died 43 months after the onset of his illness, and there was a light but diffuse infiltrate of lymphocytes throughout the choroid; marked sclerosis of choroidal blood vessels with medial fibrosis and plump, prominent endothelial cells; prominent edema and fibrosis; areas of necrosis and hyperplasia of the retinal pigment epithelium; and degeneration of the overlying sensory retina.

In my patient, both eyes had many foci of granulomatous inflammation in the posterior choroid, rare minute foci of fibrinous necrosis in the choroid just beneath the choriocapillaris, and areas where the choriocapillaris was infiltrated by inflammatory cells. The inflammatory infiltrate in my patient resembled the granulomatous sclerouveitis reported in WG, which contains a mixture of T and B lymphocytes, macrophages, and areas of necrosis in the choroid just beneath the choriocapillaris, and areas where the choriocapillaris was infiltrated by inflammatory cells. The inflammatory infiltrate in my patient resembled the granulomatous sclerouveitis reported in WG,5 which contains a mixture of fibrinous necrosis in the choroid just beneath the choriocapillaris, and areas where the choriocapillaris was infiltrated by inflammatory cells.

I postulate that the difference in the histological appearance of the choroid in my patient’s eyes and that reported by Cutler and Blatt is due to the shorter duration of the WG in my patient and its stage of activity at the time of death. However, I cannot exclude the possibility that the difference reflects underlying variation in choroidal manifestation of WG.

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**Online First**

Detection of Progressive Glaucomatous Optic Neuropathy Using Automated Alternation Flicker With Stereophotography

Examination of the optic nerve complex (optic nerve head, retinal nerve fiber layer [RNFL], and parapapillary region) is an integral part of the examination for glaucoma. Glaucomatous optic neuropathy (GON) can be diagnosed by characteristic changes in the neuroretinal rim, RNFL, or parapapillary region and often precedes visual field loss.1

**Video available online at www.archophthalmol.com**

The use of flicker chronoscopy for the longitudinal evaluation of glaucomatous change in serial optic nerve photographs was first described by Goldmann and Lotmar.2 A new technique, automated alternation flicker (AAF), may facilitate the detection of progressive optic disc change.3 The original technique of alternation flicker involved manual alignment and alternation of serial disc photographs (eg, using 2 overlapping projectors to display sequential images onto a screen).4 Although time-consuming, this approach permitted discerning structural optic nerve changes over time. Automated alternation flicker, however, uses software that automatically aligns 2 images by identifying vascular intersections or other salient image features, superimposing the photos at a subpixel level after global transformations (eg, rotation and magnification), and alternating the images at a user-dictated frequency.

Automated alternation flicker has previously been used to identify changes between monoscopic images, a potential limitation of this technique. Evaluation of serial sets of optic disc stereophotographs has been suggested to be the best standard for monitoring glaucomatous change in both clinical and research settings. In particular, 3-dimensional visualization of the optic nerve complex can provide a clear view of neuroretinal rim tissue changes. Perhaps for this reason, interobserver agreement for optic nerve grading is higher with stereoscopic assessment, and stereoscopic photographs may permit greater sensitivity for and earlier detection of GON compared with monoscopic viewing.3 We describe the combined use of AAF with stereoscopic photography to detect structural progression in 3-dimensional viewing in 4 cases of GON: topographic change with blood vessel movement, neuroretinal rim loss, parapapillary atrophy progression, and disc hemorrhage.

**Methods.** Baseline and longitudinal digitized optic nerve stereophotographs from 4 patients with progressive GON were taken with a Nidek 3Dx simultaneous stereo camera (Nidek Inc, Fremont, California) and imported into Matched-
Flickr8 software (V1.2; EyeIC, Narberth, Pennsylvania), which aligned the images using an automated algorithm. Screen captures from the MatchedFlicker8 software were then imported into Adobe Photoshop CS3 (V9.0; Adobe Systems, San Jose, California), and a movie file was created that alternated the baseline and follow-up photographs of the serial photographic pairs at a flicker rate of 2 Hz.

Results. The MatchedFlicker8 software successfully aligned and alternated the 4 cases of progressive GON. The alternating serial pairs demonstrated neuroretinal rim blood vessel movement (video 1, http://www.archophthalmol.com), progressive neuroretinal rim loss (video 2), parapapillary atrophy progression (video 3), and a disc hemorrhage (video 4).

Comment. We demonstrate a technique to assess optic nerve head changes using both AAF technology and stereoscopic optic nerve images, a combination that has not been previously described and that may potentially enhance clinicians' ability to detect progressive GON. Despite its importance in glaucoma diagnosis and monitoring, optic disc evaluation shows poor agreement among observers and may not correlate with changes found during visual field evaluation or structural assessment using imaging technologies.

Our method may optimize the ability to detect early structural changes and overcome the aforementioned limitations. This may have meaningful implications for early glaucoma diagnosis and detection of progressive structural change and should be further compared with other devices currently used to detect glaucoma progression.

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