

Highlights of the World Glaucoma Congress

The latest research findings from the biennial meeting of the World Glaucoma Association, held in Boston July 8 to 11, 2009.

BY GEOFFREY T. EMERICK, MD

The World Glaucoma Association is an umbrella organization representing national and regional glaucoma societies. Its activities include the publication of the *International Glaucoma Review* and a Consensus Series combining global expertise on glaucoma surgery, screening, and other subjects (both published by Kugler Publications [Amsterdam, The Netherlands]). This year's meeting, the largest to date, attracted 2,666 participants from more than 50 countries, with 78% coming from outside the United States. Highlights of the World Glaucoma Congress (WGC) included didactic sessions, symposia, free papers, posters, a film festival, exhibitors, and social events. This article focuses on several new research findings with the most immediate clinical relevance.

DIAGNOSTIC TESTING

Despite advances in imaging technology, the comparison of serial stereo disc photographs is still the standard used in clinical studies and practice. Another option is alternation flicker technology, a way of converting serial photographs into a "movie" in which change is visible as motion (MatchedFlicker; EyeC Inc., Narberth, PA). Nathan Radcliffe, MD, presented a comparison of alternation flicker and stereo photographs for the detection of progression. Four graders assessed disc photos for nerve head progression, disc hemorrhage, or blood vessel movement. The graders also evaluated the photographs using alternation flicker. Visual field progression was assessed as well. Forty eyes of 20 patients with glaucoma were included. All had a minimum of 36 months' follow-up, with visual field testing every 4 months and annual disc photographs. The agreement among graders was not significantly different using photographs or alternation flicker ($P = .29$) for changes in the optic nerve head. Agreement, however, was better ($P < .001$) using stereo photographs for disc hemorrhage and better ($P = .002$) using flicker for blood vessel movement. The overall agreement between visual field progression

and disc progression using stereo photographs and flicker analysis was similar. The study's authors concluded that the assessment of glaucomatous optic disc progression using alternation flicker may be as good as standard stereo disc photographs.¹

Given the pitfalls of visual field testing, the search continues for an objective test of visual function. Multifocal visual evoked potentials (mfVEP) offer a potential alternative. Hemamalini Arvind, MD, and colleagues from the University of Sydney, Australia, sought to determine the ability of blue-on-yellow mfVEP to identify functional loss in preperimetric glaucoma. Thirty patients with glaucomatous optic discs and normal visual fields were tested using mfVEP. Stereo disc photographs and optical coherence tomography (OCT) were also evaluated. Fourteen (46.7%) patients demonstrated significant abnormality on visual evoked potential amplitude asymmetry deviation plots. In all 14 cases, the defect was monocular and corresponded to the eye with the worse disc. In 13 of 14 patients, the defect also corresponded to the location of the worst affected rim. In eyes with visual evoked potential defects, the average thickness of the retinal nerve fiber layer was $81.2 \pm 9.9 \mu\text{m}$, significantly lower than that of patients without defects ($90 \pm 10.5 \mu\text{m}$, $P = .035$). The study's authors concluded that amplitude asymmetry of blue-on-yellow mfVEP appears to be a promising tool to identify functional loss in preperimetric glaucoma.²

GLAUCOMATOUS PROGRESSION

Measuring progression is a critical challenge in the management of patients with glaucoma. Michael Kass, MD, presented data from the Ocular Hypertension Treatment Study (OHTS) indicating that, despite treatment, many patients who developed glaucoma based on optic nerve progression went on to develop a visual field defect and vice versa. Of 84 participants with an initial optic disc endpoint, 32 (38%) developed visual field loss; of 59 participants with initial visual field loss, 29 (49%) went on to

show optic nerve damage.³

Beta-zone parapapillary atrophy and disc hemorrhage are known risk factors for glaucomatous progression. In areas of beta-zone parapapillary atrophy, retinal pigment epithelium and photoreceptors are absent, and choroidal vessels with underlying sclera are visible. Gustavo De Moraes, MD, and colleagues studied 245 eyes with glaucoma from the Glaucoma Progression Study (GAPS). Beta-zone parapapillary atrophy was present in 146 (65%) and a disc hemorrhage in 41 (16%). Of the eyes with a disc hemorrhage, 32 (78%) had parapapillary atrophy. In multivariate analysis, only baseline IOP (HR: 1.09, $P < .01$) and the presence of beta-zone parapapillary atrophy (HR: 2.42, $P < .01$) were statistically significant predictors of visual field progression. The researchers proposed an increased susceptibility of the optic nerve head complex in linking disc hemorrhage and parapapillary atrophy. Since disc hemorrhages are transient, parapapillary atrophy may have emerged as a stronger predictor. The investigators concluded that clinicians should pay careful attention to parapapillary atrophy in patients with glaucoma.⁴

Visual fields have long been used to measure glaucomatous progression, with varying success. Physicians are also making increasing use of objective measurements, including imaging devices. Progression software has been available for confocal scanning laser ophthalmoscopy and scanning laser polarimetry for several years. Christopher Leung, MD, and colleagues used recently developed progression software for OCT (Guided Progression Analysis; Carl Zeiss Meditec, Inc., Dublin, CA) to evaluate 586 OCT scans. A mean of 9.5 scans were performed in each eye. Progression analysis detected 19 eyes with progression at a specificity of 95% to 99% compared with 12 eyes detected with visual field mean deviation trend analysis. As expected, the inferotemporal sector most frequently showed progression.⁵

CATARACT SURGERY IN ANGLE-CLOSURE GLAUCOMA

Angle-closure glaucoma (ACG) was accorded center stage at the WGC, given the conference's international flavor and the worldwide significance of this form of glaucoma.

Cataract surgery can be an effective treatment for ACG, either in the acute or chronic stages. A common question is when to combine cataract surgery with a glaucoma filtering procedure. Clement Tham, MD, and colleagues from Hong Kong identified factors predicting IOP control after phacoemulsification and combined phacotrabeculectomy in chronic ACG with coexisting cataract. The investigators randomized 123 eyes. They used an IOP control index (IOP X [number of glaucoma medications + 1]) to represent the quality of pressure control. In multivariate analysis, the preoperative IOP control index was the only factor

significantly associated with the postoperative index. The investigators' conclusion was that cataract surgery alone is effective in eyes with chronic ACG and controlled preoperative IOP, with fewer postoperative complications than the combined procedure.⁶

CEREBROSPINAL FLUID PRESSURE

Increasing evidence points to the role of cerebrospinal fluid (CSF) pressure in glaucoma. Berdahl et al found CSF pressure to be significantly lower in 28 patients with primary open-angle glaucoma compared with that in 49 controls.⁷ At the WGC, Ren and colleagues presented the results of a prospective study of CSF in patients with open-angle glaucoma and normal IOP.⁸ The researchers examined 43 patients with open-angle glaucoma (14 with normal IOP and 29 with elevated IOP) and 71 controls. CSF pressure was significantly lower in subjects with normal IOP (9.5 ± 2.2 mm Hg) than in the high-IOP group (11.7 ± 2.7 mm Hg) or in controls (12.9 ± 1.9 mm Hg). The translamina pressure difference (IOP - CSF pressure) was higher in the normal-IOP glaucoma group (6.6 ± 3.6 mm Hg) and the high-IOP group (12.5 ± 4.1 mm Hg) than in the control group (1.4 ± 1.7 mm Hg). Patients with lower CSF pressure and a higher translamina pressure difference tended to have worse glaucoma. The study's authors concluded that a low CSF pressure may contribute to optic nerve damage in an eye with "normal" IOP. Whether the manipulation of CSF pressure becomes a potential target for glaucoma therapy remains to be seen. □

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