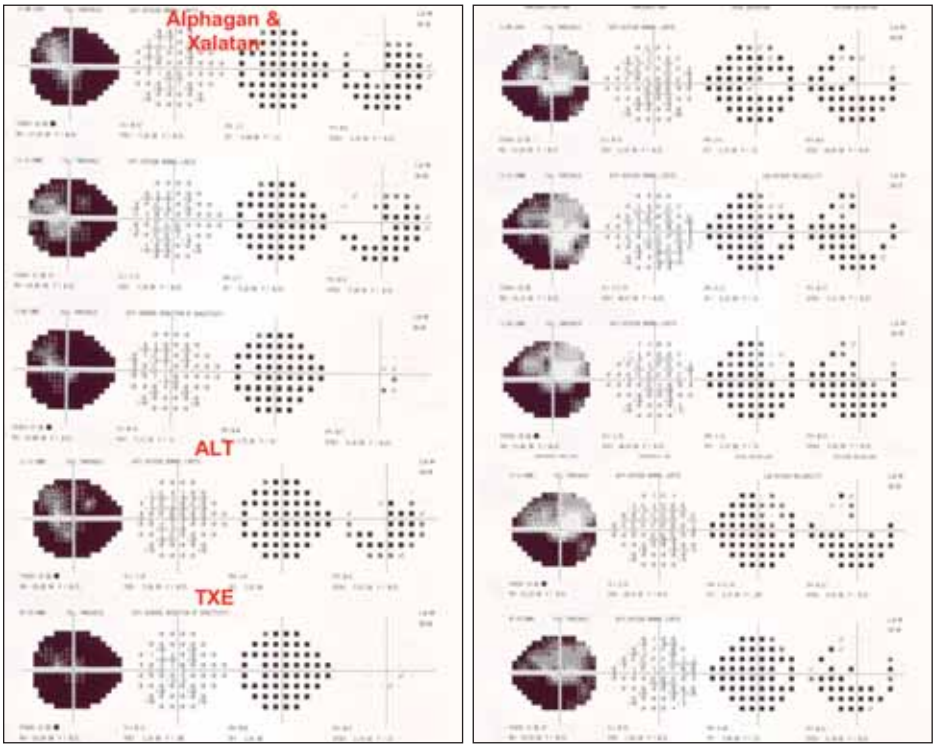

Figure 1. The patient's ophthalmologist performed bilateral, 24-2 Humphrey visual field testing using the Swedish Interactive Threshold Algorithm-Standard.

Upon initial examination at our glaucoma clinic, the patient's BCVA was 20/25 OD and 20/40 OS. Her IOP was 15 mm Hg OD and 16 mm Hg OS. Slit-lamp examination of the anterior segment of both eyes was unremarkable. Gonioscopy was open to the ciliary body band 360° in her right eye, and her left eye showed regularly spaced peripheral anterior synechiae 360° that were consistent with previous argon laser trabeculoplasty. Central corneal thickness measured 598 µm OD and 597 µm OS. Ishihara color plate testing was depressed,

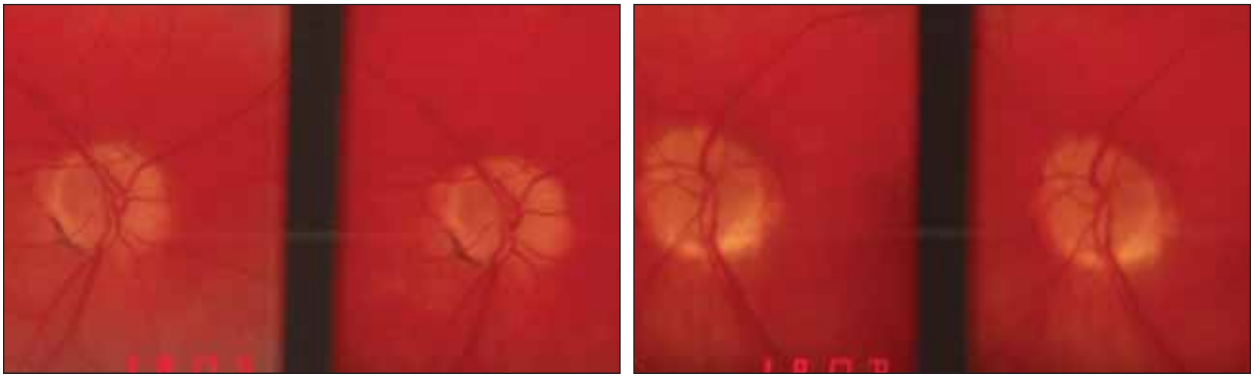

Figure 2. The authors obtained stereo disc photographs for this patient.

with only two of eight positive identification bilaterally. Dilated examination revealed a subtle epiretinal membrane in the patient's right eye and faint mottling of the retinal pigment epithelium in her left eye. Large, elevated, tuberous optic nerve drusen were more prominent in her left eye (Figure 2).

HOW WOULD YOU PROCEED?

1. Do the visual field changes truly show progression or long-term fluctuation?
2. Are the visual field findings due to drusen or glaucoma?
3. Would ancillary testing be helpful?
4. Is surgical intervention warranted?

CLINICAL COURSE

Repeat Humphrey visual field testing (Carl Zeiss Meditec Inc., Dublin, CA) confirmed the presence of an inferior arcuate defect and a nasal step, both seemingly stable, in the patient's right eye. The visual field, however, had worsened in her left eye; testing showed complete, diffuse depression and worsening of the mean deviation (Figure 3). Optical coherence tomography (OCT; necessary because stereo photographs did not

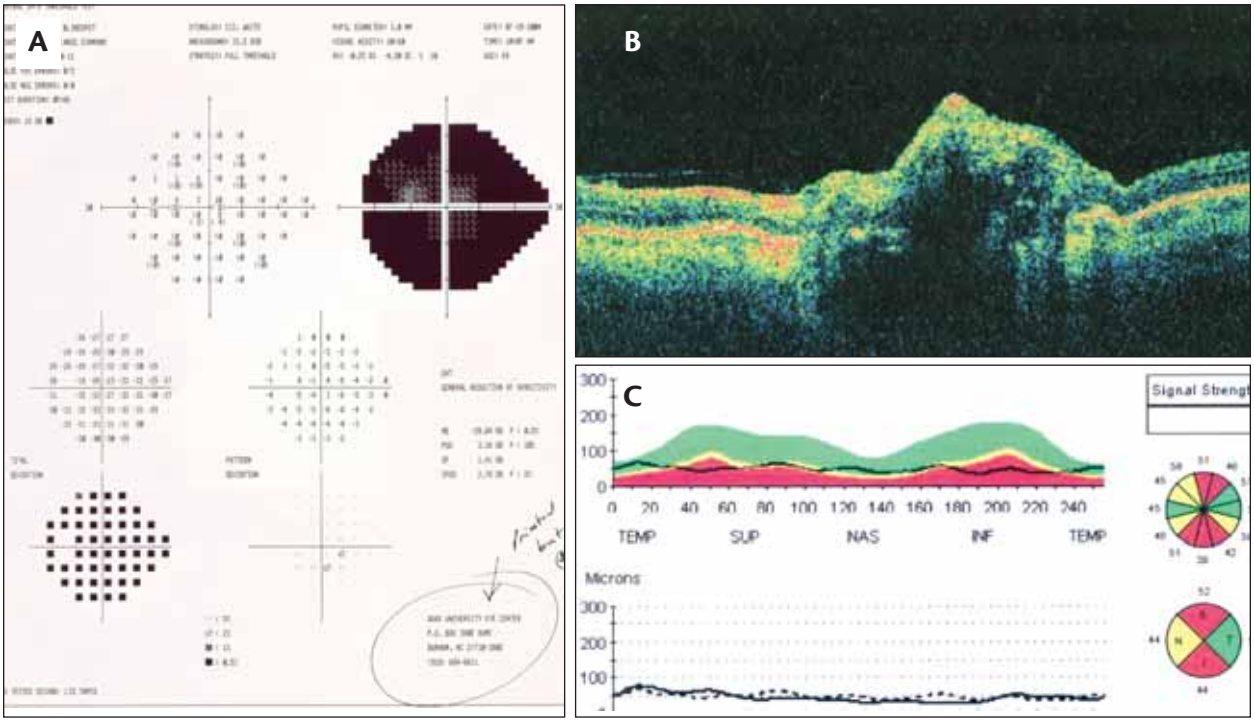

Figure 3. The Humphrey visual field (A), axial OCT of the optic nerve (B), and OCT of the RNFL (C) of the patient's left eye are shown.

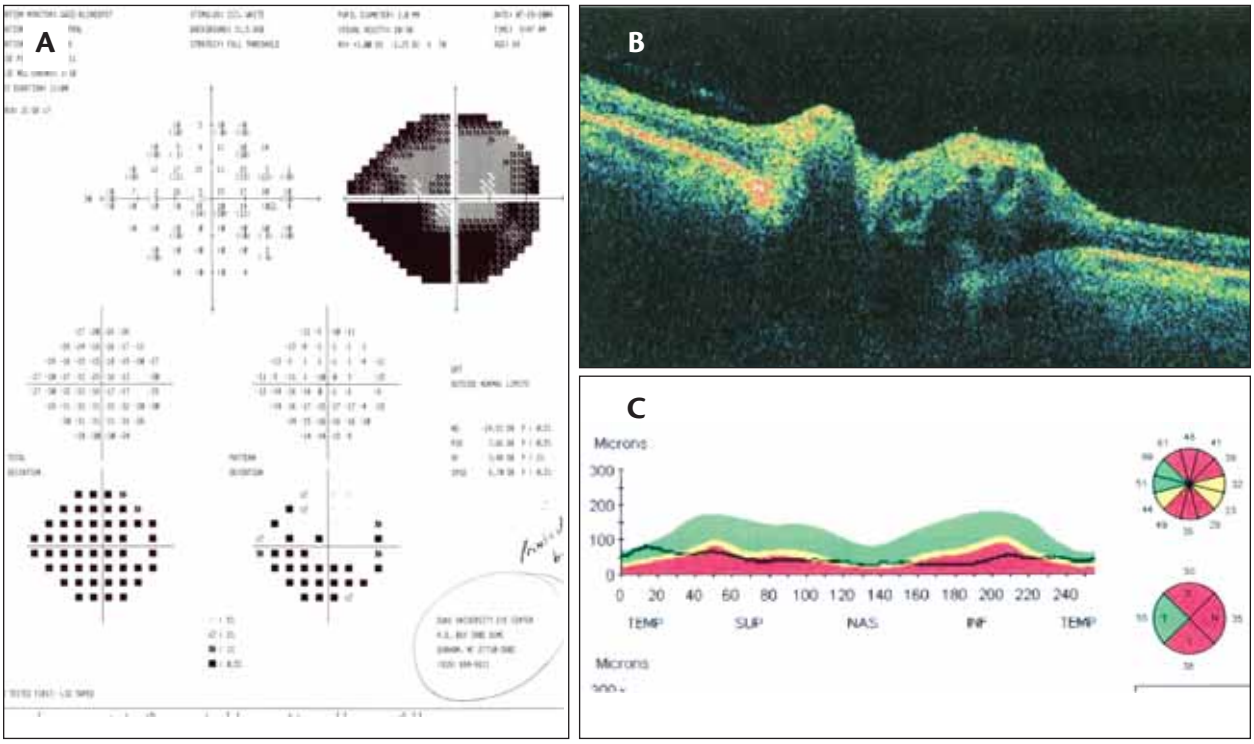

Figure 4. The Humphrey visual field (A), axial OCT of the optic nerve (B), and OCT of the RNFL (C) of the patient's right eye are shown.

show the nature of the drusen) and analysis of the retinal nerve fiber layer (RNFL) revealed significant bilateral thinning. OCT cross-sectional imaging of the optic nerve head verified large, protuberant drusen in both eyes (Figures 3 and 4).

OUTCOME

After a lengthy discussion with this patient regarding treatment options, including surgery, she opted for close observation. We discussed the possibility of starting a carbonic anhydrase inhibitor, but, in light of her sulfa allergy, we arranged for the patient to be evaluated by an allergist prior to using this type of agent. She has not yet seen the allergist and is scheduled for follow-up with us next month. Current management was continued.

DISCUSSION

Differentiating visual field changes due to optic disc drusen from those caused by glaucomatous damage is difficult if not impossible, even with currently available techniques. Optic nerve head drusen are globular, calcified, hyaline bodies usually detected on clinical examination. They are relatively infrequent in the general population (an incidence of 3.4 per 1,000[1]) and are bilateral when present in up to 91.2% of patients.[2] Although no distinct gene has been identified as causative, pedigree studies suggest a theory of irregular dominance.

Ultrastructurally, drusen are degenerative axonal byproducts. Although the exact etiology of optic nerve head drusen is unknown, investigators have postulated that tight scleral foramina impede normal axoplasmic flow and lead to stasis and, ultimately, extrusion of metabolic debris in the extracellular space.[3] Continuous calcification of the debris may then cause an enlargement of drusen over time. Drusen are most frequently seen as multilobular yellowish-white or pinkish nodules, but they can be confirmed by B-scan ultrasonography, CT scan, autofluorescence on red-free photography, or cross-sectional OCT imaging. Although it is currently unknown why drusen are associated with visual field defects, the likely causes are axonal damage and RNFL loss.

Complicating the determination of what caused the damage, many changes seen in glaucomatous eyes can also be observed in nerves with optic drusen. Occasionally, neovascularization or hemorrhages may appear in the optic disc and extend into the peripapillary region, just as they may in glaucoma. In 71% of eyes with optic disc drusen, various visual field defects have been

reported, including an enlargement of the blind spot, generalized constriction, nasal depression, and arcuate scotomas.[4] Progression in one study occurred in 16% to 22%, with the most drastic field change attributed to vascular complications such as anterior ischemic neuropathy.[5] Thinning of the RNFL has also been documented, most commonly in the nasal peripapillary region.[4] Although OCT recently confirmed RNFL thinning in patients with drusen, interestingly, the thinning did not always correlate with where drusen appeared on the nerve during clinical examination or with visual field changes.[6]

"Most patients are unaware of their scotomas, but severe visual defects usually precede the severe impairment of visual acuity."

Most patients are unaware of their scotomas, but severe visual defects usually precede the severe impairment of visual acuity.[3] Transient amaurosis and even monocular blindness are rare but can occur. Unfortunately, no effective treatment for optic nerve head drusen is available.

In this case, determining the etiology of our patient's visual field progression is a formidable challenge. Her large anterior drusen obviously obscure cupping, but OCT imaging confirms significant thinning of the RNFL. Despite treatment that has lowered her IOP, the patient continues to lose visual field, especially in her left eye. Of particular concern is the

DISCUSSION

By Alan L. Robin, MD

It is often difficult to determine who does and who does not have glaucoma as well as to define progression.[1] We clinicians have learned that IOP is neither adequately sensitive nor specific to diagnose glaucoma, and we have turned instead to the appearance and function (visual fields) of the optic nerve in order to make a diagnosis.

This article deals with one of many exceptional cases in which we have trouble evaluating the parameters of the "normal" optic nerve. Here, optic nerve head drusen have permanently altered the disc's appearance. These drusen alone may have caused visual field changes and progression. Newer technologies such as optical coherence tomography may assist us in such a case.

Comparable problems face us in young children in whom accurate perimetry is not possible. Similarly, it is difficult to detect a glaucomatous etiology for visual field changes in patients who have suffered a cerebrovascular accident and have a neurological reason for the perimetric loss. Additionally, some individuals whose optic nerves have an oblique or unusual appearance present a challenge to ophthalmologists attempting to assess glaucomatous damage or change. Eyes with colobomata or pits may have coexisting perimetric changes with other disc pathology but not with glaucomatous loss.

In their article, Drs. Herndon and Im stress the importance of the clinical assessment of disease and the possible role that newer technologies may play. Many cases lack a clear "right" or "wrong" and force us to act on clinical assumptions. They also highlight the importance of doctors who focus on building relationships with patients and involving them in decisions about their care.

Alan L. Robin, MD, is Clinical Professor of Ophthalmology at the University of Maryland in Baltimore. He is Associate Professor of Ophthalmology at the Wilmer Eye Institute and Associate Professor of International Health at the Bloomberg School of Public Health, both at Johns Hopkins University in Baltimore. Dr. Robin may be reached at (410) 377-2422; glaucomaexpert@cs.com.

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significant overall depression observed, because patients with drusen on the optic nerve's surface seem to be at the highest risk for losing visual acuity. We do not know exactly what is causing vision loss in this case, glaucomatous progression or drusen. Decreasing IOP, however, may be helpful in cases of drusen in which the optic nerve is crowded, causing RNFL loss and possible vascular compromise.

We plan to follow this patient serially for RNFL thinning by OCT and for regular visual field testing. She refused surgical intervention, and we are unable to add another topical agent until she consults with her allergist.

We believe that nerves crowded by large drusen are more susceptible to damage and that the monitoring and lowering of IOP should be undertaken upon the documentation of RNFL thinning with visual field progression. ❑

Leon W. Herndon, MD, is Associate Professor of Ophthalmology at the Duke University Eye Center in Durham, North Carolina. He stated that he holds no financial interest in the products or companies mentioned herein. Dr. Herndon may be reached at (919) 684-6622; leon.herndon@duke.edu.

Lily Im, MD, is Clinical Associate at the Duke University Eye Center in Durham, North Carolina. She stated that she holds no financial interest in the products or companies mentioned herein. Dr. Im may be reached at (919) 684-6622; lily.im@duke.edu.

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