localized defects of the retinal nerve fiber layer in Jonas and Xu's[4] report was significantly higher in the patients with POAG and ocular hypertension together having disc hemorrhages (35%) than in those without (17%).

Although in individual patients a relation between disc hemorrhages and retinal fiber layer defects can be confirmed by changes in the visual fields, it recently was reported that subtle nerve fiber layer defects are beyond the level of detection by automated perimetry (unpublished data, Milior et al; presented at the 1994 ARVO Annual Meeting). In a group of 32 patients with glaucoma and disc hemorrhages, we observed a mean delay of 3 years before deterioration of visual fields became significant with automated perimetry (unpublished data; presented at the 1992 ARVO Annual Meeting). In addition, only 5 (31%) of 16 progressive eyes disc hemorrhages showed a relation between the position of disc hemorrhages at the optic nerve head and localized visual field progression. Both observations indicate that although disc hemorrhages may have a direct relation with the development of slits and wedges in the nerve fiber layer, the gross progressive changes in the visual fields detectable with perimetry mostly are related indirectly to observed disc hemorrhages in glaucoma.

In conclusion, disc hemorrhages seem to be an early general sign of chronic impairment of ocular blood flow at the optic nerve head, rather than a direct cause of gross visual field deterioration. We agree with Drs. Jonas and Iester that the presence of a disc hemorrhage with ocular hypertension is important in the differential diagnosis of ocular hypertension from early glaucoma, but this does not imply that patients with ocular hypertension and disc hemorrhages will, per se, convert to POAG in time.

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## Ultrasound of Macular Holes

Dear Editor:

I read with interest the article by Dugel and co-workers entitled, "Macular Hole Syndromes: Echographic Findings with Clinical Correlation" (*Ophthalmology 1994;101: 815–21*), and congratulate the authors on an excellent study. Based on a clinical and ultrasonographic study of macular holes begun in October 1991 and presented at the October 1992 Annual Meeting of the Vitreous Society and the November 1993 Annual Meeting of the American Academy of Ophthalmology, I agree that ultrasonography provides useful and accurate adjunctive information in evaluating macular holes. Unlike the study of Dugel and colleagues, my study included all stages of macular holes, including stage I macular holes, and correlated the ultrasonographic findings to the clinical course of 47 eyes of 44 patients with macular holes in varying stages of development.

In my opinion, the greatest benefit of ultrasonography in evaluating eyes with macular holes is in examining the optically clear vitreous structures and the vitreoretinal relations. To best evaluate the vitreoretinal relations in eyes with macular holes, I agree with using longitudinal and transverse scans with high gain, which avoid loss of resolution due to absorption by the natural crystalline lens or implant.[1] Horizontal axial scans, in my experience, have been less helpful than longitudinal scans due to the above noted absorption problems. An important probe position used throughout my study, but used only "in some cases" by Dugel and colleagues, is the longitudinal scan of the nasal posterior fundus, which provides the best opportunity to demonstrate fine macular details at low gain, and the nasal vitreoretinal relations to the optic nerve and macula itself at high gain. At low gain, this particular probe position was most successful in imaging the macular hole.

Although stage I macular holes were purposefully not studied in the article by Dugel and associates, I believe that the ultrasonographic study of the vitreoretinal relations has been most useful in acutely symptomatic eyes, many of which are stage I macular holes. Echography can evaluate not only for the important prognostic finding of the presence or absence of a posterior vitreous detachment or vitreofoveal separation, but also can detect a focal foveal elevation in stage I macular holes, which corresponds to the reversal of the foveal depression characteristic of the biomicroscopic findings in stage I macular holes.[2] In addition, focal insertion of cortical vitreous fibers can be demonstrated to the focal foveal elevation in many acutely symptomatic macular holes. This ultrasonographic finding supports the tangential cortical vitreous traction theory of Gass.[2]

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### Authors' reply

Dear Editor:

We thank Dr. Kokame for his interest in our article. We are pleased that he concurs with our conclusion that echography has a very important role in evaluating macular hole syndromes. There are four basic B-scan probe positions that allow optimal imaging of the macula: hori-

zontal, axial, vertical transverse, and longitudinal and vertical macula.[1] During a typical examination, all four positions are used. The most useful probe position for a particular patient will vary and depend on several patient and examiner characteristics: lens status, lens opacity, configuration of posterior vitreous detachment, and examiner preference and experience.

Our study evaluated the correlation of echographic and intraoperative findings in 25 patients who underwent macular hole surgery. Stage I macular holes were not studied because the role of surgery in impending macular holes is unclear.[2] Our limited experience in distinguishing stage I holes from early stage II holes echographically has been disappointing. However, a recent prospective study[3] concurs with Dr. Kokame's echographic findings of impending and full-thickness macular holes. These studies also confirm Dr. Gass'[4] theory of cortical vitreous traction in the pathogenesis of macular holes.

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## Reliability of Visual Fields in AGIS

Dear Editor:

The authors of the recent article entitled, "Advanced Glaucoma Intervention Study. 2. Visual Field Test Scoring and Reliability" (*Ophthalmology 1994;101:1445–55*), recognize the need for trustworthy indices in evaluating automated perimetry results. They assert that "objective, quantitative methods of scoring test reliability and severity" were developed for this purpose. It appears, however, that they actually confirmed the inadequacy of automated, light threshold perimetry for the clinical task at hand.

Their criteria for reliability accept up to 20% fixation losses, 33% false-positive responses, and 33% false-negative responses. Other studies have shown that only approximately half of patients with glaucoma are able to meet these relaxed criteria.[1] These standards would permit a patient to have less than 20% correct responses and still be deemed reliable. Despite those generous parameters and in a preselected population experienced in taking these tests, 16% of subjects in this report had large fluctuations that were not supported by clinical findings. This is consistent with previous findings that when other factors (learning curve, order of tests, long- and short-term fluctuations, associated ocular disorders, fatigue, etc.) are considered, "one is forced to conclude that there is at present no way (that has been validated) to tell if a patient's visual field is getting worse."[2] Prior studies documented inter examination instability, which apparently is confirmed by this report, and warned that "one should almost never base a therapeutic decision on a single visual field change. The determination must be repeated and the change shown to be reproducible."[3] Reliability also is reduced by prolonged tests with more presentations[4] and in patients with documented glaucoma.[5] The test protocol in this study used 400 questions as a limit for reliability, and the subjects were only those with medically uncontrolled glaucoma.

Clinical instruments often are designed around the concepts and technology available at a particular point in time. Automated perimeters are direct descendants of tangent screens. They embody the same beliefs about the organization and functions of the visual system. We now have decades of experience with various test protocols and statistical analyses of the subjective and equivocal data generated by automated perimeters. This has led to the realization that the appearance of visual field defects is an arbitrary point that occurs only after considerable portions of the optic nerve have been lost.[6] It may be more productive to reconsider traditional ideas about perimetry and its appropriateness to glaucoma management than to habitually manipulate statistics in futile attempts to extract useful information from essentially spurious data.[7]

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