Journal Highlights

NEW FINDINGS FROM THE PEER-REVIEWED LITERATURE

Ophthalmology

Selected by George B. Bartley, MD

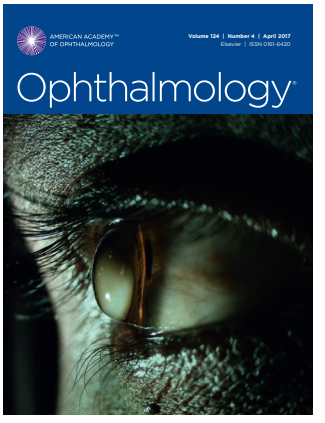
Peripheral Retinal Changes Associated With AMD in AREDS2

April 2017

The **OPERA (Optos PEripheral RetinA) Research Study Group** compared rates of peripheral retinal changes in Age-Related Eye Disease Study 2 (AREDS2) participants with at least intermediate age-related macular degeneration (AMD) versus control subjects without intermediate age-related changes (large drusen). The researchers found that peripheral retinal changes are more prevalent in eyes with AMD than in control eyes. Drusen were seen in a majority of eyes with AMD in both the mid- and far periphery.

This ancillary AREDS2 study, a cross-sectional evaluation of clinic-based patients, included 484 AREDS2 participants (951 eyes) with AMD (cases) and 89 controls (163 eyes) without AMD who had gradable color and fundus autofluorescence (FAF) images. The 200-degree pseudocolor and FAF images were captured using an Optos 200 Tx Ultrawide-field device. The montaged images were graded at a reading center, with the images divided into 3 zones: zone 1, posterior pole; zone 2, midperiphery; and zone 3, far periphery. The main outcome measures were peripheral retinal lesions: drusen, hypo- or hyperpigmentary changes, reticular pseudodrusen, senile reticular pigmentary changes, cobblestone degeneration, and FAF abnormalities.

In zones 2 and 3, neovascularization and geographic atrophy (GA) were present, ranging from 0.4% to 6% in eyes of cases, respectively; while GA was present in 1% of eyes of controls. Drusen were detected in 97%, 78%, and 64% of eyes of cases; and in 48%, 21%, and 9% of eyes of controls in zones 2 and 3 superior and 3 inferior, respectively.



The researchers concluded that peripheral retinal changes are more prevalent in eyes with AMD than in control eyes. In a majority of eyes with AMD, drusen are seen in both the mid- and far periphery, whereas pigmentary changes and features of advanced AMD are seen less frequently. The findings suggest that AMD should be considered more than just a macular condition, as it appears to involve the entire retina.

Quantifying Fall-Related Hazards in Homes of Individuals With Glaucoma

April 2017

Yonge et al. characterized fall-related hazards in homes of people with suspected or diagnosed glaucoma and assessed whether people with worse visual field (VF) damage have fewer home hazards. The researchers found multiple hazards in the homes of this study population, and the numbers of hazards were not fewer in the homes of those with advanced VF deficits.

Participants in the ongoing Falls in Glaucoma Study (FIGS) were recruited from individuals aged 60 years or older who presented at the Wilmer Eye Institute glaucoma clinic, who were diagnosed with glaucoma or were glaucoma suspects, and who were able to perform VF testing. At baseline, all FIGS participants underwent a comprehensive assessment of visual function, including visual acuity (VA), Humphrey 24-2 VF testing, and contrast sensitivity (CS). The primary metric for VF was integrated visual field (IVF), an average calculated across several VF points.

Among the 245 participants, 174 (71%) agreed to allow a trained evaluator to visit their homes and perform the Home Environment Assessment for the Visually Impaired (HEAVI). This instrument measures 46 distinct items each in various areas of the home (up to a maximum of 127 possible hazards), including hazards related to handrails, lighting, flooring, and furniture.

The mean number of items graded per home was 85.2, and the evaluator identified an average of 32.7 (38.3%) as hazards. Among areas, bathrooms had the greatest number of hazards; and

the most common hazard in all rooms related to lighting (inadequate illumination or exposed bulbs).

The researchers found no significant association between total home hazards or number of hazards in any given room and IVF sensitivity, CS, or VA. Further, although IVF sensitivity, CS, and VA were not associated with home lighting levels, brighter room lighting was noted in the homes of participants with higher median income.

The researchers concluded that home hazards were common in this study population and that hazard numbers were not lower for those with worse VF damage. These findings suggest that people with more advanced glaucoma do not adapt their homes for safety; and, thus, further work is needed to develop interventions to reduce fall hazards in this high-risk group.

Outcomes of NAION in Patients With and Without Diabetes Mellitus

April 2017

People with diabetes mellitus (DM) are known to have a greater risk of nonarteritic anterior ischemic optic neuropathy (NAION) than those without DM. **Sharma et al.** compared the visual outcomes, predictors of visual outcomes, and prevalence of bilateral/sequential NAION in these 2 groups of patients. The authors found that the visual acuity (VA) levels at presentation with NAION and at final follow-up were not significantly different between diabetic patients and nondiabetic controls, even though diabetic patients had a higher prevalence of cardiovascular risk factors.

Study participants included 30 patients with DM and 62 without DM (control patients) who presented within 4 weeks of onset of NAION symptoms. Of these 92 patients who completed baseline demographic assessments, 81 had clinical follow-up for ≥3 months and were included in the final visual outcomes. (Median follow-up duration was 38.7 weeks in diabetic patients and 52.9 weeks in nondiabetic patients.) The main outcome measure was visual acuity at last follow-up.

In nondiabetic patients, the most prevalent risk factor for NAION was hyperlipidemia (62.9%); for diabetic patients, NAION risk factors included hypertension (83.3%), hyperlipidemia (83.3%), and small cup-to-disc ratio (63.3%). Sequential NAION occurred in 36.8% of diabetic patients and 20.9% of nondiabetic patients. At last follow-up, 48% of diabetic and 62% of nondiabetic patients had VA better than 20/40. Similar proportions of diabetic and nondiabetic patients (8 [27%] diabetic and 14 [22.5%] nondiabetic patients) recorded a final follow-up vision of 1.0 logMAR or worse at a minimum of 3 months. Ischemic heart disease (odds ratio [OR], 7.21; $p < .001$) and greater age (OR, 1.05; $p = .045$) were associated with increased risk for final VA <20/200 in the multiple regression model (OR, 4.35; $p = .011$).

The researchers concluded that their analysis of VA outcomes in patients with NAION demonstrates that DM does not affect final VA, despite its association with increased NAION risk. Further, they found that ischemic heart disease may be an independent risk factor for worse final VA after the acute disease has resolved.

—Summaries by Marianne Doran

American Journal of Ophthalmology

Selected by Richard K. Parrish II, MD

Association of Nocturnal BP Dips and Optic Disc Hemorrhage in NTG Patients

April 2017

Kwon et al. performed a case-control study of patients with normal-tension glaucoma (NTG) to assess whether there is an association between nocturnal dips in blood pressure (BP) and optic disc hemorrhage (OHD). They also evaluated the possible linkage between ODH and visual field progression (VFP). They found that "overdipping" is a significant risk factor for ODH and that the presence of ODH is a strong predictor of VFP.

The study included 349 Korean adults with NTG (698 eyes) who underwent 24-hour monitoring of intraocular pressure (IOP) and ambulatory BP. All patients were examined by optic disc photography every 4-6 months and completed at least 5 reliable visual field tests during follow-up (minimum, 3 years).

The researchers noted that a reduction of nocturnal BP in the range of 10%-20% relative to daytime BP levels is usually observed in normotensive subjects and in the majority of hypertensive patients. For this study, subjects within that range were classified as physiologic dippers; nonphysiologic dippers were defined as overdippers (>20% reduction in nocturnal BP) and nondippers (<10% reduction).

Among all eyes, ODH was detected in 15.3% and VFP in 8.6%. The frequency of ODH was significantly greater among overdippers than either nondippers or physiologic dippers. Throughout follow-up, overdipping remained a significant and independent risk factor for ODH. The rate of VFP was 6% for physiologic dippers, 7% for nondippers, and 24% for overdippers. The cumulative probability of VFP was significantly greater in eyes with 1 episode of ODH than in eyes without ODH, and eyes with recurrent ODH (≥2 episodes) had significantly greater cumulative probability of VFP compared with those that had only 1 episode of ODH.

The researchers concluded that nocturnal overdipping is a risk factor for the occurrence of ODHs during follow-up in NTG eyes. Further, they found that ODH is a potent prognostic factor for glaucomatous VFP. They noted that their findings support the idea that occurrence of ODH may be associated with IOP-independent risk factors and that vascular mechanisms may play an important role in the pathogenesis of OHD.

Head-Mounted Display Technology for Low-Vision Rehabilitation and Vision Enhancement

April 2017

Ehrlich et al. provided an overview of head-mounted display (HMD) technology and devices for vision rehabilitation and enhancement, including their potential advantages over conventional

low-vision aids (LVAs). Drawing on key literature and professional experience, the authors noted that the newer technology may be particularly helpful for patients with peripheral vision loss and that see-through displays such as retinal projection devices have the greatest potential as LVAs.

Although many LVAs and rehabilitation strategies have been used for years, little is known about their efficacy. Traditionally, LVAs consisted of magnifiers, spectacle-mounted optical aids, and devices to enlarge images, increase illumination, improve contrast, and reduce glare.

HMDs, originally developed for military use, have been adapted for low vision as costs decreased. They are a type of electronic visual aid that attaches to the user's head and presents information directly to the user's eyes. HMDs have been shown to improve constricted peripheral fields, night vision, and visual acuity; however, their effectiveness compared with standard LVAs has not been adequately studied. The display types and optical designs of HMD systems vary widely in terms of field of view, illumination, resolution, color, stereopsis, effect on head motion, user interface, and relationship to the user's eyes. The selection of appropriate devices should be tailored to the unique needs of specific patient populations.

The authors concluded that HMD systems may offer advantages over conventional LVAs, including the ability to couple image-processing software with a wearable display system. Use of HMDs is likely to increase as improvements are made to the displays, software capabilities, and aesthetic appearance of the systems. Future research is warranted to compare newer and older devices with respect to their ability to address the rehabilitation goals of diverse patients.

Ahmed vs. Baerveldt Implants for Glaucoma: 5-Year Pooled Analysis

April 2017

Christakis et al. conducted a pooled analysis of 2 randomized clinical studies to compare efficacy of the Ahmed-FP7 and Baerveldt BG101-350 glaucoma drainage devices. The authors found that the Baerveldt implant was less likely to fail over 5 years and was associated with decreases in mean intraocular pressure (IOP), rate of glaucoma surgery, and number of glaucoma medications required. However, the risk of hypotony was lower with the Ahmed device.

The authors examined data for 514 patients with advanced, uncontrolled glaucoma (trabeculectomy had failed or was at high risk of failing) who had been randomized to receive the Ahmed or the Baerveldt device. Outcome measures included cumulative rate of device failure (based on target IOP of 6-18 mm Hg), rate of de novo glaucoma surgery, mean IOP, mean number of glaucoma medications, and visual acuity.

Preoperatively, mean IOP was 31.2 mm Hg in the Ahmed group and 31.8 in the Baerveldt group. Five years postoperatively, mean IOP was 15.8 mm Hg for patients with the Ahmed device and 13.2 mm Hg for those with the Baerveldt device ($p < .001$). The average number of glaucoma medications was 1.9 in the Ahmed group and 1.5 in the Baerveldt group ($p = .007$).

The 5-year cumulative failure rate was higher for patients with the Ahmed implant (49% vs. 37% for Baerveldt implant; $p = .007$). In both groups, most device failures were ascribed to elevated IOP, but failure due to hypotony was more common in the Baerveldt group (4.5% vs. 0.4% for Ahmed group; $p = .002$). De novo glaucoma surgery was more common among patients who received the Ahmed implant (16% vs. 8% for Baerveldt implant; $p = .006$). Visual acuity was similar for the study groups and declined significantly over 5 years.

The authors concluded that the Baerveldt device appears superior in terms of efficacy outcomes, but it poses a higher risk of hypotony than the Ahmed implant. An analysis of risk factors for treatment failure is forthcoming, which may help to guide selection of the most appropriate drainage device for each patient.

—Summaries by Lynda Seminara

JAMA Ophthalmology

Selected by Neil M. Bressler, MD, and Deputy Editors

Disparity in Clinical Activity and Medicare Payments: Male vs. Female Ophthalmologists

March 2017

Although gender-related salary differences have been studied in many medical specialties, comparisons of the clinical activity and collections by male and female ophthalmologists are lacking. **Reddy et al.** examined associations between gender and compensation by the Centers for Medicare & Medicaid Services (CMS) for outpatient care in a 2-year retrospective study of more than 16,000 ophthalmologists. The authors found that both CMS earnings and clinical activity were lower for female ophthalmologists.

Nearly 20% of the study population was female. In 2012, the first year of the study, female ophthalmologists collected an average of $0.58 for every dollar received by male ophthalmologists (95% CI, $0.54-$0.62), and their median earnings were slightly lower ($0.56 per male-earned dollar). In 2013, mean and median income disparities between genders were similar to those of the preceding year.

The mean payment per charge was the same for men and women: $66 in 2012 and $64 in 2013. A strong correlation was found between CMS collections and clinical activity. Medicare received fewer submissions from females than males in 2012 (median, 1,120 vs. 2,055 charges, respectively) and in 2013 (median, 1,141 vs. 2,078 charges, respectively). Moreover, a comparison of men and women adjusted for similar clinical activity showed lower remuneration for women. Among ophthalmologists with the highest collections in each study year, women were underrepresented.

The authors found that the pay gap identified in this study is markedly greater than that in other medical specialties, and they anticipate that their findings will promote introspection and discussion among men and women in the field. They concluded that more

research is needed to determine causes of the gender disparities, to address the obstacles faced by women, and to strive for equity throughout the specialty. *(Also see related commentary by Ruth D. Williams, MD, in the same issue.)*

Differences in Ocular Symptom Documentation Between EMR and Patient Reports

March 2017

Valikodath et al. performed an observational study to determine whether symptoms reported by patients on an eye symptom questionnaire (ESQ) were consistent with those documented in their electronic medical record (EMR). The authors found substantial discordance in symptom reporting between these methods and noted that many symptoms reported on the ESQ were absent from the EMR.

Data for the following ocular symptoms were collected from ESQs and EMRs of 162 adult patients: blurry vision, pain/discomfort, glare, itching, light sensitivity, burning/stinging, gritty sensation, and redness. Symptom reporting was analyzed using κ statistics and McNemar tests. Disagreement was defined as a negative report or no mention in the EMR of a symptom that had been noted by the patient as being moderate or severe on the ESQ. Logistic regression was applied to investigate whether the probability of disagreement between records correlated with specific patient factors, physician characteristics, or diagnoses.

ESQ and EMR reports of glare, blurry vision, pain/discomfort, and redness were discordant for 48%, 34%, 27%, and 25% of participants, respectively. Agreement was poor to fair (κ range, −0.02 to 0.42). Discordant reporting usually was characterized by a positive symptom report on an ESQ that was not documented in the EMR (Holm-adjusted McNemar, $p < .03$ for all symptoms except blurry vision). The likelihood of patient-reported blurry vision being documented in the EMR was greater during visits by new patients than by returning patients. Discordant reporting of blurry vision, pain/discomfort, or redness did not correlate significantly with patient age, gender, diagnosis, or physician characteristics (e.g., duration of practice, volume of work, presence of medical scribe). Whenever a patient reported 3 or more symptoms on the ESQ, the 2 records were not fully concordant.

The authors concluded that because of substantial inconsistencies between patient and EMR reports of ocular symptoms, EMR content should not be considered a comprehensive resource for patient care or large-scale research. Additional studies are warranted to determine reasons for the discordant reporting. *(Also see related commentary by Christina Y. Weng, MD, MBA, in the same issue.)*

Retinal Recovery After Iatrogenic Macular Detachment for Gene Therapy

March 2017

Simunovic et al. observed the effects of limited iatrogenic macular detachment on retinal structure and function after delivery of gene therapy to the subretinal space. They found that structural recovery occurred within 1 week and function generally was restored by 1 month.

Five men with choroideremia of confirmed genetic etiology participated in this prospective, interocularly controlled study. Gene therapy consisted of unilateral subretinal injection of a 0.1-mL solution containing 1×1011 particles of AAA.REP1 (an adeno-associated viral vector encoding Rab Escort Protein 1). Before surgery and at 1 week and 1 month after it, retinal structure was evaluated with optical coherence tomography, and retinal function was assessed by microperimetry, best-corrected visual acuity (BCVA), and the Farnsworth-Munsell 100-hue test.

In all patients, subretinal fluid dissipated within 1 week after surgery. By 1 month postoperatively, the mean change in central foveal thickness was +9.6 µm for treated eyes and +8.8 µm for control (fellow) eyes. Mean BCVA of treated eyes also improved by the 1-month mark (mean change from baseline, +5.4 letters vs. +0.8 letters for control eyes). From baseline to 1 month postsurgery, threshold sensitivity increased for 3 treated eyes and decreased for 2.

Color discrimination was variable. Although most treated eyes functioned at or above baseline, 1 patient had worsening of a preexisting Verriest type III deficiency in color vision at 1 month. This suggests that the optical density of cone photopigments is decreased in the early postoperative period. No patients had a postoperative shift in the preferred locus of retinal fixation, as measured by microperimetry.

The authors concluded that structural and functional restoration of the retina develops asynchronously after iatrogenic detachment, with structural recovery occurring within 1 week and visual acuity returning within 1 month. The improvements may be accompanied by subtle alterations in threshold sensitivity and color discrimination. These recovery kinetics may be ascribed to the combination of functional gains from REP1 expression and functional losses from retinal detachment. *(Also see related commentary by Jacque L. Duncan, MD, in the same issue.)*

—Summaries by Lynda Seminara

OTHER JOURNALS

Selected by Deepak P. Edward, MD

FACE-Q Eye Module for Measuring PROMs After Cosmetic Eye Treatments

JAMA Facial and Plastic Surgery 2017;19(1):7-14.

Cosmetic eye treatments can dramatically change a person's appearance, but the outcomes are rarely measured from the patient's perspective. **Klassen et al.** described the development and psychometric evaluation of FACE-Q Eye Module scales, designed for patient-reported outcome measurements (PROMs) after aesthetic eye treatment.

The FACE-Q is a validated PROM that was developed to address the lack of instruments for facial aesthetic procedures. It includes more than 40 scales and checklists that measure appearance, health-related quality of life, adverse effects of treatment, and the patient experience of care. The FACE-Q

Eye Module has been developed to specifically measure eye-related PROMs and includes 4 appearance scales (eyes overall, upper eyelids, lower eyelids, and lashes), ranging from 0 (worst) to 100 (best), as well as a checklist to measure adverse effects after eye treatments.

Participants included 287 pretreatment and posttreatment patients 18 years and older undergoing facial aesthetic procedures. They were recruited from plastic surgery clinics in United States and Canada and asked to complete the FACE-Q survey questionnaire, either in person or by mail; 233 patients (81%) completed the survey.

The researchers used Rasch Measurement Theory, a modern psychometric approach, to analyze the difference between observed and predicted responses and to evaluate goodness of fit between the data and the model.

The adverse effects reported by patients included being bothered by eyelid scars, dry eyes, and eye irritation. Applying Rasch analysis, the researchers found that each scale's items had ordered thresholds and good item fit. Higher scores on the eye scales correlated with fewer adverse effects. In the pretreatment group, older age correlated with lower scores on the scales measuring appearance of the eyes and upper and lower eyelids. Compared with the pretreatment group, posttreatment participants reported significantly better scores on the scales measuring appearance of eyes overall, as well as upper and lower eyelids.

The researchers stated that their psychometric analysis provided evidence of the reliability and validity of the 4 FACE-Q Eye Module scales. Thus, they concluded that this instrument can be used for the collection of evidence-based information about cosmetic eye treatments from the patient's perspective.

Patching Retinal Breaks With Seprafilm for Treating Retinal Detachments

Eye
Published online Jan. 27, 2017

Haruta et al. described the long-term surgical outcomes of 4 patients who were treated for retinal detachment with the novel technique of using Seprafilm Adhesion Barrier (Sanofi). This material is a bioresorbable translucent membrane that was developed to prevent adhesions after abdominal and pelvic surgeries. At 9 years postsurgery, the researchers found that the retina remained attached in all 4 patients.

The 4 patients (4 eyes) in this series had rhegmatogenous retinal detachment (RRD). The retinal breaks in these eyes were covered with Seprafilm, which was applied through a transvitreal approach after cataract surgery, pars plana vitrectomy, fluid-air exchange, and laser photocoagulation. Neither long-lasting gas nor silicone oil was used. The patients were not instructed to maintain a specific head position postoperatively.

The surgeons achieved successful retinal reattachment in all 4 eyes after a single procedure, and none of the patients developed proliferative vitreoretinopathy, a major cause of surgical failure. All eyes had a transient postoperative intraocular pressure spike, which was managed with medication and resolved within 2 weeks. The Seprafilm was undetectable on fundus examination 2 weeks after surgery. The mean best-corrected visual acuities among these patients were 20/97 preoperatively and 20/33 at 9 years after surgery. Further, the visual outcomes showed no apparent adverse effects related to the use of Seprafilm.

The authors concluded that covering retinal breaks with Seprafilm may promote retinal reattachment without the need for gas tamponade or postoperative head positioning. They commented that their work provides a basis for further clinical studies of retinal patching surgery in patients with RRDs.

Retinal Status on OCT After Endophthalmitis Following Cataract Surgery

British Journal of Ophthalmology
Published online Jan. 24, 2017

Zhou et al. analyzed optical coherence tomography (OCT) images to assess macular parameters in patients who developed acute postcataract endophthalmitis. They found that epiretinal membrane (ERM) and macular edema (ME) were the main macular abnormalities 12 months after the acute endophthalmitis.

This multicenter longitudinal observational study included 46 patients who had clinical signs of endophthalmitis within 6 weeks after cataract surgery. Acute management was at the discretion of the treating physician, most often with intravitreal antibiotic injection, sometimes with the addition of topical antibiotics and dexamethasone or pars plana vitrectomy in severe cases. OCT imaging of the macula was performed at 3, 6, and 12 months to assess central macular thickness (CMT); perifoveal macular thickness; central foveal point thickness; and abnormalities of the outer retina, macula, and vitreoretinal interface.

During follow-up, macular abnormalities were observed on OCT in 55%-63% of the patients; at month 12, the macula appeared normal in 45% of patients. In months 3-12, the researchers noted that ERM prevalence increased from 26% to 39%, vitreomacular traction prevalence decreased from 12% to 6%, and nontractional ME prevalence varied between 7% and 13%. Macular thinning remained stable at 10%. At month 12, a significant correlation was found between nontractional ME and capsular rupture during cataract extraction. Eyes with an ERM had increased CMT and lower visual acuity (VA) at month 12 compared with the group with a normal macular appearance. The researchers also found a significant association between ERM and alteration of the ellipsoid band as well as the external limiting membrane.

The researchers noted that their study was the first to report the prevalence of macular complications, as seen on OCT, after treatment of acute postcataract endophthalmitis and the progression over 12 months. They concluded that ERM and ME are the main macular abnormalities diagnosed in the first year of follow-up. Nevertheless, despite these 2 complications, 50% of the cases attained a VA of 20/40 or better.

—Summaries by Marianne Doran