

## The 45th Annual Meeting of the American Association for Pediatric Ophthalmology and Strabismus, San Diego, California, March 27-31, 2019

### Costenbader Lecture

#### 001 Making the superior oblique great again. David A. Plager

**Purpose:** To review the history and bring up to date clinically relevant knowledge about the anatomy and physiology of the superior oblique.

**Current practice:** Varies widely among strabismologists according to their training and personal experience.

**Best practice:** Evaluation and treatment algorithms based on the author's 30 years of learning from others, personal experience and mistakes. There will be emphasis on the importance of relative tendon laxity, how it is easily evaluated and how it can be applied to surgical decision making. When torsion should be specifically addressed or perhaps can be willfully ignored will be discussed.

**Expected outcomes:** Audience will have an appreciation of the history of strabismologist attitudes toward operating on the superior oblique, the evolution of knowledge about its structure and function, and the author's approach toward formulating individual surgical plans based on a combination of clinical and intraoperative findings.

**Format:** Lecture supplemented with illustrations and videos.

**Summary:** The superior oblique is by far the most complicated extraocular muscle and the source of more angst and controversy when learning how best to approach its dysfunction than all the other EOMs combined. However, by applying a few basic principles and avoiding a few common pitfalls, surgeons can have many grateful patients whose annoying or even debilitating symptoms they have relieved.

### Helveston Lecture

#### 002 Cataract surgery in children from birth to less than 13 years of age in the PEDIG registry: status three years following surgery.

Michael X. Repka, MD, MBA, for the Pediatric Eye Disease Investigator Group

**Introduction:** To describe visual outcome and complications three years following lensectomy in children.

**Methods:** Prospective observational study in children <13 years of age at time of lensectomy with follow-up between 30 and 42 months after surgery. Review of registry data for 789 eyes of 611 children for visual acuity, rates of amblyopia, change in refractive error, glaucoma and glaucoma suspect, and other intraocular surgery.

**Results:** Lens surgery was bilateral in 274 (45%; 95% CI, 41%-49%) children and unilateral in 337 (55%; 95% CI, 51%-59%). An intraocular lens (IOL) had been implanted in 414 (56%; 95% CI, 52%-59%) eyes. Amblyopia was identified in 390 (64%; 95% CI, 60%-68%) children. In 488 children 3 years of age and older at follow up, the mean VA was 0.53 (about 20/63) in bilateral aphakic eyes, 0.28 (about 20/40) in bilateral pseudophakic eyes, 0.90 (20/160) in unilateral aphakic eyes, and 0.54 (about 20/63) in unilateral pseudophakic eyes. Age-normal visual acuity was reported for 117 (32%; 95% CI, 27%-37%) pseudophakic eyes and 45 (27%; 95% CI, 20%-35%) aphakic eyes.

A myopic shift in refractive error was found with a mean change of  $-6.87$  D (95% CI =  $-8.45$  to  $-5.28$ ) in bilateral aphakia,  $-1.28$  D (95% CI,  $-1.57$  to  $-0.98$ ) in bilateral pseudophakia,  $-10.66$  D (95% CI =  $-13.43$  to  $-7.90$ ) in unilateral aphakia, and  $-1.41$  D (95% CI,  $-1.75$  to  $-1.06$ ) in unilateral pseudophakia.

A new diagnosis of glaucoma or glaucoma suspect was made in 97 (13%; 95% CI, 10%-15%) eyes. Additional intraocular surgery was performed in 259 (33%; 95% CI, 30%-37%) eyes, most commonly vitrectomy or membranectomy to clear the visual axis.

**Discussion:** About one-third of the eyes with IOLs achieved normal VA for age by 3 years post-lensectomy. Management of visual axis obscuration was the most common surgical intervention, also affecting one-third of eyes.

**Conclusions:** Myopic shift was minimal with the placement of an IOL, about 0.50 D per year. This finding will affect the ultimate refractive outcomes and may require adjustment of guidelines for IOL power selection.

### Young Investigator Award Paper

#### 003 The functional impact of strabismus. Stacy L. Pineles

**Introduction:** Despite strabismus being common, little is known about its effect on functional vision and associated systemic morbidity in children. Common pediatric eye diseases often have a negative effect on children's depth perception, visual field, and binocular summation but it is unclear how this affects a child's ability to function.

**Methods:** Review of studies related to the functional impact of strabismus on children.

**Results:** Strabismus in children significantly diminishes stereopsis and binocular summation, while increasing binocular inhibition, which has been associated with a decrease in patient quality of life. In most cases, strabismus surgery improves binocular summation in children. However, in some cases such as infantile esotropia, binocular summation does not improve. Although there are no published studies in pediatric patients, claims data in adults reveals that the presence of strabismus increases the risk of fractures, falls and musculoskeletal injuries by 27%. This increased risk is presumably due to the functional limitations induced by strabismus. Data from our ongoing studies on the risk of injuries in children with strabismus will be presented.

**Discussion:** Binocular summation is significantly decreased in children with strabismus. This impact, combined with other functional and psychosocial effects, lead to diminished scores in quality of life. In addition, there is evidence in adults that the functional impact of strabismus leads to an increased risk of injuries. It is not clear how strabismus affects a child's risk of physical injuries.

**Conclusions:** Continued claims-based studies will focus on the risk of physical injuries in children with various eye diseases. We will also evaluate the effect of strabismus surgery on the risk of physical injuries.

### Papers

#### 004 Can fluorescein angiography retinal findings predict the late-onset risk of recurrence post intravitreal bevacizumab for ROP?

Swati Agarwal-Sinha, Andres Gonzalez

**Introduction:** Fluorescein angiography (FA) use has documented retinal vascular changes in eyes treated with Intravitreal bevacizumab (IVB) for retinopathy of prematurity (ROP). We studied the retinal vasculature post IVB with FA and assessed features imposing risk for sight threatening complications.

**Methods:** Retrospective study of 25 infants treated with IVB between 7/2014 to 08/2018 was performed.

**Results:** 25 infants had Retcam and FA performed at an average 68 weeks post-menstrual age (PMA). Of these, 19 infants had second FA at an average 98 weeks' PMA and 10 infants had third FA at an average 120 weeks' PMA. Average GA and BW was 24.7 weeks and 675 g, respectively. Average PMA at first IVB treatment was 37.1 weeks. 8 eyes of 6 infants received repeat IVB for recurrent stage 3 at an average 46.6 weeks. The average number of IVB treatments was 2. All 25 infants continued to show inhibited retinal vasculature in zone 2. Twenty-two of 25 infants had or conventional FA features, which included avascular retina, peripheral leakage, shunts, abnormal vessels branching and tangles. Three infants showed unconventional FA findings; significant posterior vascular tortuosity, extreme peripheral vascular branching, diffuse hyperfluorescence at the regressed proliferation site. Of the 3 infants only 1 had late tractional proliferation at 92 weeks' PMA which was treated with barrier laser.

**Discussion:** Unconventional FA features post-IVB may need close long-term follow-up for early detection of sight-threatening complications.

**Conclusions:** FA features can categorize infants as low and high-risk, which would be beneficial in redefining the ROP follow-up guidelines post-IVB treatment.

#### 005 A novel algorithm for visual field testing in pediatric neuro-ophthalmic disease using saccadic vector optokinetic perimetry.

Bilal K. AlWattar, D. Luisa Mayer, Ronald M. Hansen, Gena Heidary  
**Introduction:** Formal methods for visual field testing in young children are limited. Saccadic vector optokinetic perimetry (SVOP), which utilizes eye tracking technology, has been introduced as a potential method for visual field assessment. This study seeks to determine the validity of a novel visual field algorithm which was specifically tailored for testing pediatric patients with neurologic disease using SVOP.

**Methods:** We prospectively compared a novel 33 point visual field algorithm developed at Boston Children's Hospital using SVOP to modified automated Humphrey perimetry testing protocol to assess the validity of the new method in pediatric patients.

**Results:** Eighteen participants (56% female) were enrolled between the ages of 10-18 (median, 16) years. Ten subjects had normal visual fields, and 8 had known visual field loss; 3 had bitemporal hemianopias, 3 had homonymous hemianopias, and 2 had quadrantanopias. Successful completion of both testing paradigms occurred in 17/18 patients. The sensitivity of the new algorithm was 70%, the specificity was 91.5%, the positive predictive value was 62.4%, and the negative predictive value was 94%.

**Discussion:** SVOP testing with the new BCH pediatric neuro-ophthalmic disease algorithm was relatively sensitive in detecting neurologic visual field defects and was able to exclude the presence of visual field loss with high predictability.

**Conclusions:** Compared with standard perimetry, SVOP testing using this novel algorithm has the potential to detect visual field loss from underlying neurologic disease in pediatric patients and warrants further evaluation in a larger cohort of patients.

#### 006 Short- and long-term effects of aflibercept on retinal vascular development in the oxygen-induced retinopathy mouse model of retinopathy of prematurity.

Sarina M. Amin, Jade Guevara, Andres Gonzalez, Wesley C. Smith, Swati Agarwal-Sinha  
**Introduction:** The goal of this study was to assess the effect of aflibercept on retinal vasculature and determine potential long-term detrimental effects in the oxygen-induced retinopathy mouse model.  
**Methods:** Eighty-one mouse eyes were randomly assigned to a room air control (n = 21) or hyperoxia with 75% oxygen (n = 60). The hyperoxia

eyes were divided into three groups: 0 ng (n = 13), 100 ng (n = 25), or 1000ng (n = 22) of aflibercept. Intravitreal aflibercept injections were administered on day 14 of life. The eyes were assigned to be enucleated 3 days (P17) or 11 days (P25) post-injection. Stained flat mount retina preparations were processed and areas of perfusion and nonperfusion were quantified using Image J software. The ratios of nonperfused area of the hyperoxic groups to perfused area of the control groups were determined and a two-sample test was performed.

**Results:** Only the P25 hyperoxic control eyes had a statistically significant larger ratio of nonperfusion compared to the 1000ng eyes ( $P < 0.05$ ); however, there was no significant difference between the P17 groups in terms of nonperfusion. There was a statistically significant decrease ( $P < 0.05$ ) in the ratio of nonperfusion for the 1000ng treatment dose in the P25 group compared to the P17 group.

**Discussion:** These results suggest that the effect of aflibercept dissipates between P17 and P25, and that normal retinal vasculature is not completely inhibited at the 1000 ng dose by P25.

**Conclusions:** This study highlights the efficacy of aflibercept in the mouse model of ROP. It also ascertains that aflibercept does not inhibit the development of normal retina long-term.

#### 007 Trabeculotomy ab interno with the Trab360 device for childhood glaucomas.

Raymond G. Areaux Jr, Alana L. Grajewski, James D. Brandt, Beth Edmunds, Elena Bitrian  
**Introduction:** The Trab360 (Sight Sciences) device facilitates up to 360° of trabeculotomy ab-interno via clear corneal incision (Trab360). This study investigated the success rate and complications of Trab360 in childhood glaucomas.

**Methods:** Multicenter retrospective review of eyes with childhood glaucomas that underwent Trab360 with at least 3 months follow-up. Postoperative IOP less than 25 mm Hg with or without medications and no additional glaucoma surgery defined success.

**Results:** Forty-eight eyes of 43 patients were included. Mean age at surgery was 83 months; 50% occurred prior to 20 months. 50% were right eyes; 43% were male. Mean treatment was 293°. Mean follow-up was 14.8 months. Preoperative IOP was  $31.2 \pm 6.9$  mm Hg; postoperative reduction of IOP was 17 (95% CI 14.3-19.7) mm Hg. Mean number of preoperative glaucoma medications was  $2.7 \pm 1.4$ ; mean decrease postoperatively was 1.2 (95% CI, 0.7-1.7). 69% (95% CI, 53.6%-80.9%) of eyes succeeded. Among the 42 eyes for which Trab360 was the first glaucoma surgery, 71.4% (95% CI, 55.2%-83.8%) succeeded. 83.3% (95% CI, 61.8%-94.5%) of PCG eyes succeeded. Among PCG eyes for which Trab360 was the first glaucoma surgery, 85.7% (95% CI, 62.6%-96.2%) succeeded. Two eyes (4.2%) suffered partial cyclodialysis. There were no other significant complications.

**Discussion:** Trab360 success resembles literature on other angle surgeries for childhood glaucomas. Good surgical technique and caution in high-risk angles is imperative to avoid cyclodialysis. Our study is limited by the imperfections inherent in any retrospective analysis.

**Conclusions:** Trabeculotomy ab interno with the Trab360 device is effective and safe for treating childhood glaucomas, especially PCG.

#### 008 Outcomes and complications of simultaneous bilateral cataract surgery (SBCS) in children—a 10-year review.

Vishaal Bhambhawani, Sina Khalili, Maram Isaac, Asim Ali, Nasrin Tehrani, Kamiar Mireskandari  
**Introduction:** SBCS has been viewed with caution by the ophthalmology community due to risk of devastating complications in both