

Journal Highlights

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

Ophthalmology

Assessing Visually Impaired Children and Adolescents

Ophthalmology

Published online Oct. 11, 2013

Tadić et al. developed a self-assessment questionnaire that can be given to visually impaired children and adolescents. The researchers noted that the assessment tool, which they call the Functional Vision Questionnaire for Children and Young People (FVQ_CYP), might be used as an adjunct to objective clinical assessments in pediatric research and clinical practices. In addition, they stated that it could be used either as a stand-alone measurement or as part of a comprehensive evaluation of the impact of vision loss.

The researchers developed the FVQ_CYP so that it could be easily used by visually impaired patients between the ages of 10 and 15. It comprises 56 items that are organized into four categories of activity: home, school, sports, and leisure. For each item, the child is asked to rate his or her level of functioning on a 5-point scale, from “very easy” to “this doesn’t apply to me/I don’t do this for other reasons.” Sample activities include seeing the board in class, playing sports,

getting around school unassisted, using escalators, reading price tags, and finding the correct money to pay for items.

According to the researchers, pediatric ophthalmologists should find the questionnaire useful as a means of capturing a child’s personal perspective on his or her daily functioning, particularly over time. As a result, it can be used in evaluating disease progression and the effectiveness of low vision rehabilitation or other clinical interventions.



The researchers acknowledged that further development and testing of the FVQ_CYP is necessary and that a multicenter study will be needed to replicate this study’s findings of reliability and validity as well as to assess its acceptability and feasibility.

Cost-Effectiveness of Femto vs. Phaco Cataract Surgery

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Proponents of femtosecond laser-assisted cataract surgery argue that the procedure is superior to standard cataract surgery in terms of surgical precision, ultrasound requirements, and corneal wound structure. But what about comparative costs? In

this study, Abell et al. found that femtosecond cataract surgery is not cost-effective when compared with conventional phacoemulsification cataract surgery. Moreover, before femtosecond cataract surgery can be considered a cost-effective procedure, the price would have to drop significantly, by as much as 50 to 70 percent.

The researchers obtained data on complication rates of femtosecond and conventional cataract surgery from a review of the current literature and created two hypothetical cohorts of patients who were undergoing cataract surgery in the better eye. They then used computer-based economic modeling and constructed a decision tree that incorporated quality-adjusted life years (QALYs).

The primary outcome measures in this study included the increase in QALYs between six months and one year after surgery, and this information was combined with approximate costs via a cost-utility analysis model. Even with what the researchers described as “generous assumptions” for improvements in visual outcomes and reduction in complication rates, femtosecond cataract surgery was associated with a much higher cost and only a small incremental gain in QALY (0.06) when compared with standard cataract surgery.

Despite their economic model’s hypothetical status, the researchers concluded, it shows that the potential

benefits of femtosecond laser are not cost-effective, given the technology's current costs to patients.

Reducing Contamination Risk in the Retina Practice

Ophthalmology

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Using adenosine triphosphate (ATP) luminometry, **Amin et al.** assessed the effectiveness of different cleaning methods in the intravitreal injection setting. They found that it was possible to reduce the surface ATP bioburden to levels well below those commonly accepted in hospitals and other health care settings.

For this prospective comparative case series, the researchers assessed the effectiveness of three room-cleaning methods: baseline terminal cleaning, directed terminal cleaning, and enhanced terminal cleaning. Baseline terminal cleaning was defined as the department's standard end-of-day process; the directed and enhanced approaches built on this, with enhanced terminal cleaning the most exacting of the three programs.

Nine commonly touched surfaces located near patients were identified for before-and-after sampling; these included examination chair seats and backs, computer keyboards, telephones, sinks, faucet handles, and medication cabinet handles. A total of 792 room surfaces—divided into pre- and postcleaning sample sets of 396 each—were swabbed.

The main outcome measure was surface ATP relative light units (RLUs). Of the three cleaning programs, enhanced terminal cleaning produced the lowest median ATP bioburden, 71 RLU, far below the researchers' benchmark level of 100 RLU, which is already less than currently accepted ATP thresholds used in many other health care settings. In comparison, the median ATP level for baseline terminal cleaning was 391 RLU, and the median ATP level for directed terminal cleaning was 264 RLU.

The researchers acknowledged that the current rate of postinjection

endophthalmitis related to intravitreal injections is already fairly low and noted that further studies will be needed to determine whether achieving such a low ATP level will reduce the endophthalmitis rate even further.

Ranibizumab for Retinal Vein Occlusion

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Campochiaro et al. evaluated the visual prognosis of patients whose retinal vein occlusion was treated with ranibizumab. They found that long-term outcomes differed according to whether the patient had branch retinal vein occlusion (BRVO) or central retinal vein occlusion (CRVO), with BRVO patients experiencing good visual potential and CRVO patients having a guarded prognosis.

In this prospective study, the researchers analyzed a subset of patients from two earlier phase 3 trials of ranibizumab. Of the 66 patients who entered this follow-up trial, 34 had BRVO and 32 had CRVO. Main outcome measures included improvement in best-corrected visual acuity (BCVA) and percentage of patients who experienced resolution of their edema.

After a mean follow-up of 50.2 months, 17 of the BRVO patients (50 percent) had edema resolution and an excellent visual outcome, with a final BCVA of 20/40 or better in 80 percent of that group. Although the other 50 percent of the BRVO patients still required additional intravitreal injections during their last year of follow-up, 80 percent of these patients also achieved a final BCVA of 20/40 or better.

After a mean follow-up of 51.4 months, 14 of the CRVO patients (44 percent) experienced resolution of their edema, and 64 percent of these patients had a final BCVA of 20/40 or better. However, the remaining 18 CRVO patients (56 percent) required an average of six intravitreal injections during their last year of follow-up, and only 25 percent of this group had a fi-

nal BCVA of 20/40 or better.

The researchers concluded that although there is room for improvement, the BRVO results with ranibizumab are encouraging; the CRVO results, however, indicate that new treatment paradigms are needed.

Understanding Focal Choroidal Excavations

Ophthalmology

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Xu et al. evaluated the clinical and imaging findings of focal choroidal excavation (FCE) that was complicated by choroidal neovascularization (CNV). They found that, contrary to earlier theories about this recently discovered and little-understood condition, FCE is not always stable. In addition, they noted that CNV commonly exists in FCE patients and that it responds well to intravitreal injections of ranibizumab or bevacizumab.

For this retrospective observational case series, the researchers evaluated the medical records of 12 patients (15 eyes) with FCE. Of the 15 eyes with FCE, 12 also had CNV at presentation. During follow-up, which ranged from one to 45 months, CNV occurred in the other three eyes. The primary outcome measures included the results from fundus fluorescein angiography (FFA), indocyanine green angiography (ICGA), and spectral-domain optical coherence tomography (SD-OCT).

Before CNV development, normal appearance or nonspecific pigment disturbance could be seen around the choroidal excavation. FFA revealed window effects that corresponded to the excavations, while ICGA images indicated areas of hypofluorescence. In eyes with CNV, hyperfluorescence representing classic CNV could be seen on FFA.

The SD-OCT scans revealed that all eyes had a single FCE. The excavations were located subfoveally in seven of the 15 eyes, while the others were eccentric (defined as a distance greater than 200 μm between the posterior border of the FCE and the fovea). Although the

development of CNV was not related to either the location or depth of the excavation, all of the CNV lesions grew from the bottom or slope of the excavations.

In addition, CNV occurred in both the conforming and nonconforming types of FCE, regardless of whether the excavation was shallow or deep, subfoveal or eccentric. In the former type, the outer retinal layers conform to retinal pigment epithelial alterations within the excavation; in the latter, there is a separation between the outer retina and the retinal pigment epithelium within the excavation, as revealed by SD-OCT.

The CNV lesions responded well to intravitreal injections of either 0.5 mg of ranibizumab or 1.25 mg of bevacizumab and regressed in 13 of the 15 eyes after a single injection. The remaining two eyes required an additional injection. The researchers also noted that cases of nonconforming FCE changed to the conforming type after successful treatment of CNV.

They concluded that FCE does not always appear to be stable. And although they encountered three cases of FCE without CNV, the researchers could not determine whether CNV is more inclined to grow in the site of choroidal excavation until stronger epidemiologic data are available. Thus, a more comprehensive understanding of FCE requires the accumulation of more cases in future investigations.

American Journal of Ophthalmology

Corneal vs. Internal Astigmatism and Axis Difference

December *AJO*

Eom et al. evaluated the axis difference between corneal and internal astigmatism in patients with cataract. They hypothesized that if the axis of corneal astigmatism is opposite to the axis of internal astigmatism, the amount of refractive astigmatism will increase after cataract surgery owing to disappearance of the neutralizing effect of the crystalline lens on corneal astigmatism.

This retrospective cross-sectional study involved 180 patients who underwent cataract surgery. A wavefront analyzer was used to measure preoperative refractive, corneal, and internal astigmatism in one eye of each patient. “On-axis” was defined as an axis difference between corneal and internal astigmatism of 180 ± 10 degrees. “Opposite-axis” was defined as an axis difference of 90 ± 10 degrees. The remaining cases were labeled “oblique-axis.”

The researchers found an on-axis difference in 18 eyes (10 percent), an opposite-axis difference in 37 eyes (21 percent), and an oblique-axis difference in 125 eyes (69 percent). In addition, the percentage of eyes with the opposite-axis difference had a tendency to increase as corneal and internal astigmatism increased.

The authors also found that a total of 18 eyes (10 percent) had an opposite-axis difference with more than 1.00 D of both corneal and internal astigmatism—and they advised that these patients be considered for surgery to reduce corneal astigmatism, such as implantation of toric intraocular lenses.

The authors will conduct a prospective study to assess the postoperative satisfaction of cataract patients according to the axis difference between corneal and internal astigmatism.

Use of Enoxaparin During Cataract Surgery

December *AJO*

Ihan et al. investigated the effects of enoxaparin-containing infusion fluid during cataract surgery on patients with moderate nonproliferative diabetic retinopathy and nuclear cataract. The researchers found that the addition of enoxaparin into the balanced salt solution (BSS) decreased postoperative inflammation.

This masked trial included 51 eyes of 51 patients with moderate nonproliferative diabetic retinopathy and grade 2 to 3 nuclear cataracts. The researchers randomly sorted these patients into two groups: group 1 re-

ceived enoxaparin in BSS during cataract surgery, while group 2 received standard BSS. They were then followed up at one day, one week, and one and two months after surgery. Inflammation was evaluated by counting cells in the anterior chamber, while flare degree was assessed by an oblique intense-beam technique at high magnification.

One day after surgery, 20 patients in group 1 and four patients in group 2 had a mean of less than 10 cells, while 20 patients from group 1 and eight patients from group 2 had flare between 0 and +1. After the first week, 20 patients from group 1 and 10 patients from group 2 had a mean of less than 10 cells, while 24 patients from group 1 and 18 patients from group 2 had flare between 0 and +1. There was no difference between groups in terms of postoperative inflammation at the first and second months after surgery.

The authors concluded that the effect of different doses of enoxaparin on inflammation should be investigated in a larger series and with quantitative measurements of inflammation.

Visual Field Index for the Humphrey Visual Field Analyzer in Patients With Glaucoma

December *AJO*

Talbot et al. evaluated the accuracy of the visual field index for use with the Humphrey Visual Field Analyzer’s new Glaucoma Progression Analysis II software in a population of patients with mild to moderate glaucoma. The researchers found that the analysis was most precise when the predicted visual field index value was greater than 90 percent; the accuracy declined notably when the predicted value was below this benchmark.

This retrospective cohort study included 42 patients (61 eyes) with at least 11 years of follow-up and annual automated visual fields. Patients with mean deviations of no greater than -20 dB were excluded, and unreliable fields were omitted. Visual fields were divided into two five-year series, and the data were analyzed by the Humphrey

Visual Field Analyzer software. Projected visual field indices from the first five years were then compared with observed values obtained from the subsequent five years, and the unreliable fields that were initially excluded were reintroduced into the series to create a comparison.

The researchers found that predicted visual field indices were accurate, with a mean overestimation of visual field deterioration of 1.37 percent. Of these predicted values, 95 percent were between -4.5 percent and 5.2 percent of the observed values when the predicted visual field index was at least 90 percent, and between -13.8 percent and 20.5 percent when the predicted visual field index was less than 90 percent. No statistical difference was found between the reliable and unreliable series.

The authors concluded that the accuracy of the Humphrey Visual Field Analyzer's new software is greatest for patients whose visual field indices are not expected to progress below 90 percent. Nonetheless, it is a helpful tool for monitoring glaucoma progression in many patients and is proving to be a powerful visual aid and reference to help them understand the status of their visual fields and any changes over time.

JAMA Ophthalmology

Phaco Power Modulation and the Risk of Postoperative Corneal Decompensation

November *JAMA Ophthalmology*

In this prospective randomized clinical trial, **Doors et al.** compared corneal thickness and volume changes in patients with Fuchs endothelial dystrophy (FED) who underwent torsional and longitudinal phacoemulsification, and they assessed the risk factors associated with postoperative corneal decompensation.

The authors found that torsional phacoemulsification effectively reduced ultrasonography time and cumulative dissipated energy compared with the longitudinal variant.

However, neither showed long-term significant differences in postoperative central corneal thickness (CCT), peripheral corneal thickness (PCT), corneal volume (CV), or best spectacle-corrected visual acuity (BSCVA).

This study included 52 eyes with FED and visually significant cataract that underwent torsional ($n = 26$) or longitudinal ($n = 26$) phacoemulsification. Patients were evaluated preoperatively and one day, one week, and one, three, and six months postoperatively. During visits, anterior segment optical coherence tomography was used to evaluate CCT and PCT, and Scheimpflug imaging was used to calculate CV.

Ultrasonography time and cumulative dissipated energy were significantly lower in the torsional group for harder nucleus density grades compared with the longitudinal group. CCT, CV, and PCT at the 6-o'clock position were significantly smaller in the torsional group, but only at one day after surgery. Changes in PCT at the 12-o'clock position and BSCVA were not significantly different between the two groups.

The authors also found that preoperative CCT was the only significant predictor of corneal decompensation after phacoemulsification. A thickness of 620 μm corresponded to an odds ratio of 1, meaning no increased risk of developing the condition. For each 10- μm increase, the odds of developing decompensation increased 1.7 times.

They concluded that these results can assist in the optimization of patient selection and counseling and help prevent corneal decompensation after cataract surgery in patients with FED.

Patients' Travel Patterns After Vision Loss From Glaucoma and Macular Degeneration

November *JAMA Ophthalmology*

Curriero et al. investigated whether decreased visual acuity or visual field loss is associated with restricted travel patterns in older adults. They found that, indeed, decreased visual acuity associated with age-related

macular degeneration (AMD), but not visual field loss related to glaucoma, is associated with restriction of travel to nearby locations. This self-limitation on travel may impact quality of life and hinder access to essential services.

This cross-sectional study included 61 control subjects with normal vision, 84 subjects with glaucoma and bilateral visual field loss, and 65 subjects with AMD and bilateral or severe unilateral loss of visual acuity.

Using a cellular tracking device, the researchers took note of patients' location every 15 minutes between 7 a.m. and 11 p.m. for seven days. Average excursion size (defined as the average maximum distance away from home) and average excursion span (defined as the average maximum distance between all recorded locations away from home during a given excursion) were then determined for each individual.

In multivariable models comparing subjects with AMD and control subjects, average excursion size and span decreased by approximately one-quarter mile for each line of better-eye visual acuity loss. Similar—but not statistically significant—associations were observed between average daily excursion size and span and the severity of better-eye visual field loss in subjects with glaucoma versus control subjects. The researchers also found that being married, living with someone, and younger age were factors associated with more distant travel, while less distant travel was noted in older individuals, African-Americans, and those individuals living in more densely populated regions.

The researchers concluded that validated strategies to motivate and safely enable travel may be an important aspect of low vision rehabilitation in individuals with poor vision due to AMD.

Ophthalmology summaries are written by Jean Shaw and edited by John Kerrison, MD. American Journal of Ophthalmology summaries are edited by Thomas J. Liesegang, MD. JAMA Ophthalmology summaries are written by the lead authors.

ROUNDUP OF OTHER JOURNALS

Bioengineered Lacrimal Glands Achieve Functionality

Nature Communications

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A novel avenue of treatment for dry eye disease achieved proof-of-concept status when **Hirayama et al.** successfully developed and transplanted a bioengineered lacrimal gland replacement in a mouse model.

The mice used in this study had an extraorbital lacrimal gland defect, which mimics the lacrimal gland dysfunction that causes corneal epithelial damage seen in dry eye disease. The researchers engrafted bioengineered lacrimal and harderian gland germs, both developed *in vivo*, into the lacrimal ducts of 7-week-old mice. Transplant growth was apparent by the 30-day mark, with the gland germs developing into acini and ducts with correct cell polarity.

Success rates for the *in vivo* development of the bioengineered lacrimal and harderian gland germs were 95 and 93.8 percent, respectively; success rates for the development of engrafted bioengineered glands were 77.8 percent for the lacrimal glands and 73.7 percent for the harderian glands. The bioengineered glands achieved full tear function, producing a sufficient volume of tears in response to pilocarpine and menthol stimulation. Analysis of the tear fluid secreted from the glands revealed that the fluid contained the appropriate tear proteins, such as lactoferrin.

The researchers also noted that corneal thickness was maintained in the engrafted mice, indicating that the procedure could maintain a healthy ocular surface.

Further studies are needed, however, on the identification of stem cells, including adult tissue stem cells, embryonic stem cells, and inductive pluripotent stem cells, as sources for these bioengineered lacrimal and harderian gland germs.

Secondary IOLs Outperform Simultaneous Implants in Juvenile Idiopathic Arthritis

Ocular Immunology & Inflammation

Published online Sept. 18, 2013

Should an intraocular lens (IOL) be implanted after a uveitis-related pediatric cataract is removed—and if so, how soon should it be implanted?

Magli et al. compared primary and secondary (i.e., postponed) IOL implantation in 40 children with uveitis related to juvenile idiopathic arthritis. They found that secondary IOL implantation resulted in a significantly lower incidence of secondary glaucoma.

In this retrospective interventional study, 21 patients received IOLs immediately following cataract surgery, and 19 had IOLs implanted 11 to 16 months after their cataracts were removed. Follow-up in the two cohorts was nearly equivalent, ranging from 35 to 64 months in the primary IOL group and from 32 to 64 months in the secondary IOL cohort. Outcome measures included best-corrected visual acuity (BCVA) and incidence of secondary glaucoma.

Despite the use of similar uveitis therapy in both groups and the quiescence of the disease at the time of surgery, secondary IOL implantation produced better outcomes. At last visit, mean IOP was 20.3 ± 3.3 mmHg in the primary IOL group and 17.6 ± 2.7 mmHg in the secondary IOL group. BCVA outcomes also were superior in the secondary group, with final mean logMAR measurements (at the two-year mark) of 0.20 ± 0.08 in the secondary IOL group and 0.32 ± 0.1 in the primary IOL group.

The researchers concluded that a delay of one year before secondary implantation seems sufficient to limit potential inflammation-related complications in patients with juvenile idiopathic arthritis-related uveitis.

Visual Prognosis and IOP Control After Cyclodialysis Cleft Repair

Eye

Published online Aug. 30, 2013

Agrawal et al. evaluated visual prognosis and intraocular pressure (IOP) control after the surgical repair of traumatic cyclodialysis clefts and found that successful cleft repair can lead to both a good long-term visual prognosis and stable IOP control, even in eyes with a protracted history of ocular hypotony.

For this retrospective case series, a single surgeon operated on 17 patients (17 eyes). All eyes had ocular hypotony, with optic disc swelling, macular folds, or macular edema. The clefts were caused by blunt ocular trauma in 16 of the patients and by penetrating ocular trauma in one patient. These clefts were located inferiorly in 48 percent of the eyes and superiorly in 29 percent, and they extended for 2.1 ± 1.6 clock hours (range, 0.5 to 6 clock hours). Mean follow-up was 43.7 ± 24.6 months (range, 12 to 110 months).

Cleft cryotherapy alone was used as the initial treatment in 14 of the patients; this option was not used in three patients either because of the size of their clefts or because they had undergone previous attempts at surgical repair. Clefts that did not respond to cryotherapy were then treated with direct cyclohexy; all told, 12 patients underwent direct cyclohexy.

Although IOP spikes of up to 70 mmHg developed in 13 eyes, no eyes had persistent elevated IOP or secondary glaucomatous optic neuropathy at final follow-up. In addition, no serious complications—including suprachoroidal hemorrhages or endophthalmitis—were noted. Preoperatively, four eyes had a best-corrected visual acuity of 6/12 or better; this improved to 12 eyes after surgery.

Roundup of Other Journals is written by Jean Shaw and edited by Deepak P. Edward, MD.