Journal Highlights

EXTRA
CONTENT AVAILABLE

NEW FINDINGS FROM *OPHTHALMOLOGY, AJO,* AND *JAMA OPHTHALMOLOGY*

Ophthalmology

SD-OCT Shows Progressive Glaucomatous Damage Undetected by Conventional Methods

November *Ophthalmology*

Liu et al. set out to establish whether progressive loss of the retinal nerve fiber layer (RNFL) occurs in the fellow eye of patients who have unilateral glaucoma. This prospective longitudinal, observational cohort study found that a substantial proportion of fellow eyes demonstrated a significant decline in RNFL thickness over time.

The study included 173 patients (346 eyes)—118 eyes with glaucoma and 228 eyes with suspected glaucoma—who were followed for an average of 3.5 ± 0.7 years. All study participants underwent standard automated perimetry (SAP) and spectral-domain optical coherence tomography (SD-OCT) in both eyes at 6-month intervals. Eyes were determined to be progressing by conventional methods: either masked grading of optic disc stereophotographs or SAP Guided Progression Analysis (GPA; Carl Zeiss Meditec).

Thirty-nine participants showed evidence of unilateral progression by the conventional methods of GPA, disc photographs, or both during the follow-up period. In these patients, the mean ± standard error rate of RNFL loss in the progressing eye was –0.89 ± 0.22 µm/year ($p < .001$), and the fellow eye also showed significant RNFL loss (–1.00 ± 0.20 µm/year; $p < .001$). The remaining 134 participants did not show progression by conventional methods in either eye; however, RNFL thickness declined in these eyes as well (–0.71 ± 0.09 µm/year; $p < .001$).

The authors concluded that loss of RNFL thickness occurs in a significant number of eyes that do not show progression when measured by conventional methods. Further, because glaucomatous damage is irreversible, they recommend identification of progression at an early stage, before it can be seen on stereo disc photography or SAP.

CATT Trials: VA Response at Week 12 Is a Good Predictor of 2-Year Outcomes

December *Ophthalmology*

In a secondary analysis of 1,185 participants from the Comparison of Age-Related Macular Degeneration Treatment Trials (CATT), **Ying et al.** examined the association between baseline characteristics and early visual acuity (VA) responses among participants with visual outcomes at years 1 and 2.

Patients with a visual acuity of 20/25 to 20/320 were randomly assigned to ranibizumab or bevacizumab and to 1 of 3 dosing regimens. The main outcome measure was change in visual acuity from baseline.

Statistically significant baseline predictors of less gain in visual acuity at year 2 were older age, VA of 20/40 or better, larger area of choroidal neovascularization, presence of geographic atrophy, total foveal thickness ≤325 µm or ≥425 µm, and elevation of retinal pigment epithelium.

The researchers concluded that VA at week 12 is more predictive of visual outcomes at 2 years than are several other baseline characteristics or the response at week 4, and that outcomes at year 1 were similar to those at year 2. They also found that some eyes with an initial decline in VA experienced late VA gains and noted that this finding supports continuation anti-VEGF therapy despite early lack of response.

HIV-Related Neuroretinal Disorder and Vision-Specific Quality of Life

December *Ophthalmology*

Ashraf et al. found that some individuals infected with HIV have optic nerve or retinal dysfunction that presents as decreased contrast sensitivity despite good best-corrected visual acuity (BCVA). This condition,

known as HIV-related neuroretinal disorder (HIV-NRD), poses a risk of visual impairment, blindness, and increased mortality. The researchers investigated the effect of HIV-NRD on vision-specific quality of life (QOL).

Study participants were drawn from the Longitudinal Study of the Ocular Complications of AIDS. Among the 2,392 participants, 813 met the study criteria. Each participant completed the National Eye Institute 25-item Visual Function Questionnaire (VFQ-25), had a BCVA of 20/40 or better, and had no evidence of an ocular opportunistic infection or cataract. The researchers compared QOL by HIV-NRD status and adjusted for potentially confounding variables.

Of the 813 participants, 39 were found to have HIV-NRD. Compared with the participants without HIV-NRD, those with NRD had significantly lower scores on composite VFQ-25 and on 8 of the 11 subscales. The differences in QOL were independent of BCVA and markers of HIV disease severity. The researchers stated that reduced contrast sensitivity, which is characteristic of NRD, has been linked with increased falls, decreased reading speed, avoidance of driving, and other factors that affect QOL.

They concluded that even though the incidence of vision loss from opportunistic infections such as cytomegalovirus infection has decreased substantially with the wide adoption of antiretroviral therapies, ocular conditions such as NRD still have a negative effect on the QOL of HIV survivors.

American Journal of Ophthalmology

Soft Contact Lens Wear–Related Limbal Stem Cell Deficiency

December *AJO*

Shen et al. reported on the outcomes of limbal stem cell (LSC) transplantation in eyes with LSC deficiency related to soft contact lens wear in patients who did not respond to more conservative measures. They found that LSC transplantation before the onset of subepithelial fibrosis yielded good outcomes and avoided subsequent corneal transplantation.

A database search at the Cincinnati Eye Institute revealed 9 patients (14 eyes) who had undergone LSC transplantation for soft contact lens wear–related LSC deficiency. The average patient age at time of surgery was 46.6 ± 11.1 years, and the average duration of follow-up was 28 ± 19.1 months. Preoperative best-corrected visual acuity (BCVA) was 20/40 or worse in all eyes, and symptoms included foreign body sensation, tearing, redness, and pain. Four eyes (29%) received a living-related conjunctival limbal allograft, and 10 eyes (71%) received a cadaver donor keratolimbal allograft. Topical and systemic immunosuppression, including steroids and steroid-sparing agents, was administered to all patients.

At final follow-up, the ocular surface was stable in 12 of 14 eyes (86%). All patients except 1 achieved a BCVA of 20/30 or better as well as complete resolution of symptoms. The only patient who did not experience these improvements had significant rosacea blepharokeratoconjunctivitis. The most common adverse event was an increase in intraocular pressure in 8 of 14 eyes (57%), requiring topical antiglaucoma treatment. Ten of 14 eyes (71%) underwent cataract extraction related to steroid use. No eyes required subsequent penetrating keratoplasty.

The authors concluded that LSC transplantation is a viable option for the management of soft contact lens wear–related LSC deficiency in otherwise healthy patients, when undertaken prior to development of subepithelial fibrosis. Comanagement with a solid-organ transplant specialist is helpful for monitoring and managing systemic adverse events related to systemic immunosuppression.

Corneal Cross-linking to Halt Progression of Keratoconus and Ectasia

December *AJO*

In a study conducted in the United Kingdom, **O'Brart et al.** used a retrospective cohort design to determine the long-term efficacy and safety of corneal cross-linking (CXL) in halting the progression of keratoconus and corneal ectasia. Long-term follow-up showed that CXL benefits were maintained, and no treated eyes had progressed, at 7 years.

Thirty-six patients (36 eyes) who had undergone epithelium-off CXL 6 to 8 years previously were examined. At a mean follow-up of 7 years, mean spherical equivalent refractive error increased by +0.78 D, and mean simulated topographic keratometry (SimK) and mean maximum keratometry (Kmax) were reduced by –0.74 D and –0.91 D, respectively, compared with preoperative values. Uncorrected distance acuity and corrected distance visual acuity (CDVA) had improved; and root mean square (RMS), coma, and secondary astigmatism had lessened. At 7 years compared with 1 year postoperatively, CDVA had improved; mean SimK and mean Kmax were reduced by –0.45 D and –0.56 D, respectively; and RMS and coma had decreased. At 7 years compared with 5 years postop, CDVA had improved and trefoil was reduced. In 29 initially untreated fellow eyes, mean SimK and mean Kmax increased by +0.54 D and +0.87 D, respectively; and refractive astigmatism increased.

The authors concluded that in CXL-treated eyes, topographic and wavefront parameter benefits seen at 1 year continued to improve at 5 years and were maintained at 7 years. No treated eyes progressed over the follow-up period, and no sight-threatening complications were reported.

Retained Lens Fragments in the Anterior Chamber After Phaco

December *AJO*

Zavodni et al. reviewed the clinical features, treatments, and outcomes of patients with retained lens fragments in the anterior chamber (AC) after phacoemulsification with an intact posterior capsule.

Fifty-four eyes of 54 patients with a diagnosis of retained lens fragment in the AC following otherwise uncomplicated phacoemulsification

cataract surgery were included. All lens fragments were located in the inferior angle or the inferior AC, with 13% of cases requiring gonioscopy for diagnosis. Among the 54 eyes, 56% had associated corneal edema, most often located inferiorly. Medical management was initially attempted in 44%, but all eyes eventually underwent surgical removal of the lens fragments.

The mean time between the date of cataract surgery and removal of the fragments was 70 days (range, 1 day to 30 months). Five patients had corneal edema that did not resolve following fragment extraction, and 3 eventually received an endothelial keratoplasty. Best-corrected visual acuity improved from an average of 20/51 before lens fragment removal to 20/28 after surgical extraction.

The authors concluded that corneal edema is common in the setting of retained lens fragments, and it can lead to corneal decompensation requiring transplantation. Inferior corneal edema, in particular, should alert the ophthalmologist to possible retained lens fragments. Surgical removal of retained lens fragments should be considered at the time of diagnosis.

JAMA Ophthalmology

Treatment Effect and Corneal Light Scattering in 2 CXL Regimens

November *JAMA Ophthalmology*

In order to indirectly quantify the treatment effect of corneal cross-linking (CXL), **Rehnman et al.** assessed the spatial distribution and time course of the increased corneal densitometry (measured by corneal light backscatter) seen after CXL. They concluded that the degree of backscatter relates to the reduction in corneal steepness and could be helpful in evaluating the effect of CXL.

This open-label randomized clinical trial included 43 patients (60 eyes), aged 18 to 28 years, who had progressive keratoconus and were treated with CXL at a university hospital in Sweden. The eyes were randomized to receive conventional CXL (n = 30) using the Dresden protocol or CXL with mechanical compression of the cornea using a flat rigid contact lens sutured to the cornea during the treatment (CRXL; n = 30). Patients were treated and followed for a 6-month period between Oct. 13, 2009, and May 31, 2012.

The main outcome measures included change in corneal densitometry after conventional CXL and CRXL. A densitometry increase was seen after both treatments, but it was deeper and more pronounced in the conventional CXL group (difference between the groups at 1 month in the center layer, zone 0-2 mm, 5.02 grayscale units [GSU]; $p < .001$). This increase diminished with time but was still noticeable at 6 months (difference between the groups at 6 months, 3.47 GSU; $p < .001$) and was proportional to the reduction in corneal steepness ($R = -0.45$ and -0.56 for conventional CXL and CRXL, respectively).

The authors concluded that the amount of corneal light backscatter relates to the reduction in corneal steepness. It may be a useful complement to other methods to evaluate the effect of CXL, for example, in comparing different treatment regimens.

Vaccinations and Retinal Hemorrhage in Children

November *JAMA Ophthalmology*

Vaccinations have been proposed as a cause of retinal hemorrhage in children, primarily as part of a defense strategy in abusive head trauma cases. To investigate this issue, **Binenbaum et al.** conducted a retrospective cohort study on the prevalence and causes of retinal hemorrhage among infants and young children in an outpatient ophthalmology clinic setting. Only a very small number of retinal hemorrhages were found in this population, and all instances could be attributed to child abuse.

Participants were children aged 1 to 23 months old who had a dilated fundus examination between June 1, 2009, and August 30, 2012, at pediatric ophthalmology clinics in Philadelphia. (Children who had intraocular surgery or active retinal neovascularization were excluded.) In 7,675 outpatient fundus examinations of 5,177 participants, 9 children were found to have retinal hemorrhage, for a prevalence of 0.17%. All 9 had abusive head trauma diagnosable with nonocular findings.

The researchers also investigated possible temporal association between vaccination injection and retinal hemorrhage in a subset of 2,210 children who had complete immunization records available and who underwent 3,425 ophthalmoscopic examinations. In this subset, 163 children had an eye exam within 7 days of vaccination, 323 within 14 days, and 494 within 21 days. No children had retinal hemorrhage within 7 days of vaccination, 1 child had a hemorrhage within 14 days, and no additional child had hemorrhage within 21 days. No temporal association was found between vaccination injection and retinal hemorrhage in the prior 7, 14, or 21 days.

The authors found that retinal hemorrhage was rare among outpatients younger than 2 years, despite the frequency of vaccination in this age group. No temporal association, either immediate or delayed, was identified between vaccination and retinal hemorrhage. The authors concluded that no evidence supports the theory that vaccination causes retinal hemorrhage, and this notion should not be accepted clinically or in legal cases. They state that ophthalmologists who find an incidental retinal hemorrhage in the absence of known ocular or medical disease should consider a child abuse evaluation.

ROUNDUP OF OTHER JOURNALS

Outdoor Recess Helps Prevent Myopia in Schoolchildren

Journal of the American Medical Association
2015;314(11):1142-1148

He et al. conducted a 3-year randomized trial to test the efficacy of outdoor activity during recess and in time away from school in staving off myopia among 6-year-old students in Guangzhou, China.

Six schools, with a total of 952 students, were selected as intervention schools. These children participated in an additional 40-minute class of outdoor activities each day; moreover, their parents were encouraged to engage their children in outdoor activities after school and on weekends and holidays. Children and parents in 6 control schools (951 students) followed their usual patterns of activity.

The cumulative incidence of myopia was 30.4% among students in the intervention group versus 39.5% in the control group. The authors also found a significant difference in the 3-year change in spherical equivalent refraction in the intervention group (–1.42 D) compared with the control group (–1.59 D). Increase in axial length did not differ significantly between the 2 groups (intervention group, 0.95 mm; control group, 0.98 mm).

The authors noted that the study achieved an absolute difference of 9.1% in the incidence rate of myopia, which represents a 23% relative reduction in incident myopia after 3 years. Although this reduction was less than anticipated, it remains clinically important because children who develop myopia at an early age are at the greatest risk of progressing to high myopia (greater than or equal to –6 D) and of developing pathological myopia. However, the study also found that—despite the educational plan directed at parents in the intervention group—the time spent outdoors outside of the school day did not differ significantly between the 2 groups. Therefore, the intervention exposure was only the extra 40 minutes/day spent outdoors for 5 school days/week during the 9.5 months of each school year.

Retinal and Choroidal Folds in IIH and Papilledema

Invest Ophthalmol Vis Sci
2015;56(10):5670-5680

Using fundus photos and optical coherence tomography, **Sibony et al.** examined the patterns, frequency, and biomechanical implications of retinal and choroidal folds in papilledema attributable to idiopathic intracranial hypertension (IIH).

The researchers surveyed fundus photos from 165 participants in the IIH Treatment Trial. Of these, 125 were also in the OCT Substudy Group and underwent spectral-domain optical coherence tomography (SD-OCT).

The researchers identified 3 types of folds among patients who had IIH with papilledema: peripapillary wrinkles (PPW), retinal folds (RF), and choroidal folds (CF). Fundus photos revealed the prevalence of these folds as 26%, 19%, and 1%, respectively. SD-OCT, however, detected a much higher prevalence: 46%, 47%, and 10%, respectively. These features may occur alone, or there may be more than 1 type within the same eye or between eyes.

Fundus photographs showed that among the 165 study eyes, 43 (26%) had PPW; 32 (19%) had RF, and 2 (1%) had CF. Overall, 68 eyes (41%) had at least 1 type of fold, and 7 (4%) had more than 1 type. The researchers noted that PPW were invariably located on the temporal half of the disc, and only 1 study eye had photographically visible folds on the nasal side. The most common location was just above the horizontal at 10 o'clock.

Retinal folds were most often found within the papillomacular bundle (63%) and were typically horizontal or slightly oblique. The researchers suggested that these folds resulted from the interplay between the degree of papilledema and the deformation of the sclera and the lamina cribrosa. The presence of retinal or choroidal folds did not appear to affect visual acuity or visual field in this study group.

Smartphone-Based Retinal Photography for Diabetic Retinopathy Screening

PLoS ONE
2015;10(9):e0138285

Rajalakshmi et al. evaluated the sensitivity and specificity of the "fundus on phone" (FOP) camera, a smartphone-based retinal imaging system developed in India, in screening for diabetic retinopathy (DR).

In this single-site, prospective, comparative, instrument-validation study, the researchers compared the new imaging system to standard 7-field digital retinal photography. They examined 301 patients (602 eyes) who had type 2 diabetes. Each patient underwent standard 7-field digital fundus photography with both a Carl Zeiss fundus camera and a FOP camera at a tertiary-care diabetes center in South India. The mean age of the study participants was 53.5 ± 9.6 years, and the mean duration of diabetes was 12.5 ± 7.3 years.

Two independent retina specialists evaluated the patients' DR using the modified Early Treatment Diabetic Retinopathy Study (ETDRS) grading system. Sight-threatening DR was defined as the presence of proliferative DR or diabetic macular edema. The researchers assessed sensitivity, specificity, and image quality.

The Zeiss camera showed nonproliferative DR in 43.9% of the participants, and proliferative DR in 15.3%. By comparison, the FOP camera showed nonproliferative DR in 40.2%, and proliferative DR in 15.3%. The FOP's sensitivity and specificity for detecting DR were 92.7% and 98.4%, respectively; the kappa (κ) agreement was 0.90. Compared with conventional fundus photography, the FOP's sensitivity in detecting sight-threatening DR was 87.9%; specificity was 94.9%; and κ agreement, 0.80.

The researchers concluded that the combination of affordability, portability, and easy transmission of images would make the FOP useful both in the clinic and in mass DR screening programs in India and other low- and middle-income countries.

Ophthalmology *summaries are written by Marianne Doran and edited by Susan M. MacDonald, MD.* American Journal of Ophthalmology *summaries are edited by Thomas J. Liesegang, MD.* JAMA Ophthalmology *summaries are based on the abstracts, as edited by senior editor(s).* Roundup of Other Journals *is written by Marianne Doran and edited by Deepak P. Edward, MD.*

EXTRA *MORE ONLINE. See this article at www.eyenet.org for additional journal summaries.*