



# AAPOS 2023

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# ABSTRACTS

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American Association for  
Pediatric Ophthalmology  
and Strabismus

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# **AAPOS Abstracts**

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Lecture #1  
Thursday, March 30, 2023  
8:25 AM – 8:50 AM

*Costenbader Lecture – 2023*

## **What We Have Learned from the Infant Aphakia Treatment Study**

Scott R Lambert

Stanford University  
Palo Alto, California

**Introduction:** The visual outcomes of unilateral congenital cataract surgery are generally quite poor secondary to deprivation amblyopia. Part-time patching of the fellow eye is important in the rehabilitation of these eyes.

**Methods:** Infants with a visually significantly unilateral congenital cataract were randomized to cataract surgery with or without intraocular lens (IOL) implantation. Patching therapy was assessed with quarterly telephone interviews and annual 7-day patching diaries to age 5 years. Visual acuity was tested at age 10.5 years using the E-ETDRS testing protocol. Parenting stress was assessed using the Parenting Stress Index.

**Results:** A total of 114 infants were randomized to cataract surgery; 57 to IOL implantation and 57 to aphakia and contact lens correction. Caregivers reported patching their children a mean of 3.73 hours/day in the first year of life and 3.43 hours/day thereafter. Caregivers reported the highest level of stress 3 months after cataract surgery. Reported hours of patching was associated with visual acuity at age 4.5 years, but accounted for less than 15% of the variance. Visual acuity was tested in 110 of the 114 (96%) patients at age 10.5 years; median logMAR acuity in the treated eyes were similar in the IOL and aphakia groups (0.89 vs 0.86;  $p=.82$ ). Visual acuity was excellent in the treated eye of 27 (25%) children, but poor in the treated eye of 50 (44%) children.

**Conclusion/Relevance:** Visual acuity outcomes were highly variable. Implanting an IOL at the time of cataract extraction was neither beneficial nor detrimental to the visual outcome.

### **References:**

1. Lambert SR, Cotsonis G, DuBois L, Nizam A, Kruger SJ, Hartmann EE, Weakley DR, Drews-Botsch for the Infant Aphakia Treatment Study Group. Long-term effect of intraocular lens vs contact lens correction on visual acuity after cataract surgery during infancy: A randomized clinical trial. *JAMA Ophthalmol* 2020;138:365-372.
2. Drews-Botsch C, Celano M, Cotsonis G, Hartmann EE, Lambert SR. Association Between Occlusion Therapy and Optotype Visual Acuity in Children Using Data From the Infant Aphakia Treatment Study: A Secondary Analysis of a Randomized Clinical Trial. *JAMA Ophthalmology* 2016;134:863-869.
3. Drews-Botsch C, Celano M, Cotsonis G, DuBois L, Lambert SR. Parenting Stress and Adherence to Occlusion Therapy in the Infant Aphakia Treatment Study: A secondary analysis of a randomized clinical trial. *TVST* 2019;8:1-11.



Lecture #2

Thursday, March 30, 2023

11:30 AM – 11:50 AM

## Helveston Lecture: How Research is Evolving the 21<sup>st</sup>-Century Practice of Pediatric Ophthalmology

Michael F. Chiang, MD  
Director, National Eye Institute  
National Institutes of Health, Bethesda, MD

**Introduction:** Remarkable advances in science and computation are rapidly moving us into an era where knowledge discovery is increasingly limited only by creativity. This is creating unprecedented opportunities to improve treatment of blinding diseases that affect children. The National Eye Institute (NEI) directs and funds vision research in the United States, and published a strategic plan in November 2021 outlining its priorities over the next 5 years. This talk will discuss how several of these priority areas are evolving the clinical practice of pediatric ophthalmology.

**Methods:** NEI strategic planning began with a Request for Information to researchers, clinicians, patient advocates, professional societies, and the general public to solicit perspectives on research needs. Incorporating this input, NEI created diverse expert panels to foster dialogue across traditional fields. To develop the final strategic plan, NEI considered panel reports and additional public feedback. NEI has now begun to implement key opportunities identified in this strategic plan.

**Results:** This talk will discuss four areas from the NEI strategic plan that are evolving pediatric ophthalmology practice: (1) Regenerative medicine (e.g., gene therapy, cell-based therapy), which is providing new treatment options for inherited retinal degenerations. (2) Data science, which is making the practice of pediatric ophthalmology increasingly quantitative. (3) Visual neuroscience, which is creating potential for new treatments for conditions such as amblyopia and cerebral visual impairment (CVI). (4) Public health and disparities, which must be addressed to improve access to eye care for children and will require increasing diversity of the pediatric ophthalmology workforce.

**Conclusion/Relevance:** Pediatric ophthalmologists should embrace the impact of technology on clinical practice, recognize recent advances in knowledge, and appreciate that being the best clinician requires understanding of the research process.

### References:

1. Chiang MF, Tumminia SJ. The 2021 National Eye Institute Strategic Plan: eliminating vision loss and improving quality of life. *Ophthalmology* 2022;129:12-14.
2. Chiang MF. The 2021 National Eye Institute Strategic Plan: the impact of vision on health and quality of life. *JAMA Ophthalmol* 2021;139:1263-5.
3. Van Gelder RN, Chiang MF, Dyer MA, et al. Regenerative and restorative medicine for eye disease. *Nat Med* 2022;28:1149-56.

## Frequency and Type of Strabismus 5 Years Following Lensectomy for Pediatric Cataract

Katherine A. Lee, MD, PhD; Michael X. Repka, MD, MBA; Desirae R. Sutherland, MPH; Sarah R. Hatt, DBO; Donny W. Suh, MD; G. Robert LaRoche, MD; Roseanne Superstein, MD; David A. Leske, MS; B. Michele Melia, ScM; Raymond T. Kraker, MSPH; Susan A. Cotter, OD, MS; Jonathan M. Holmes, BM, BCh

Jaeb Center for Health Research  
Tampa, FL

**Introduction:** Strabismus occurs frequently in pediatric cataract,<sup>1-3</sup> yet there are few large cohort studies with long-term follow-up. We report frequency, characteristics, and risk factors for strabismus in a cataract surgery registry.

**Methods:** Participants were <13 years old at lensectomy for non-traumatic cataract (with or without intraocular lens [IOL] implantation) and at least one follow-up exam post-lensectomy. Period prevalence of strabismus (any measurable tropia) by 5-years follow up, including those affected at baseline, was calculated by laterality/IOL status and by age at surgery. Logistic regression analyses were performed to identify factors associated with strabismus by 5 years (laterality, IOL status, age at lensectomy, birth weight; strabismus or nystagmus or systemic medical condition at enrollment; maximum spherical equivalent refractive error 1 year postoperatively, development of glaucoma-related adverse events, surgery to clear the visual axis, ocular abnormality, axial length).

**Results:** Of 864 participants, 23% had strabismus at baseline and 60% (95% CI: 57%-64%) by 5 years after lensectomy. Cumulative incidence was highest in unilateral aphakia (80%, 95% CI: 70%-87%) and age <6 months (78%, 95% CI: 70%-83%). Strabismus by 5 years was associated with unilateral lensectomy (OR=2.33, 95% CI: 1.46-3.69) and younger age at lensectomy (OR=0.83, 95% CI: 0.76-0.91). Of 575 children with a 5-year postoperative examination, 395 (69%) had strabismus: 152 (38%) ET and 149 (38%) XT.

**Conclusion/Relevance:** Most children undergoing lensectomy had or developed strabismus over 5 years of follow up; therefore, long-term care of pediatric cataract will usually involve management of strabismus.

**References:** 1. David R, Davelman J, Mechoulam H, Cohen E, Karshai I, Anteby I. Strabismus developing after unilateral and bilateral cataract surgery in children. *Eye (Lond)* 2016;30:1210-4.  
2. Demirkilinc Biler E, Bozbiyik DI, Uretmen O, Kose S. Strabismus in infants following congenital cataract surgery. *Graefes Arch Clin Exp Ophthalmol* 2015;253:1801-7.  
3. Park SH, Na JH, Shin SY. Strabismus following bilateral cataract surgery in childhood. *Jpn J Ophthalmol* 2010;54:272-7.

## **Objective Assessment And Quantitative Analysis Of Pediatric Cataracts Using Optical Coherence Tomography: Correlation With Clinical Findings**

Savleen Kaur, MD; Jaspreet Sukhija, MD; Anand Bhardwaj, MD; Srishti Raj, MD; Jagat Ram, MD

Post Graduate Institute of Medical Education and Research  
Chandigarh, India

**Introduction:** Slit-lamp microscopy is used to evaluate the extent of lens opacity when planning cataract surgery in adults. But since small children often are uncooperative to sit at a slit lamp, a complete preoperative cataract assessment in the pediatric age group is often possible only under anesthesia. The purpose of the study was to describe and quantify opalescence of pediatric cataractous lens and capsule when imaged with optical coherence tomography and correlate with clinical parameters.

**Methods:** Consecutive pediatric patients <8 years, scheduled for pediatric cataract surgery from October 2020 to June 2021, were recruited. Imaging of the lens was performed preoperatively on the Optical Coherence Tomography system (CASSIA2 ASOCT; Tomey, Nagoya, Japan). The captured images were graded and compared to clinical and intraoperative examinations.

**Results:** The study included 33 eyes of 29 patients. The morphological characterization of cataracts on ASOCT was accurate in 31/33(94%) cases. The ASOCT accurately identified fibrosis and rupture of the capsule in 32/33 (97%) cases each. Whole and nuclear lens densities could be quantified using automated software in the pediatric cataractous lens.

**Conclusion/Relevance:** It is the first study to report the use of Anterior segment optical coherence tomography (ASOCT) to study the pediatric lens in vivo. The findings correlate well with clinical parameters. We propose an objective assessment of pediatric lens opacification on the ASOCT, which can aid in the detection, monitoring, and surgical management of pediatric cataracts.

**References:** 1. Xiang D, Chen L, Hu L, Song S, Xie W, Long J. Image features of lens opacity in pediatric cataracts using ultrasound biomicroscopy. *J AAPOS*. 2016;20:519-522.e4.  
2. El Shakankiri NM, Bayoumi NH, Abdallah AH, El Sahn MM. Role of ultrasound and biomicroscopy in evaluation of anterior segment anatomy in congenital and developmental cataract cases. *J Cataract Refract Surg*. 2009;35:1893-905.  
3. Huang J, Zhao Y, Savini G et al. Reliability of a New Swept-Source Optical Coherence Tomography Biometer in Healthy Children, Adults, and Cataract Patients. *J Ophthalmol*. 2020;2020:8946364

## Factors Associated with Visual Acuity 5 Years Following Lensectomy for Infantile Cataract

Michael X. Repka, MD, MBA; Bahram Rahmani, MD; Desirae R. Sutherland, MPH; Sarah R. Hatt, DBO;  
Marielle P. Young, MD; Susanna M. Tamkins, OD; Mitchell B. Strominger, MD; Benjamin G. Jastrzembski, MD;  
Raymond T. Kraker, MSPH; B. Michele Melia, ScM; Susan A. Cotter, OD, MS; Jonathan M. Holmes, BM, BCh

Jaeb Center for Health Research  
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**Introduction:** In infants with cataract, very early surgery (less than 12 weeks of age) has been reported to be associated with better visual acuity (VA) outcomes,<sup>1-2</sup> but has also been shown to increase the risk of glaucoma.<sup>3</sup>

**Methods:** Using a linear mixed model, we evaluated the relationship between VA at 5 years follow-up and age at time of lensectomy, along with other factors (nystagmus, systemic diagnosis, secondary IOL) in infants enrolled in a prospective registry who had undergone lensectomy for non-traumatic cataract (without primary IOL implantation) before 12 months of age.

**Results:** 149 participants/203 eyes (123 from bilateral cases, 80 unilateral) were included (median age at surgery 1.8, range 0.6 to 11.6 months). Age at lensectomy was not associated with logMAR VA at 5 years (mean [SD] at age <2 months, 2 to <6 months, 6 to <12 months = 0.67 [0.41], 0.72 [0.50], 0.76 [0.50], P=.96). Secondary IOL placement was associated with worse VA (mean VA [SD] with vs without = 0.81 [0.47], 0.65 [0.44], P=.008) as was nystagmus (mean VA [SD] with vs without = 0.80 [0.40], 0.68 [0.46], P=.005), while bilateral lensectomy was associated with better VA (mean VA [SD] bilateral vs unilateral = 0.56 [0.34], 0.92 [0.52], P<.0001).

**Conclusion/Relevance:** In children <12 months of age at lensectomy we found no association between age at lensectomy and VA at approximately 5 years of age. It may be acceptable to delay lensectomy until after 12 weeks given the increased risk of glaucoma with very early surgery.

**References:** 1. Birch EE, Cheng C, Stager DR, Jr., et al. The critical period for surgical treatment of dense congenital bilateral cataracts. *J AAPOS* 2009;13(1):67-71.  
2. Birch EE, Stager DR. The critical period for surgical treatment of dense congenital unilateral cataract. *Invest Ophthalmol Vis Sci* 1996;37(8):1532-8.  
3. Lambert SR. The timing of surgery for congenital cataracts: Minimizing the risk of glaucoma following cataract surgery while optimizing the visual outcome. *J aapos* 2016;20(3):191-2.

Paper #4

Thursday, March 30, 2023

9:16 AM – 9:23 AM

## **Standard Monofocal Intraocular Lenses Versus Enhanced Monofocal Intraocular Lenses for Children 6-13 Years Old with Pediatric Cataract**

Shaza Elzawahry, MD; Hala Elhilali, MD; Ahmed Awadein, MD; Ghada Gawdat, MD; Sara Maher, MD

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**Introduction:** Visual rehabilitation following monofocal intraocular lens (IOL) implantation for pediatric cataract poses a challenge because of the difficulty of maintaining good visual acuity (VA) at variable distances. The aim of this study was to evaluate the use of an enhanced monofocal IOL to improve the visual performance at varying distances.

**Methods:** This was a pilot study performed on 45 eyes of children aged 6-13 years old presenting with unilateral or bilateral cataract. Patients were randomized into 2 groups; monofocal group (23 eyes) in whom a standard monofocal aspheric lens (Tecnis Model ZCB00, Johnson & Johnson Vision, Santa Ana, CA) was implanted and the enhanced monofocal group (22 eyes) in whom an enhanced monofocal lens (ICB00; Tecnis Eyhance, Johnson & Johnson Vision, Santa Ana, CA) was used. Target refraction was emmetropia. Uncorrected and corrected VA were measured at distance, intermediate, and near distances at 3 months. Defocus curves wearing distance correction to simulate vision at different distances were plotted.

**Results:** Uncorrected and corrected distance, intermediate, and near VA, and the power of near added were comparable between both groups ( $P > 0.05$ ). Mean logMAR VA through the defocus range was significantly better ( $P < 0.01$ ) in the Eyhance group (0.27 vs. 0.36). Moreover, 25% of patients with Eyhance maintained their corrected VA within 1 line through a 1.5 D of defocus.

**Conclusion/Relevance:** The use of an enhanced monofocal IOL improved visual performance at intermediate distances  $>1$  meter but did not reduce the power of spectacles needed for distances  $<1$  meter.

**References:** Auffarth GU, Gerl M, Tsai L, et al. Clinical evaluation of a new monofocal IOL with enhanced intermediate function in patients with cataract. *J Cataract Refract Surg.* 2021;47(2):184-191.



Paper #5  
Thursday, March 30, 2023  
9:27 AM – 9:34 AM

## **Anterior Chamber Iris-Claw Intraocular Lens Implantation for Aphakia in Children with Ectopia Lentis in Marfan Syndrome**

Marije Sminia; Elsbeth Zeeburg van; Nicoline Schalijs-Delfos

Leiden University Medical Center; LUMC  
Leiden, the Netherlands

**Introduction:** In the absence of capsular support, intraocular lens (IOL) implantation needs a personalized surgical approach and selection of the most suitable IOL for the individual patient. This paper reports the long term outcome of lensectomy with primary anterior chamber iris-claw lens implantation in the eyes of children with ectopia lentis due to Marfan syndrome.

**Methods:** Retrospective analysis of 44 eyes of 23 children operated between September 2007 and April 2019.

**Results:** Main outcome measures were endothelial cell count (ECC), visual acuity gain and complications. Median age at IOL implantation was 6,25 (1-17) years (y). Mean follow up was 7 (2-13)y. Mean annual ECC decline after surgery was 2.1% ±2.9 (SD). Mean best corrected visual acuity was 0.5 (1.0-0.15) LogMAR preoperatively and 0.00 (0.80-0.30) LogMAR at last follow up. Mean vision gain was 0.2 (0.90-0.20) LogMAR. Three eyes had a fibrinous reaction with obstruction of the peripheral iridectomy (PI) 1 day postoperatively, two needing reoperation. During long-term follow up one eye needed surgery for flat anterior chamber caused by occlusion of the PI and two for retinal detachment. Six eyes needed repositioning of one of the claws after high impact trauma.

**Conclusion/Relevance:** Anterior chamber iris-claw IOL implantation results in good visual outcome and endothelial cell counts comparable to normative data of children without a history for intraocular surgery. Complication rate is acceptable but posttraumatic IOI-luxation and PI-size call for preventive measures. Iris-claw implantation is a suitable option for surgical correction of aphakia in the absence of capsular support in children with Marfan syndrome.

**References:** Cheung CSY, Vanderveen DK. Intraocular Lens Techniques in Pediatric Eyes with Insufficient Capsular Support: Complications and Outcomes. *Seminars in Ophthalmology* 2019; 34: 293-302.  
Sminia ML, Odenthal MT, Prick LJ, et al. Long-term follow-up after bilateral Artisan aphakia intraocular lens implantation in two children with Marfan syndrome. *J AAPOS* 2012; 12(1): 92-94.  
Gawdat GI, Taher SG, Salama MM, et al. Evaluation of Artisan aphakic intraocular lens in cases of pediatric aphakia with insufficient capsular support. *J AAPOS* 2015; 19(3): 242-246.

Paper #6

Thursday, March 30, 2023

9:34 AM – 9:41 AM

## **Anatomical and Functional Outcomes of Rotational Autokeratoplasty in Children: A Multicenter Retrospective Study**

Priscille de Laage de Meux, MD; Damien Guindolet, MD, PhD; Georges Caputo, MD;  
Dominique Bremond-Gignac, MD, PhD; Pascal Dureau, MD; Matthieu Robert, MD, PhD; Gilles Martin, MD

**Introduction:** To report the operative indications and the long-term anatomical and functional results of a series of children operated on by ipsilateral rotational autokeratoplasty (IRA).

**Methods:** This retrospective, multicenter study was based on the medical records of children operated on by IRA in two pediatric ophthalmology centers in Paris. The etiology of corneal opacity, time of onset, preoperative and postoperative visual acuity, size of the trephine used, any complications, astigmatism and duration of follow-up were recorded

**Results:** 33 eyes of 31 children were included. The mean age at surgery was 51.7 months. The commonest etiology of corneal opacity was post-traumatic (64%), followed by Peters' anomalies (27%) and post-infectious scarring (9%). Ninety-seven percent of the corneas were clear at last count. Postoperative visual acuity averaged 0,16 and mean postoperative astigmatism was -5.41 diopters. In children with available visual acuity, 32% had visual acuity of 0,50 or better in the operated eye. The factors significantly associated with a postoperative visual acuity of 0,50 or better were the 'late' age of onset of the opacity ( $p<0.01$ ), the 'late' age of the surgery ( $p<0.01$ ), and the post-traumatic etiology ( $p=0.03$ ). Forty percent of the patients had postoperative complications, the most frequent was the occurrence of a Seidel and/or an iris hernia in early postoperative period.

**Conclusion/Relevance:** IRA is an interesting alternative to penetrating keratoplasty (PK) in children. The anatomical result seems to be better and less random in IRA than in PK, and the complication rates are also less important

**References:** 1. Ramappa M, Pehere NK, Murthy SI, Chaurasia S, Rao HL, Sangwan VS. Rotational autokeratoplasty in pediatric patients for nonprogressive paracentral corneal scars. *Ophthalmology*. 2012;119(12):2458-2462. doi:10.1016/j.ophtha.2012.06.045

## Probing and Irrigation versus Primary Nasal Endoscopy for the Treatment of Congenital Dacryocystoceles

Tessnim R. Ahmad, MD; Maanasa Indaram, MD

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San Francisco, CA, USA

**Introduction:** Dacryocystoceles are a rare complication of congenital nasolacrimal duct obstruction and may require surgical intervention.<sup>1,2</sup> We compare outcomes and complications of probing and irrigation (P&I) alone, P&I with nasal endoscopy and cyst marsupialization, and primary nasal endoscopy with cyst marsupialization.

**Methods:** Pediatric patients (age  $\leq 2$  years) with a diagnosis of dacryocystocele from 2012 to 2022 were retrospectively identified and their electronic medical records were reviewed. The primary outcome was resolution of the dacryocystocele after a single procedure. Secondary outcomes were use of general anesthesia, complication rate, admission rate, and admission duration. Interventions were compared using chi-square and one-way analysis of variance.

**Results:** Of 54 patients, 21 (39%) underwent P&I, 23 (18%) underwent P&I with endoscopy, and 10 (19%) underwent primary endoscopy. Most treated with P&I received general anesthesia (P&I alone,  $n = 17$ , 81%; P&I with endoscopy,  $n = 22$ , 96%) compared to none who underwent primary endoscopy ( $P < 0.001$ ). Resolution was 76% ( $n = 16$ ) for P&I and 100% for the remainder ( $P = 0.381$ ). The complication rate was 14% ( $n = 3$ ) for P&I, 48% ( $n = 11$ ) for P&I with endoscopy, and 0% for primary endoscopy ( $P = 0.005$ ). Most P&I procedures required hospital admission compared to half of primary endoscopy procedures ( $P = 0.015$ ), but admission duration was not different ( $P = 0.939$ ).

**Conclusion/Relevance:** Primary nasal endoscopy is safe and effective for the treatment of dacryocystoceles and avoids general anesthesia, which poses risks for the newborn.<sup>2</sup>

**References:** 1. Basic Clinical and Science Course. Pediatric Ophthalmology and Strabismus. 2019-20. Chapter 19 pg 260-261.

2. Lueder GT. Endoscopic treatment of intranasal abnormalities associated with nasolacrimal duct obstruction. JAAPOS. 2004;8(2):128-32. doi: 10.1016/j.jaapos.2003.09.016.

3. von Ungern-Sternberg BS, Boda K, Chambers NA, Rebmann C, Johnson C, Sly PD, Habre W. Risk assessment for respiratory complications in paediatric anaesthesia: a prospective cohort study. Lancet. 2010 4;376(9743):773-83. doi: 10.1016/S0140-6736(10)61193-2.

## **Ethnic Disparity in Timing of Amblyopia Diagnosis**

Daniel A. Greninger, MD; James Ruben, MD; Carol Conell, PhD

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**Introduction:** Earlier diagnosis and treatment of amblyopia leads to better outcomes. This study seeks to determine whether the timing of amblyopia diagnosis in a managed care population of pre-school children is impacted by ethnicity, state-subsidized insurance, or gender.

**Methods:** We obtained information from the electronic health record on self-identified ethnicity, insurance subsidy, gender, and amblyopia diagnoses between ages 36-95 months for 285,039 children born between 2000-2008 who were enrolled continuously in a Northern California membership-based health plan providing integrated primary care and specialty eye care to urban, suburban, and rural communities. Multivariable logistic regression was used to investigate whether ethnicity, insurance subsidy, gender, geographic area, or birth year were associated with differences in the odds of diagnosis before or after 6 years old.

**Results:** 3389 patients (1.2%) had amblyopia with average age of diagnosis 69.5 months. The odds ratio of early diagnosis was 0.6 for Hispanic and Black ethnicities compared to White and 0.7 for subsidized insurance compared to those with no subsidy ( $\alpha = .05$ ). Differences between Asian and White ethnicity, and effects of gender, geographic area, and birth year were nonsignificant ( $\alpha = .05$ )

**Conclusion/Relevance:** Hispanic and Black ethnicity were both independently associated with later diagnosis of amblyopia. Presence of insurance subsidy, which may serve as a proxy for socioeconomic status, was also independently associated with later diagnosis of amblyopia. Sub-analysis suggests that the ethnic disparity cannot be explained solely by differences in the prevalence of subsidized insurance amongst different ethnic groups.

**References:** 1. Holmes JM, Lazar EL, Melia BM, et al. Effect of age on response to amblyopia treatment in children. *Arch Ophthalmol* 2011; 129:1451-7

## **Randomized Clinical Trial of Patch-Free Streaming Binocular Contrast-Rebalanced Dichoptic Cartoons versus Patching for Treatment of Amblyopia in Children Aged 3 to 5 Years**

Reed M. Jost, MS; Prashanthi Giridhar, MD; David R. Stager, Jr, MD; Becky Luu, MD; Lori Dao, MD; Cynthia L. Beauchamp, MD; Taylor A. Brin, PhD; Yi-Zhong Wang, PhD; Robert F. Hess, PhD; Benjamin Thompson, PhD; Eileen E. Birch, PhD

Retina Foundation of the Southwest  
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**Introduction:** Contrast-rebalanced dichoptic videos and games that promote binocular experience are effective in treating amblyopia in children.<sup>1</sup> Because younger children improve more than older children (>7y) with binocular amblyopia treatment,<sup>2,3</sup> we developed a modified, dichoptic set of short, age-appropriate cartoons designed for preschool children. In a randomized clinical trial, we compared these new dichoptic cartoons, streamed at-home on a handheld 3D-enabled portable game console, versus patching as amblyopia treatment for children aged 3-5 years.

**Methods:** Twenty-seven amblyopic children (3-5y; 20/40-20/100) were randomly assigned to patching (2 hours/day, 7 days/week) or dichoptic cartoons (1 hour/day, 4 days/week). Dichoptic animated cartoons had reduced fellow eye contrast for background elements and high contrast characters/objects for the amblyopic eye displayed on a New Nintendo 3DS XL. After the 2-week primary outcome, all children watched dichoptic cartoons for the next two weeks. Best corrected visual acuity (BCVA), stereoacuity, and suppression were measured at each visit.

**Results:** After 2 weeks of binocular treatment (8.0 hours, 100% adherence), BCVA improved  $0.10 \pm 0.02$  logMAR ( $p=0.001$ ). Similarly, with 2 weeks of patching treatment (26.2 hours, 94% adherence), BCVA improved  $0.07 \pm 0.02$  logMAR ( $p=0.007$ ). Visual acuity continued to improve in both groups with up to 4 weeks of binocular treatment (0.15 and 0.14 logMAR improvement, respectively, with 52% obtaining 20/32 or better).

**Conclusion/Relevance:** This novel at-home binocular cartoon treatment significantly improved amblyopic eye BCVA after 2 weeks and 4 weeks. Repeated binocular visual experience with contrast-rebalanced binocular cartoons provides an additional effective option for amblyopia treatment in young children.

**References:** 1. Birch EE; Kelly KR; Wang J. 'Recent advances in screening and treatment for amblyopia.' *Ophthalmol Ther.* 10.4 (2021): 815-830.

2. Birch EE; Jost RM; Kelly KR; Leffler JN; Dao L; Beauchamp CL. 'Baseline and clinical factors associated with response to amblyopia treatment in a randomized clinical trial.' *Optom Vis Sci.* 97.5 (2020): 316-323.

3. Holmes JM; Levi DM. 'Treatment of amblyopia as a function of age.' *Vis Neurosci.* 35 (2018): E015.

## **An Eye-Tracking Based Dichoptic Amblyopia Home Treatment is Comparable to Standard Occlusion for Amblyopia: A Multicenter Randomized Clinical Trial**

Tamara Wygnanski-Jaffe, MD; Burton J. Kushner, MD; Michael Belkin, MD; Avital Moshkovitz, PhD

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**Introduction:** The effectiveness of dichoptic therapy for amblyopia has been debatable, with inferior performance when compared to standard patching in RCT's 1-3.

**Methods:** To compare the effectiveness and safety of a binocular-eye-tracking-based-home-treatment (CureSight) to patching, we conducted a multicenter RCT. 103 children aged  $4 \leq 9$  years with anisometropic, small-angle strabismic, or mixed-mechanism amblyopia were enrolled at six sites.

Binocular treatment group used the CureSight for 90 min/day, 5 days/week for 16 weeks (120 hours). The treatment combined anaglyph glasses and an eye-tracker to induce dominant eye real-time blur around the central vision area on any available streamed video content. Patching group received 2-hour patching 7 days/week (224 hours). The primary outcome was the improvement in the amblyopic eye distance visual acuity (AEDVA) from baseline at 16 weeks. Secondary outcomes included stereoacuity, binocular distance visual acuity (DVA), treatment adherence and safety.

**Results:** The binocular group DVA improvement was 0.28 logMAR (SD 0.13,  $p < 0.0001$ ) and 0.23 logMAR (SD 0.14,  $p < 0.0001$ ) in the patching group demonstrating non-inferiority (90% CI of difference [-0.008, 0.076]) of the binocular treatment group. Stereoacuity, improved by 0.40 log-arcseconds ( $p < 0.0001$ ). BVA improved by 0.13 logMAR ( $p < 0.0001$ ) in the binocular group, with similar improvements found in the patching group in both stereoacuity and BVA (0.46 log arcseconds,  $p < 0.0001$ , 0.09 logMAR,  $p < 0.0001$ ). Adherence was significantly higher in the binocular vs. the patching group (91% vs. 83%,  $p = 0.011$ ). No serious adverse events were reported.

**Conclusion/Relevance:** Binocular treatment is noninferior to patching in amblyopic children aged  $4 \leq 9$  years. High adherence may provide an alternative treatment option for amblyopia.

### **References:**

1. Pineles SL, Aakalu VK, Hutchinson AK, et al. Binocular Treatment of Amblyopia: A Report by the American Academy of Ophthalmology. *Ophthalmology*. 2020;127(2):261-272.
2. Xiao S, Angjeli E, Wu HC, et al. Randomized Controlled Trial of a Dichoptic Digital Therapeutic for Amblyopia. *Ophthalmology*. 2022;129(1):77-85.
3. Holmes JM, Manh VM, Lazar EL, et al. Effect of a Binocular iPad Game vs Part-time Patching in Children Aged 5 to 12 Years With Amblyopia: A Randomized Clinical Trial. *JAMA Ophthalmol*. 2016;134(12):1391-1400.



Paper #11  
Thursday, March 30, 2023  
12:20 PM – 12:27 PM

## **A Multicentre Randomized Controlled Trial Comparing Patching for Amblyopia with and without Extended Optical Treatment**

Irene Gottlob; Frank A. Proudlock; Michael Hisaund; Gail D. Machonachie; Elena Papageorgiou; Ali Manouchehrinia

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**Introduction:** Amblyopia is the most common visual disease in childhood. An extended period of optical treatment (EOT) prior to patching for amblyopia is included in clinical guidelines in several countries. However, EOT has not been directly compared to a treatment group without EOT prior to patching in an RCT

**Methods:** A prospective RCT, stratified 334 children for type and severity of amblyopia to compare EOT (18 weeks glasses wear prior to patching; n=170) to an early patching (EP) group (3 weeks glasses wear prior to patching; n=164). Glasses wear and patching were electronically monitored in half the cohort. The primary outcome was success ( $\leq 0.200$  interocular difference in logMAR visual acuity) after 12 weeks of patching.

**Results:** The EP group had a higher level of success (66.7%) compared to the EOT group (53%,  $P=0.022$ ). Similar outcomes were also observed after 18 and 24 weeks of patching, using other definitions of success, and imputation of missing values. Prescribed and electronically monitored hours of patching were not significantly different between the two groups. Younger children with less severe amblyopia had a higher likelihood of successfully responding to EOT only.

**Conclusion/Relevance:** EOT is not an effective treatment strategy for amblyopia as a whole, providing a lower success rate compared to treatment without EOT and offering no advantage in terms of visual outcomes or the amount of patching required. However, younger children, with less severe amblyopia are more likely to successfully respond to EOT. Hence a personalized approach to the use of EOT is recommended.

**References:** Stewart CE, Stephens DA, Fielder AR, Moseley MJ; ROTAS Cooperative. Objectively monitored patching regimens for treatment of amblyopia: randomised trial. *BMJ*. 2007 ;335(7622):707

Writing Committee for the Pediatric Eye Disease Investigator Group, Cotter SA, Foster NC, et al.. Optical treatment of strabismic and combined strabismic-anisometropic amblyopia. *Ophthalmology*. 2012;119:150-8.

Cotter SA; Pediatric Eye Disease Investigator Group, Edwards AR, et al. Treatment of anisometropic amblyopia in children with refractive correction. *Ophthalmology*. 2006;113:895-903

Paper #12  
Thursday, March 30, 2023  
12:27 PM – 12:34 PM

## Failed Vision Screenings and Childhood Refractive Errors: When Do We Actually Prescribe Glasses?

Yoon H. Lee, MD; Brian Forbes, MD, PhD; Alyssa Spiller; Yinxi Yu, MS; Gui-Shuang Ying, PhD;  
Gil Binenbaum, MD, MSCE

Children's Hospital of Philadelphia  
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**Introduction:** Anecdotally, pediatric ophthalmology practices have experienced an increase in referrals for failed vision screening (FVS), particularly among younger children. The utility of these referrals is unclear. We sought to describe glasses prescribing patterns overall and specifically for children referred for FVS.

**Methods:** Retrospective cross-sectional study of children under age 18 years who had a cycloplegic refraction (CR) by a pediatric ophthalmologist or optometrist at CHOP during 2009-2022. CR with strabismus, ocular surgery, low vision, or already wearing glasses were excluded. Primary outcome was proportion of glasses prescribed, stratified by type and amount of refractive error and age at CR. Sub-analysis for children referred for FVS, time-period comparisons, and comparison to AAO-prescribing guidelines<sup>1</sup> were performed.

**Results:** 87,771 CRs of 63,301 children were studied. Overall, glasses prescribing was low before age 12 months regardless of refractive error or meeting AAO guidelines, and prescribing thresholds decreased gradually with age across all refractive-error categories. Refractive-error specific prescribing rates did not change significantly between 2009-2015 and 2016-2022. Among 14,284 CRs of 13,584 children with FVS, prescribing was 4%, 13%, 26%, and 48-50% for ages <1 year, 1-2 years, 2-3 years, and 3-18 years, respectively. Before age 2, prescribing rates following FVS were >60% only for myopia>-4.00D, hyperopia>+5.00D, astigmatism>+3.00D, and anisometropia>+2.00D, and 90% of FVS referrals before age 2 did not meet these thresholds.

**Conclusion/Relevance:** The rate of glasses prescribing for FVS before age 2 years is very low. Re-evaluation of referral thresholds are warranted, based on real-world prescribing patterns data.

**References:** 1. Wallace DK et al. on behalf of the American Academy of Ophthalmology Preferred Practice Pattern Pediatric Ophthalmology/Strabismus Panel. Pediatric Eye Evaluations Preferred Practice Pattern. *Ophthalmology*. 2018; 125(1): 189-220. DOI: <https://doi.org/10.1016/j.ophtha.2017.09.032>

## Ocular Biometric Parameters Changes and Choroidal Vascular Abnormalities in Patients with Neurofibromatosis Type 1 Evaluated by OCT-A

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**Introduction:** To analyze ocular biometric parameters alterations of the posterior pole and choroidal abnormalities in patients with neurofibromatosis type 1 (NF1) by adopting multimodal imaging, especially focusing on the role of novel diagnostic devices like swept-source optical coherence tomography angiography (SS-OCTA).

**Methods:** In this prospective, case-controlled study, patients with NF1 and age-matched control subjects were quantitatively analyzed by using multimodal imaging. All the subjects underwent confocal scanning laser ophthalmoscopy (SLO), SS-OCT and SS-OCTA examinations.

**Results:** SS-OCT analysis revealed a lower macular retinal nerve fiber layer (RNFL) thickness in patients with NF1 compared with those with suspected NF1 ( $95.0 \pm 15.9$  vs  $109.7 \pm 11.3$   $\mu\text{m}$ ;  $P = 0.001$ ) and control subjects ( $106.8 \pm 14.4$   $\mu\text{m}$ ,  $P = 0.003$ ). Retinal thickness was significantly lower in NF1 patients compared to those with suspected NF1 ( $280.7 \pm 23.0$  vs  $304.2 \pm 15.3$   $\mu\text{m}$ ;  $P < 0.001$ ) and control subjects ( $298.7 \pm 23.8$   $\mu\text{m}$ ,  $P = 0.003$ ). The mean vascular flow area of the SCP was significantly higher in patients with NF1 ( $42.6 \pm 2.2\%$ ) and suspected NF1 ( $43.1 \pm 2.5\%$ ) compared to control subjects ( $41.0 \pm 2.0\%$ ; respectively,  $P = 0.017$  and  $P = 0.002$ ). In the second choroidal layer, the flow area was significantly lower in patients with NF1 compared to control subjects ( $45.4 \pm 4.8$  vs  $49.0 \pm 4.0\%$ ;  $P = 0.011$ ).

**Conclusion/Relevance:** Retinal thicknesses alterations and choroidal nodules are described as ocular manifestations in patients with NF1. In addition, OCTA could represent an important novel advanced imaging technique, capable of detecting early altered retinal and choroidal vascular flow area in patients with NF1.

**References:** 1. Biometric and refractive errors evaluation in patients with neurofibromatosis type 1.

Vagge A, Corazza P, Vagge R, Agosto G, Lester M, Camicione P, Ferro Desideri L, Traverso CE.

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PMID: 32515611

2. Choroidal Freckling in Pediatric Patients Affected by Neurofibromatosis Type 1.

Vagge A, Nelson LB, Capris P, Traverso CE. J Pediatr Ophthalmol Strabismus. 2016 Sep 1;53(5):271-4. doi:

10.3928/01913913-20160719-05. PMID: 27637020 Review.

3. Choroidal Abnormalities Detected by Near-Infrared Imaging (NIR) in Pediatric Patients With Neurofibromatosis Type 1

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population. Vagge A, Camicione P, Capris C, Sburlati C, Panarello S, Calevo MG, Traverso CE, Capris P. Acta

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Paper #14

Thursday, March 30, 2023

12:41 PM – 12:48 PM

## **Foveal Hypoplasia Grading in 95 Cases of Congenital Aniridia: Correlation to Phenotype and PAX6 Genotype**

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**Introduction:** To correlate the degree of foveal hypoplasia in congenital aniridia with visual acuity, iris phenotype, and PAX6 mutations.

**Methods:** 95 consecutive patients with high quality Spectral-domain optical coherence tomography (SD-OCT) records and available genotype were included in a single referral center. Iris hypoplasia was classified as complete, presence of iris root or remnants and mild atypical aniridia. SD-OCT images were assessed to classify foveal hypoplasia as Grade 1 to 4 and to determine mean thicknesses for retinal layers.

**Results:** Most eyes (93.5%) showed variable degree of foveal hypoplasia. PAX6-positive patients presented higher degree of foveal hypoplasia than patients negative for PAX6 ( $p < 0.0001$ ). PAX6 deletions, PAX6 variants subjected to nonsense-mediated decay and C-terminal extension variants were mostly associated with grade 3 or 4 foveal hypoplasia. Deletions restricted to the 3' flanking regulatory regions of PAX6 were associated with grade 1 or 2 foveal hypoplasia ( $p < 0.0001$ ). BCVA was higher and foveal outer retinal layers were thicker in patients with deletions in the 3' regulatory region of PAX6 ( $p = 0.001$  and  $p < 0.0001$ ). Patients with missense mutations presented with variable degree of foveal hypoplasia. The degree of foveal hypoplasia was most frequently correlated with the severity of iris defects ( $p = 0.005$ ). However, among eyes with mild iris phenotype, 70% showed severe foveal hypoplasia.

**Conclusion/Relevance:** All types of PAX6 variants, even those associated to mild iris defects, may be at risk for severe foveal hypoplasia with poor visual prognosis, except for deletions restricted to the 3' regulatory PAX6 regions.

**References:** Thomas MG, Kumar A, Mohammad S, et al. Structural grading of foveal hypoplasia using spectral-domain optical coherence tomography a predictor of visual acuity? *Ophthalmology*. 2011;

## **Childhood Glaucoma Treatment Outcomes: From Case Reports to Big Data Analysis**

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**Introduction:** Childhood glaucoma is a heterogeneous group of diseases with a wide range of evolving surgical treatment options. As a result, the childhood glaucoma treatment outcome is highly variable in the medical literature. A systematic review of literature provides insights on generalizable findings across the spectrum of childhood glaucoma.

**Methods:** Systematic review of recent literature on childhood glaucoma surgical treatment.

**Results:** Early predictors of poor final visual outcomes include the presence of nystagmus, anterior segment dysgenesis or failed angle surgery. Ab interno angle surgery such as gonioscopy-assisted transluminal trabeculotomy has a failure rate of 48.6% over a mean follow up of 2.4 years. Trabeculectomy performed within the first 2 years of life has a failure rate of 33% at 5 years, while tube shunts has a failure rate of 38% over a mean follow up of 5.4 years. Leveraging the large cohort from the IRIS® (Intelligent Research in Sight) Registry, we can glean additional risk factors for complications and failures. Rare childhood glaucoma syndromes, such as pachyphakia, microcornea and angle closure syndrome, mucogenic glaucoma, and Radius-Maumanee syndrome, require individualized surgical solutions.

**Conclusion/Relevance:** Childhood glaucoma treatment outcome is high variable. Identify early predictors of poor visual and intraocular pressure outcomes can help guide and individualize surgical approaches. A severity staging system in childhood glaucoma and prospective surgical trials may provide the data needed to improve childhood glaucoma surgical care.

**References:** Chang TC, Cavuoto KM, Grajewski AL, Hodapp EA, Vanner EA. Early predictors of long-term outcomes in childhood glaucoma. *J Glaucoma* 2018 Dec;27(12):1094-1098.  
Medert CM, Cavuoto KM, Vanner EA, Grajewski AL, Chang TC. Risk Factors for Glaucoma Drainage Device Failure and Complication in the Pediatric Population. *Ophthalmol Glaucoma*. 2020 Jul 21:S2589-4196(20)30188-5. doi: 10.1016/j.ogla.2020.07.006.  
Quan AV, Chen J, Wang YE, Vanner EA, Grajewski AL, Hodapp EA, Chang TC. Factors Associated with Gonioscopy-Assisted Transluminal Trabeculotomy (GATT) Complications and Failure in Children. *Am J Ophthalmol*. 2022 May 9;241:168-178. doi: 10.1016/j.ajo.2022.04.023.

Paper #16  
Saturday, April 1, 2023  
8:10 AM – 8:17 AM

## **Risk Factors for Glaucoma Diagnosis and Surgical Intervention following Pediatric Cataract Surgery in the IRIS® Registry**

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**Introduction:** Glaucoma following cataract surgery (GFCS) is a vision-threatening complication of pediatric cataract surgery. The IRIS® Registry (Intelligent Research in Sight) may provide insight into the risk factors for GFCS diagnosis and surgical intervention.

**Methods:** This retrospective cohort study included children (age ≤18 years) in the IRIS Registry undergoing cataract surgery between 01/2013-12/2020. Children with glaucoma diagnosis or surgery before cataract removal were excluded. The Kaplan-Meier estimator was used to determine the probability of GFCS diagnosis and glaucoma surgery five years after cataract surgery. Multivariable Cox regression was used to identify associated risk factors.

**Results:** The study included 7,530 children (median 11.0 years; 45.3% female). The five-year probability of GFCS was 22.6% (95%CI 21.2%-23.9%) and glaucoma surgery was 2.6% (95%CI 2.1%-3.1%). The probability of GFCS for children <1 year old was 38.6% (95%CI 32.3%-44.3%). Risk factors for GFCS included aphakia (HR 1.27; 95%CI 1.08-1.49), unilateral cataract (HR 1.82; 95%CI 1.60-2.08), microcornea (HR 1.86; 95%CI 1.04-3.30), Black race (HR 1.35; 95%CI 1.12-1.62), and private insurance (HR 1.52; 95%CI 1.30-1.76). The most common surgery was glaucoma drainage device (GDD) insertion (36.8%). Final visual acuity was worse in patients that required glaucoma surgery than those that did not (LogMAR 0.79 vs 0.18;  $p < 0.001$ ).

**Conclusion/Relevance:** GFCS diagnosis in the IRIS Registry was associated with young age, aphakia, unilateral cataract, microcornea, Black race, and private insurance. GDD surgery was the preferred surgical treatment, consistent with the World Glaucoma Association 2013 consensus recommendations for childhood glaucoma management.

**References:** Weinreb RN, Grajewski A, Papadopoulos M, Grigg J, Freedman S. Childhood Glaucoma: The 9th Consensus Report of the World Glaucoma Association. Amsterdam: Kugler Publications; 2013.



Paper #17  
Saturday, April 1, 2023  
8:17 AM – 8:24 AM

## Impact of Socioeconomic Factors on the Outcomes of Childhood Glaucoma

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**Introduction:** To determine the association between neighborhood-level socioeconomic status indicators and the outcomes of childhood glaucoma

**Methods:** A retrospective cohort study of childhood glaucoma patients who presented to Boston Children's Hospital between 2014-2019. We stratified glaucoma into primary and secondary childhood glaucoma. Clinical data collected included etiology, management, and visual outcomes. The Child Opportunity Index (COI) was used as a metric of neighborhood quality. COI scores were determined based on the residential address. Multivariable linear mixed effects regression models were developed to assess the association of COI with final visual acuity, intraocular pressure (IOP), and the number of medications at last follow-up controlling for patient factors (e.g., age, gender, race/ethnicity, insurance type) and accounting for inter-eye correlation.

**Results:** A total of 221 eyes (149 patients) were included (52.3% females and 56.4% non-Hispanic White children). The mean age at the time of diagnosis was 37 months for primary and 6.6 years for secondary glaucoma. The mean age at the last follow-up was 8.6 years in primary and 12.7 years in secondary glaucoma. For patients with primary glaucoma, we found the higher overall and education COI scores were associated with a lower final IOP ( $P < 0.05$ ) and higher education index was associated with a lower number of glaucoma medications at the last follow-up ( $P < 0.05$ ). For every 20-point increase in the education score, there was an adjusted -2.71 (95% CI -4.76, -0.66) mmHg decrease in the final IOP. In secondary glaucoma, we found that lower overall, health environment, education, and social and economic COI scores were associated with worse vision ( $P < 0.001$ ).

**Conclusion/Relevance:** Neighborhood-level indicators of socioeconomic status are potentially important variables for predicting outcomes in childhood glaucoma.

### References:

- 1- Vu DM, Stoler J, Rothman AL, Chang TC. A Service Coverage Analysis of Primary Congenital Glaucoma Care Across the United States. *Am J Ophthalmol.* 2021 Apr;224:112-119.
- 2- Oh SA, Ra H, Jee D. Socioeconomic Status and Glaucoma: Associations in High Levels of Income and Education. *Curr Eye Res.* 2019 Apr;44(4):436-441.
- 3- Mikolajczyk B, Greenberg ER, Fuher H, Berres M, May LL, Areaux RG Jr. Follow-up Adherence and Barriers to Care for Pediatric Glaucomas at a Tertiary Care Center. *Am J Ophthalmol.* 2021 Jan;221:48-54.

## Ocular Surface Disease in Childhood Glaucoma

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**Introduction:** To evaluate ocular surface disease (OSD) in patients with childhood glaucoma.

**Methods:** A multicenter, prospective study between September 2021 and 2022. Data collected included glaucoma type, glaucoma medications and surgeries, anterior segment examination, symptom frequency and severity, and tear break up time (TBUT). Dry eye syndrome (DES) symptoms were evaluated using a modified SPEED questionnaire.[1] OSD symptoms were divided into four categories: dryness, grittiness, or scratchiness; soreness or irritation; burning or watering; and eye fatigue.[2] Surveys were distributed to 48 total patients, who reported on symptomatology.

**Results:** The study included 37 pediatric glaucoma patients (54 eyes) and 21 healthy age-matched controls (42 eyes). The average number of glaucoma medications and surgeries amongst the 37 study patients were 1.73 and 2.27, respectively. TBUT was significantly lower ( $10.7 \pm 3.2$ ) in cases vs. controls ( $12.7 \pm 1.3$ ). 29.6% of the pediatric glaucoma patients had punctate epithelial erosions compared to 9.5% in the controls. Conjunctival erythema was more prevalent in the pediatric glaucoma group (44.4% vs 14.3%). 50% of glaucoma patients reported DES symptoms compared to 21.4% in the control group. Using 2+ glaucoma drops was associated with worse DES symptoms in all categories when compared to healthy controls. TBUT amongst these patients ( $8.6 \pm 3.1$ ) was significantly lower than those with 0-1 medications ( $11.9 \pm 2.5$ ) and controls ( $12.7 \pm 1.3$ ). All of the above mentioned analyses were statistically-significant ( $p < 0.05$ ).

**Conclusion/Relevance:** This is the first study to evaluate OSD in pediatric glaucoma patients.[3] This population has significantly greater incidence of DES signs and symptoms.

**References:** [1] Ngo W, Situ P, Keir N, Korb D, Blackie C, Simpson T. Psychometric properties and validation of the Standard Patient Evaluation of Eye Dryness questionnaire. *Cornea*. 2013;32:1204-10.  
[2] Asiedu K. Rasch Analysis of the Standard Patient Evaluation of Eye Dryness Questionnaire. *Eye Contact Lens*. 2017;43:394-8.  
[3] Scelfo C, ElSheikh RH, Shamim MM, Abbasian J, Ghaffarieh A, Elhusseiny AM. Ocular Surface Disease in Glaucoma Patients. *Curr Eye Res*. 2022:1-12.

Paper #19  
Saturday, April 1, 2023  
8:31 AM – 8:38 AM

## **Pilot Study Comparing a New Virtual Reality-Based Visual Field Test to Standard Perimetry**

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**Introduction:** Standard automated perimetry remains the gold standard for visual field assessment despite its limitations for children. This pilot study assessed a new virtual-reality (VR) based visual field platform: Vivid Vision Perimetry (VVP). [1]

**Methods:** Children <18 years with visual acuity >20/80 were recruited to perform Humphrey Visual Field (HVF) 24-2 SITA FAST and VVP Swift testing. VVP Swift uses suprathreshold stimuli to test 54 field locations and calculate a fraction seen score. Pearson correlation coefficients were calculated to evaluate correlation between HVF mean sensitivity and VVP fraction seen scores. Participants were surveyed regarding their experience.

**Results:** 37 eyes of 23 patients (average age=12.91±3.1 years; 47.8% female) were included in the study. 12 had glaucoma, 7 were glaucoma suspects, 3 had steroid-induced ocular hypertension, and 1 had craniopharyngioma. 16 participants had prior HVF experience, and none had prior VVP experience, though 7 had previously used VR. Mean test duration was 6.03±2.13 minutes for VVP and 6.35±2.64 minutes for HVF (p=0.459). Mean response time for each VVP stimulus was 712±125 milliseconds. 13 eyes produced unreliable HVF tests due to fixation losses, false positives, and false negatives. VVP detected blind spots in 24 eyes. When the 13 eyes with unreliable HVFs were excluded, the correlation between HVF average mean sensitivity and VVP mean fraction seen scores was 0.485 (p=0.02). All participants preferred VVP over HVF. 70% were “very satisfied,” 26% “satisfied,” and 4% “neutral” regarding the VVP.

**Conclusion/Relevance:** VVP is a clinically feasible testing platform for children, who all expressed preference for VVP over HVF.

**References:** 1. Greenfield JA, Deiner M, Nguyen A, et al. Virtual Reality Oculokinetic Perimetry Test Reproducibility and Relationship to Conventional Perimetry and OCT. *Ophthalmology Science*. 2022;2(1):100105.

## Performance of a Novel Virtual Reality Automated Perimetry in Patients with Pediatric Glaucoma

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**Introduction:** Automated perimetry, important in managing glaucoma, can be challenging for many children. This study evaluated VisuALL, a game-based automated perimetry utilizing virtual reality goggles, in a cohort of patients with pediatric glaucoma.

**Methods:** Ongoing prospective series of pediatric glaucoma patients at a single institution performing both VisuALL and Humphrey visual field 24-2 (HVF) testing. A masked ophthalmologist graded both VisuALL and HVF tests for field defects (3 clustered abnormal points in total or pattern deviation plot). VisuALL testing was performed binocularly and with child's spectacles. The agreement of global indices (mean deviation[MD] and pattern standard deviation[PSD]) was assessed between the two devices.

**Results:** 68 eyes (35 patients) were enrolled to date, with mean age  $14.1 \pm 3.6$  years. Average MD was  $-6.3 \pm 6.4$  dB. Sixty of 68 eyes (88%) had agreement between VisuALL and HVF concerning the presence/absence of any field defect. Forty-nine of 68 eyes (72%) had agreement regarding the presence/absence of fixation-threatening field loss. There was strong correlation between VisuALL and HVF for MD ( $R=0.68$ ,  $p<0.001$ ), PSD ( $R=0.78$ ,  $p<0.001$ ), and point-by-point sensitivity ( $R=0.63$ ,  $p<0.001$ ). Bland Altman analysis showed no systematic difference between VisuALL and HVF in assessing MD and PSD.

**Conclusion/Relevance:** VisuALL performed well compared to HVF in identifying the presence of concerning glaucomatous visual field defects. There was variability in individual point-by-point sensitivities, but MD and PSD values were comparable between the two modalities. VisuALL VR-based system may offer another way of assessing perimetry in childhood glaucoma, with the potential for lower-cost and home-based monitoring. Future study is warranted.

**References:** 1. Razeghinejad, R., Gonzalez-Garcia, A., Myers, J. S. & Katz, L. J. Preliminary Report on a Novel Virtual Reality Perimeter Compared With Standard Automated Perimetry. *J. Glaucoma* 30, 17-23 (2021).

## One Year Results of Gonioscopy-Assisted Transluminal Trabeculotomy versus Two-Site Rigid-Probe Trabeculotomy in Primary Congenital Glaucoma

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Cairo

**Introduction:** The purpose of this study was to compare the outcomes of gonioscopy-assisted transluminal trabeculotomy (GATT) to two-site rigid-probe trabeculotomy in the treatment of primary congenital glaucoma (PCG)

**Methods:** The study included 39 eyes of 31 PCG patients with clear corneas all aged <14 years. Patients were randomized to undergo either GATT using 5/0 prolene suture or two-site trabeculotomy using rigid probe. Success was defined as achieving a final intraocular pressure (IOP)<18 mmHg without (complete) or with medications (qualified). Primary outcomes were reduction of IOP and medications. Secondary outcomes were complications and success rates.

**Results:** The GATT group included 21 eyes and the two-site trabeculotomy group included 18 eyes. There was a significant reduction in IOP and glaucoma medications at 1, 3, 6, 9 and 12 months postoperatively in both groups (P-value <0.01) with no significant difference in IOP or glaucoma medications between both groups at any follow-up. After a minimum follow-up period of 9 months, there was a 43% ± 25% IOP reduction in the GATT group, compared to 41% ± 17% in the trabeculotomy group (P-value=0.32). Success was achieved in 19 eyes (90%) of which 2 eyes were on medications (9.5%) in the GATT group; and in 17 eyes (94%) in the trabeculotomy group (P-value=0.35). There were no vision-threatening complications in either group.

**Conclusion/Relevance:** Circumferential trabeculotomy using ab-interno GATT or ab-externo two-site trabeculotomy yielded comparable results in terms of safety and efficiency. Both procedures may be used interchangeably in PCG eyes with clear corneas, according to surgeon's preference and availability of instrumentation.

**References:** El Sayed YM, Gawdat GI. Microcatheter-assisted Trabeculotomy Versus 2-site Trabeculotomy With the Rigid Probe Trabeculotome in Primary Congenital Glaucoma. *J Glaucoma*. 2018 Apr;27(4):371-376.

Grover DS, Smith O, Fellman RL, Godfrey DG, Butler MR, Montes de Oca I, Feuer WJ. Gonioscopy assisted transluminal trabeculotomy: an ab interno circumferential trabeculotomy for the treatment of primary congenital glaucoma and juvenile open angle glaucoma. *Br J Ophthalmol*. 2015 Aug;99(8):1092-6.

Paper #22  
Saturday, April 1, 2023  
8:58 AM – 9:05 AM

## **Analysis of Ganglion Cell Thinning in Paediatric Papilledema- At What Point Does Visual Function Become Affected?**

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Toronto

**Introduction:** We studied the relationship between macula ganglion cell (GC) thinning and visual loss in children with papilledema.

**Methods:** Retrospective, single-center study of patients (<18 years old) presenting with papilledema between 2012-2022. Presenting age, sex, lumbar puncture opening pressure and etiology were recorded in addition to initial and final BCVA, disc rNFL and macula GC thickness (GCT). Visual fields were performed when possible. We defined vision loss as a final BCVA of 20/40 or worse or an abnormal visual field (abnormal Goldmann VF or >-3.00DB mean deviation on Humphrey VF)

**Results:** 85 patients (170 eyes) were included. 57(67%) were female with mean age 11.4 years (3-18). Mean follow up was 21.3 months. Etiologies were primary PTSC (74/85) and secondary PTSC in (11/85). 16 eyes (9.4%) from 14 patients experienced visual loss (8 persistent VF deficits, 8 BCVA loss). Mean final GCT was 70um vs 83um ( $p<0.00001$ ) and minimum GCT 65um vs 79um ( $p<0.0003$ ) in those with vision loss vs those without. A mean GCT <70um was 100% predictive of visual loss and <70um minimum GCT carried an 88% chance of visual loss. Those with visual loss had a significantly higher LP opening pressure (41vs 49cmH20  $p=0.006$ ). No difference between groups was found for age, sex, initial disc rNFL or etiology.

**Conclusion/Relevance:** In our data, GCT was significantly reduced in paediatric papilloedema patients experiencing persistent visual loss. The highest risk occurred when mean GCT was <70um. This information is important for patient management and counselling.

**References:** Lee TH, Ji YS, Park SW, Heo H. Retinal ganglion cell and axonal loss in optic neuritis: risk factors and visual functions. *Eye (Lond)*. 2017 Mar;31(3):467-474. doi: 10.1038/eye.2016.253. Epub 2016 Nov 18. PMID: 27858936; PMCID: PMC5350374.



## Predicting Visual Acuity and Myopic Changes in Children Wearing Glasses with a Photoscreener

Sandra Guimaraes, MD, PhD; Maria Joao Vieira, MD; Jose Miguel Vilas Boas

Hospital School of the University Fernando Pessoa  
Gondomar, Oporto, Portugal

**Introduction:** With high increase in myopia prevalence, we aimed to assess if Plusoptix\_A09 can be used in myopic children under spectacles to predicted visual acuity (VA) and myopic refraction changes.

**Methods:** Myopic children underwent a complete ophthalmological examination. Plusoptix\_A09 was performed under spectacles. VA changes, refraction changes and time since previous glasses prescription, were determined. Age, current or past history of amblyopia, presence of strabismus and self-perception of VA changes were registered.

**Results:** 199 patients were included. Spherical power (SP) and spherical equivalent (SE) measured by Plusoptix\_A09 under spectacles predicted both VA changes ( $p < .001$ ) and refraction changes ( $p < .001$ ). Values of  $SP < -0.06D$  or  $SE < -0.22D$  indicated a VA decrease ( $AUC > 0.9$ ,  $p < 0.01$ ) for sensitivity and specificity of 85.1%, 82.1% and 82.6%, 83.3%, respectively. Age and ophthalmological comorbidities did not influence Plusoptix\_A09 measurements ( $p > 0.05$ ). Plusoptix\_A09 under spectacles was a stronger predictor of VA changes when compared to children's self-perception, either in 4-9-year-old patients ( $p < .001$  versus  $p = .628$ ) and in 10-18-year-old children ( $OR \leq 0.066$  versus  $OR = 0.190$ ). A decrease in SP and SE of  $-0.10D$  in Plusoptix\_A09 predicted a myopia progression of  $-0.04D$  and  $-0.05D$ , respectively.

**Conclusion/Relevance:** This study unveiled new features for the Plusoptix, a worldwide available photoscreener used in amblyopia screening. When Plusoptix is performed in children with their glasses on, it can rapidly predict myopia progression. For each decrease of  $-0.10D$  in Plusoptix, a myopia progression of  $-0.05D$ , is expected. Moreover, Plusoptix is more reliable than children's self-perception of visual acuity changes, making it a useful tool either in primary care or ophthalmology practice.

**References:** 1. Silverstein E, McElhinny ER. Traditional and instrument-based vision screening in third-grade students. J AAPOS. 2020;24(4):232 e1- e6.  
2. Polling JR, Klaver C, Tideman JW. Myopia progression from wearing first glasses to adult age: the DREAM Study. Br J Ophthalmol. 2022;106(6):820-4.

## Rebound Effect in Gradual vs. Prompt Cessation of Atropine 0.01% Treatment for Childhood Myopia

Asaf Shemer; Nir Erdinest; Naomi London; Biana Dubinsky-Pertzov; Eran Pras; Yair Morad

Department of Ophthalmology, Shamir Medical Center  
Israel

**Introduction:** Recent studies have demonstrated the effects of low concentration atropine eye drops at slowing myopia progression. However, some patients experience a rebound effect following treatment. Our goal is to compare the rate of myopic progression following a rapid washout compared to a tapered cessation from 0.01% atropine drops.

**Methods:** This observational, retrospective study includes children treated with atropine 0.01% between 2017 and 2022. The gradual cessation group (GRADUAL) average spherical equivalent(SE) was  $-6.38 \pm 3.14D$  (range  $-1.385D$  to  $-13.875D$ ). Treatment was conducted by decreasing one day from the weekly schedule every month, i.e., six days a week for a month, then five days a week for a month, and so on, until a complete stop. The prompt cessation group (PROMPT) average spherical equivalent(SE) was  $-4.64 \pm 2.71D$  (range  $-1.25D$  to  $-11.00D$ ). Treatment was conducted by immediately stopping all atropine use.

**Results:** Sixty-six patients were included in this study. The GRADUAL group included 45 patients with a mean age of  $13.06 \pm 2.41$ , 48% males. The PROMPT group included 21 patients with a mean age of  $10.6 \pm 1.88$ , 52.3% males. The mean follow-up time was 7.44 and 11.29 months in the GRADUAL and PROMPT groups, respectively. The mean SE myopia increase measured at follow-up was  $-0.27 \pm 0.29D$  and  $-0.67 \pm 0.45D$  in the GRADUAL and PROMPT groups, respectively ( $P=0.0152$ ).

**Conclusion/Relevance:** In this study, a gradual cessation of atropine exhibited a positive effect in controlling the rebound effect following termination of treatment compared to prompt cessation of treatment. Further studies are warranted to confirm these results.

**References:** Yam JC, Zhang XJ, Zhang Y, Wang YM, Tang SM, Li FF, Kam KW, Ko ST, Yip BH, Young AL, Tham CC. Three-Year clinical trial of low-concentration atropine for myopia progression (lamp) study: continued versus washout: phase 3 report. *Ophthalmology*. 2022 Mar 1;129(3):308-21.

## Short-Term Effect of Atropine 0.01% vs Atropine 0.05% on Higher Order Aberration, Retinal Image Quality and Contrast Sensitivity in Progressive Myopia

Vinay Gupta; Rohit Saxena; Rebika Dhiman; Swati Phuljhele; Jyoti Rawat; JS Titiyal

All India Institute of Medical Sciences  
New Delhi, India.

**Introduction:** Low-dose atropine [primarily 0.01%(A01) and 0.05%(A05)] reported to affect pupil size, accommodation, optical properties of cornea and lens which can compromise the image quality. The aim of this open label observational-study was to evaluate and compare the effect of 0.01% vs 0.05% atropine on HOA, retinal image quality and contrast sensitivity.

**Methods:** HOAs of 47 children[25 receiving A01; 23 receiving A05] were measured using itracey(Tracey-Technologies) at baseline and 2-month follow-up visit. Retinal image-quality was assessed using point-spread-function and represented in terms of Strehl-ratio. Contrast-sensitivity over wide range of spatial frequencies (5, 10 & 15 cycles per degree(cpd)) measured objectively through modular-transfer-function(MTF).

**Results:** There was no significant difference noted in age( $8.7\pm 2.4$ yr vs  $8.4\pm 2.9$ yr), myopia( $-3.3\pm 1.4$  vs  $-3.6\pm 1.7$ D) and biometric parameters between A01 vs A05 at baseline. Change in mean total HOAs receiving A01[ $0.32\pm 0.13\mu$ (baseline) vs  $0.36\pm 0.17\mu$ (2 month); p:0.11] and A05[ $0.29\pm 0.11\mu$ (baseline) vs  $0.36\pm 0.18\mu$ (2 month); p:0.08] were not significant at 2-month; but were significant between the two groups after 2 months(p:0.045). The A05 shows significant decrease in Strehl-ratio as compared to A01(p: 0.047). The change in MTF was found significant at 10cpd[ $-0.121\pm 0.055$ ;p:0.03(A01) and  $-0.143\pm 0.047$ ;p:0.02(A05)] and 15cpd[ $-0.087\pm 0.043$ ;p:0.042(A01) and  $-0.101\pm 0.048$ ;p:0.037(A05)] at 2-month follow-up when compared to baseline but not at 5cpd[ $-0.039\pm 0.02$ ;p:0.061(A01) and  $-0.043\pm 0.021$ ; p:0.07(A05)].

**Conclusion/Relevance:** The effect of atropine on HOAs and retinal image-quality is dose-dependent. A01 and A05 affects contrast-sensitivity at higher spatial frequencies. Objectively, children receiving A05 perceive poorer image quality compared to children receiving A01. Quantifying wavefront-aberration and advanced visual-function provides, objective assessment of quality of vision of children; and aids to understand/develop the myopia correction methods.

**References:** 1. Joachimsen L, Farassat N, Bleul T et al. Side effects of topical atropine 0.05% compared to 0.01% for myopia control in German school children: a pilot study. *Int Ophthalmol.* 2021;41(6):2001-8.  
2. Hughes RP, Vincent SJ, Read SA, Collins MJ. Higher order aberrations, refractive error development and myopia control: a review. *Clin Exp Optom.* 2020;103(1):68-85.  
3. Sinha A, Goel S, Gupta V, Kumawat D, Sahay P. iTrace - A Ray Tracing Aberrometer. *Delhi J Ophthalmol.* 2019;30:72-75.

Paper #26  
Saturday, April 1, 2023  
9:30 AM – 9:37 AM

## Excimer Laser Refractive Surgery Outcomes in 355 Myopic Children Followed an Average 5 Years

Nicolas Faron; James Hoekel; Margaret Reynolds; Lawrence Tychsen

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**Introduction:** Studies of excimer laser treatment for pediatric myopia have shown success over a limited follow-up interval. Here we report longer-term follow-up of a large cohort of treated children and adolescents (for brevity hereinafter referred to as children).

**Methods:** Clinical outcome data were collated prospectively in 355 myopic children (589 eyes) - who had difficulties with spectacle/contact lens wear - and were treated for isoametropic or anisometropic myopia using excimer laser photorefractive keratectomy. 84% of the patients had a preexisting neurobehavioral disorder and/or visuomotor comorbidities. The mean age at refractive surgery was 13.4 years (range 3 to 23); mean follow-up was 5.1 years (range 1-20 years).

**Results:** Myopic spherical refractive error averaged  $-4.9 \pm 2.8$  D (range - 0.50 to -13.0). 94 % (554) of eyes were corrected to within  $\pm 1$  D of target value. After 5 years, refractive regression averaged - 0.18 D/yr. Myopic CDVA improved a mean 0.24 logMAR and UDVA 0.66 logMAR. 92 % (542) of treated eyes had no corneal haze. 56 % (330) of children treated had a gain in at least one level of binocular fusion. Retreatment was conducted in 1.2% of the treated eyes. Persistent epithelial defect occurred in 2 eyes (0.3 %), necessitating temporary tarsorrhaphy with scar-induced reduction of CDVA.

**Conclusion/Relevance:** Excimer laser surgery is an effective means for improving visual function and quality of life in moderately myopic children who have difficulties wearing spectacles. At 5 years follow-up, refractive regression averaged  $\sim 1$  D and the rate of sight-threatening complications was remarkably low.

**References:** Tychsen L. Refractive surgery for special-needs children with high myopia. *Mo Med.* 2022 Jan-Feb;119(1):60-64.

Paysse EA, Tychsen L, Stahl E. Pediatric refractive surgery: Corneal and intraocular techniques and beyond. *J AAPOS.* 2012 Jun;16(3):291-297.

Paper #27  
Saturday, April 1, 2023  
11:25 AM – 11:32 AM

## Reoperation following Pediatric Eye Muscle Surgery

Melissa Li, MS; Gil Binenbaum, MD, MSCE; Xiwei Yang, BA; Alyssa Spiller, BS; Samuel Tadros, MD; Yineng Chen, MS;  
Gui-Shuang Ying, PhD; Julia E. Reid, MD

Children's Hospital of Philadelphia  
Philadelphia, PA

**Introduction:** We sought to determine rates of reoperation following pediatric strabismus surgery. Detailed large-scale patient-level data are limited in the literature.

**Methods:** Retrospective cohort study of children under age 18 years who underwent eye muscle surgery at CHOP from 2009 to 2021. Primary outcomes were risk of reoperation based on survival analysis, overall and stratified by type (e.g., esotropia, exotropia, incomitant, vertical, nystagmus). Age at presentation and surgery, laterality, adjustable suture use, and number of muscles were evaluated as risk factors in multivariable Cox regression analysis.

**Results:** 2699 children underwent eye muscle surgery at mean age 4.6 (SD 3.3) years, mean follow-up 2.5 years. Overall, 1-, 3-, 5-, and 8-year estimates for cumulative reoperation rate were 8% (95% CI 7-9%), 20% (95% CI 18-23%), 28% (95% CI 25-31%), and 42% (95% CI 38-47%) respectively, with a mean 1.14 (0.42) reoperations and mean 2.2 (2.0) years between initial surgery and first reoperation. Patients with incomitant strabismus had the highest cumulative reoperation rate after 8 years (53%, 95% CI 39-68%), while other types did not differ significantly (37-44% after 8 years). Significant risk factors for reoperation included younger age at presentation (Hazard Ratio HR=1.48, 95% CI 1.05-2.11 for 2 years old or younger versus greater than 6 years) or at initial surgery (HR=1.74, 95% CI 1.26-2.40).

**Conclusion/Relevance:** In the first year following eye muscle surgery, estimated reoperation is approximately 8%, rising over time with prolonged follow-up to 42% after 8 years. These data are helpful in clinical practice for managing parents' expectations for repeat surgery.

**References:** Gezer A et al. Factors influencing the outcome of strabismus surgery in patients with exotropia. J AAPOS. 2004;8(1):56-60.

Paper #28

Saturday, April 1, 2023

11:32 AM – 11:39 AM

## **Reoperation after Unilateral Recess-Resect versus Bilateral Lateral Rectus Recessions for Intermittent Exotropia in a Randomized Clinical Trial**

Sean P. Donahue, MD, PhD; Danielle L. Chandler, MSPH; Rui Wu, MPH; B. Michele Melia, ScM;  
Raymond G. Areaux, MD; Christina A. Esposito, OD; Fatema F. Ghasia, MD; Christine Law, MD; Justin D. Marsh, MD;  
Raymond T. Kraker, MSPH; Susan A. Cotter, OD, MS; Jonathan M. Holmes, BM, BCh

Jaeb Center for Health Research  
Tampa, FL

**Introduction:** For childhood intermittent exotropia (IXT), surgeons disagree regarding whether outcomes are superior with a unilateral recess-resect (R&R) procedure versus bilateral lateral rectus recessions (BLRc). We compared rates of reoperation.

**Methods:** Children 3 to <11 years old with basic-type IXT between 15 to 40PD were randomly assigned to BLRc versus R&R. Reoperation during the 3-year randomized trial<sup>1</sup> was allowed only after meeting suboptimal surgical outcome criteria (exotropia  $\geq 10$ PD at distance or near, constant esotropia  $\geq 6$ PD at distance or near, or loss of near stereoacuity by  $\geq 2$  octaves), but was at investigator discretion between 3- and 8-years post-op. We compared reoperation rate and procedure type between treatment groups over 8 years.

**Results:** The cumulative probability of reoperation by 8 years was greater in those who had initially undergone BLRc compared with R&R (43% vs 16%, difference 27%, 95% confidence interval 7% to 47%). After BLRc, 18 (90%) of 20 reoperations were for residual-recurrent exotropia, 1 (5%) for consecutive esotropia, and 1 (5%) for oblique dysfunction. After R&R, 4 (57%) of 7 reoperations were for residual-recurrent exotropia, and 3 (43%) were for consecutive esotropia. The 8-year outcome visit was completed by 46% of participants in both treatment groups (46 of 101 in BLRc; 44 of 96 in R&R).

**Conclusion/Relevance:** By 8 years following surgery for childhood IXT, reoperation was more common after BLRc compared with R&R, primarily due to undercorrection. These data should be interpreted with caution given loss to follow up and possible investigator bias in deciding whether to reoperate.

**References:** 1. Pediatric Eye Disease Investigator Group. A Randomized Trial Comparing Bilateral Lateral Rectus Recession versus Unilateral Recess-Resect for Basic-Type Intermittent Exotropia. *Ophthalmology* 2019; 126(2): 305-317.

## **Non-Absorbable Sutures Use in Bi-Medial Rectus Recession and Bilateral Lateral Rectus Recession Improves Surgical Outcomes.**

Yair Morad; Lior Or; Eran Pras; Inbal Gazit

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Tel Aviv University  
Israel

**Introduction:** To compare the surgical outcomes of two strabismus surgeries: bi-medial rectus recession (BMR) and bilateral lateral rectus recession (BLR) using absorbable compared to non-absorbable sutures for the treatment of childhood esotropia and exotropia respectively.

**Methods:** Retrospective Cohort study of children who underwent BMR and BLR surgeries by a single surgeon. Either absorbable or non-absorbable sutures were used. A novel surgical technique was used to prevent sutures' extrusion or exposure.

**Results:** A total of 395 patients were included in the study, 266 (67%) underwent BMR and 130 (33%) underwent BLR. In 171 (43%) of the surgeries absorbable sutures were used and in 224 (57%) surgeries non-absorbable sutures were used. Consecutive deviation ( $>8$  PD) occurred in 43 (25%) and 24 (11%) patients in the absorbable and non-absorbable groups, respectively (OR= 2.79; 95%CI:1.621-4.835;  $P=0.002$ ). Additional surgery was performed in 29 (17%) and 20 (9%) patients in the absorbable and non-absorbable groups, respectively (OR=2.08; 95%CI:1.133 to 3.829;  $P=0.018$ ). Follow-up time differed significantly between the groups: 24 and 17 months in the absorbable and non-absorbable groups respectively ( $p<0.001$ ). After adjustment for confounders including follow-up time, the difference between study groups remained significant (HR=2.52; 95%CI:1.21-5.25;  $P=0.013$ ). Self-limiting pyogenic granuloma occurred in 3 (1.3%) patients in the non-absorbable group compared to none in the absorbable group. No other complications were observed in neither of the study groups.

**Conclusion/Relevance:** The use of non-absorbable sutures in BLR and BMR strabismus surgeries reduces overcorrection rates and additional surgeries compared to absorbable sutures use. A novel surgical technique prevents complications.

**References:** 1. Ludwig IH. Scar remodeling after strabismus surgery. *Trans Am Ophthalmol Soc.* 1999; 97:583-651.  
2. Farid MF, Mahmoud MR, Awwad MA. Management of stretched scar- induced secondary strabismus. *BMC Ophthalmol.* 2020 Feb 19;20(1):58.  
3. Dubinsky-Pertzov B, Einan-Lifshitz A, Pras E, Hartstein ME, Morad Y. Routine use of non-absorbable sutures in bi-medial rectus recession as a measure to reduce the incidence of consecutive exotropia. *Eye (Lond).* 2022 Sep;36(9):1772-1776.

## The Outcome of a Dissolvable Adhesion Barrier for Management of Adhesion in Strabismus Surgery

Michael C. Struck, MD

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University of Missouri  
Kansas City

**Introduction:** Objective: Adhesion formation after ocular surgery limits motility and can hinder range of single binocular vision. A technique to limit adhesions could potentially have an important role in improving surgical outcomes in certain select cases of strabismus. The objective of our study was to evaluate the outcomes after the use of cellulose mesh dissolvable physical adhesion-barrier (Interceed®) in complex strabismus surgery with adhesions in restrictive strabismus.

**Methods:** Materials: Interceed® is an oxidized, regenerated, cellulose membrane approved for human use in the reduction of pelvic adhesions. Methods: This study is a retrospective, single center, case series of 30 patients undergoing surgery between 2010 and 2022. We analyzed late post-operative results using motility and strabismus measures.

**Results:** Outcome was angle of improvement in primary and in the restricted position, versions and subjective improvement (diplopia reduction and functional ability)  
24/30 patients improved motility in field of restriction, 25/30 who reported diplopia in primary position preoperatively had resolved diplopia. Patient satisfaction with outcome was 29/30. There were no complications and only 2 reoperations during this study.

**Conclusion/Relevance:** The use of an absorbable physical barrier is ideally suited for the reduction of adhesion which may limit motility, preventing fibrosis and recurrent scar formation in the area of treatment during the critical postoperative period without compromising the reattachment of the ocular muscle to the sclera, the natural healing process, or endangering the integrity of the globe. Our case series is the first to analyze the use of Interceed® for complex strabismus cases with fat adherence. The outcomes indicate that cellulose mesh adhesion barrier is effective for strabismus cases with scarring and adherence associated with proper surgical technique.

**References:** Ahmad, G., O'Flynn, H., Hindocha, A., & Watson, A. (2015). Barrier agents for adhesion prevention after gynaecological surgery. *Cochrane Database of Systematic Reviews*, 2015(4).

<https://doi.org/10.1002/14651858.CD000475.pub3>

Akyol, N., & Akpolat, N. (2008). Effects of intraoperative oxidated regenerated cellulose on wound healing reaction after glaucoma filtration surgery: a comparative study with Interceed and Surgicel. *Indian Journal of Ophthalmology*, 56(2), 109–114. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/18292620>

Azziz, R. (1993). Microsurgery alone or with INTERCEED Absorbable Adhesion Barrier for pelvic sidewall adhesion re-formation. The INTERCEED (TC7) Adhesion Barrier Study Group II. *Surgery, Gynecology & Obstetrics*, 177(2), 135–139. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/8342092>

Beck, D. E. (1997). The role of Seprafilm bioresorbable membrane in adhesion prevention. *The European Journal of Surgery. Supplement. : = Acta Chirurgica. Supplement*, (577), 49–55. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9076452>



## Dose Response Analysis of Vertical Central Plication

Yi Ning J. Strube, MD, MS, FRCSC; Kevin Cheung, BScH, DC; Bella R. Germano; Kenneth W. Wright, MD

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Kingston, Ontario, Canada

**Introduction:** Central plication is a minimally invasive strabismus surgery to correct small angle strabismus. The original 2012 publication described its effect mostly in horizontal strabismus. No prior study has reported on the dose response. The purpose of this study was to evaluate the surgical effect of central plication on vertical rectus muscles to correct vertical strabismus.

**Methods:** This was a multicenter, retrospective chart review, observational outcomes study. Data was collected from 2 surgeons in different practice settings (2017-22). All patients who had a vertical rectus central plication were included; patients having any concurrent strabismus surgery for vertical strabismus were excluded. Primary outcome was amount of strabismus correction in prism diopters (PD) per vertical rectus central plication. Secondary outcome was to determine factors associated with better/worse surgical outcomes and patient responses. Data was analyzed using uni- and multi-variate analysis.

**Results:** 36 patients were included: mean age 60 years; mean follow-up 8 months. 31% had idiopathic strabismus, 19% congenital superior oblique palsy, with the remainder a mix including prior ocular surgery, trauma, Brown syndrome; 42% had prior strabismus surgery. 74.2% of patients had resolved diplopia. 63% no longer required prisms. Mean vertical deviation change was 4.6 PD; sub-analysis removing patients with congenital superior oblique palsy was better (5.5 PD). 78% of patients had a final deviation <5PD. No complications or induced post-op diplopia reported.

**Conclusion/Relevance:** Vertical rectus central plication corrects approximately 5 PD (range 4 - 5.5) and is an effective surgery for small angle vertical strabismus due to a variety of causes.

**References:** Leenheer RS, Wright KW. Mini-plication to treat small-angle strabismus: a minimally invasive procedure. J AAPOS 2012;16:327-330.

Corradetti G, Wright KW. Wright central plication of lateral rectus versus standard medial rectus recession in adult divergence insufficiency esotropia. J AAPOS. 2017;21:94-96.

Merino P, Mustafin I, Gomez de Liano, P, Colliga C. Central mini-plication of the medial rectus for convergence insufficiency. J Binocul Vis Ocul Motil. 2020; 70:53-56.

## Long Term Outcomes of the Intraoperative Relaxed Muscle Positioning Technique of Strabismus Surgery in Thyroid Eye Disease

Justin Muste; Kevin Wang; Elias Traboulsi

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**Introduction:** The intraoperative relaxed muscle positioning technique (IRMPT) for strabismus in thyroid eye disease (TED) involves recessing restricted muscles' insertions to positions on the globe where they rest without tension. This study seeks to report and evaluate the long-term outcomes of this technique.

**Methods:** The charts of patients with TED and diplopia who underwent RMPT between 1999 and 2021 were reviewed. Demographic characteristics, initial surgical outcomes, reoperation outcomes, and those at last follow up were evaluated. Excellent outcomes were defined as having no diplopia in primary and reading gazes without prism; good outcomes as diplopia in primary or reading gazes requiring  $\leq 10$  prism diopters in prisms; and poor when diplopia persisted.

**Results:** 129 patients were followed for an average of 4.24 years (range 0.01 - 20.66 years). 96 (73.8%) underwent one surgery. Of the 29 patients who underwent Bilateral Inferior Rectus and Medial Rectus Recession, nine required a second procedure, of whom two had a third procedure. 22 (73.3%) had an excellent outcome and 4 (13.3%) had a good outcome. Of the 23 Unilateral Inferior Rectus Recessions only six required a second procedure. 18 (78.3%) had an excellent outcome and 4 (21.7%) had a good outcome. Overall 121 (93.8%) patients experienced good or excellent results (Excellent, 76.7% and good, 12.7%). Additional analysis was done.

**Conclusion/Relevance:** The RMPT for strabismus repair in TED results in durable relief of diplopia in a large majority of patients. Patients with greater horizontal deviations, disease reactivation, and prior interventions were more likely to require re-operations.

**References:** Nicholson BP, De Alba M, Perry JD, Traboulsi EI. Efficacy of the intraoperative relaxed muscle positioning technique in thyroid eye disease and analysis of cases requiring reoperation. J AAPOS. 2011 Aug;15(4):321-5. doi: 10.1016/j.jaapos.2011.03.014. Epub 2011 Jul 20. PMID: 21778095.

## Single-Center, Long-Term, Real-World Outcomes of Intravenous and/or Intra-Arterial Chemotherapy for Retinoblastoma. Does It Last to 10 or 20 Years?

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Jerry A. Shields

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**Introduction:** Intravenous chemotherapy (IVC) and intra-arterial chemotherapy (IAC) are important globe salvage therapies for retinoblastoma.

**Methods:** Evaluation of long-term globe salvage following front-line IVC or front-line IAC for retinoblastoma.

**Results:** Regarding IVC, there were 994 consecutive eyes with retinoblastoma treated with front-line IVC. Based on the International Classification of Retinoblastoma (ICRB) groups (A vs B vs C vs D vs E) tumor control with globe salvage by year 2 (96% vs 91% vs 91% vs 71% vs 32%,  $p < 0.001$ ) remained stable up to 20 years. In order to achieve globe salvage, additional IAC or plaque radiotherapy was employed by year 2 ( $p < 0.001$ ), with little further need up to 20 years. Regarding IAC, there were 341 consecutive eyes with retinoblastoma treated with 1,292 infusions of IAC. Overall, Kaplan-Meier 5-year estimate of globe salvage was 74%. Of those treated with IAC as front-line therapy ( $n = 160$  eyes; 655 infusions), 5-year globe salvage rate was 76%. Regarding ICRB, globe salvage was for group A (not employed), B (100%), C (100%), D (86%), and E (55%). Of those treated with IAC as secondary therapy ( $n = 207$  eyes; 859 infusions), 5-year globe salvage was 71%.

**Conclusion/Relevance:** Front-line IVC for retinoblastoma provided complete tumor control for groups A (96%), B (91%), C (91%), D (71%) and E (32%), avoiding enucleation or EBRT and was lasting for up to 20 years. Frontline IAC for retinoblastoma provided complete tumor control for groups A (not employed) B (100%), C (100%), D (86%), and E (55%).

**References:** 1. Shields CL, Bas Z, Tadepalli S, et al. Long-Term (20-year) Real-World Outcomes of Intravenous Chemotherapy (Chemoreduction) for Retinoblastoma in 964 Eyes of 554 Patients at a Single Centre. *Br J Ophthalmol* 2020;104:1548-55.  
2. Shields CL, Dockery PW, Yaghy A, et al. Intra-arterial chemotherapy for retinoblastoma in 341 consecutive eyes (1292 infusions): Comparative analysis of outcomes based on patient age, race, and sex. *J AAPOS*. 2021;25(3):150.e1-150.e9.

## **Efficacy of High-Saturation Oxygen Therapy to Prevent Progression of Late-Stage Retinopathy of Prematurity: A Retrospective Cohort Study**

Robert J. Minturn; Kelly A. Hartigan; Kok Lim Kua; Sravanthi Vegunta; Charline S. Boente; Kathryn M. Haider

Indiana University School of Medicine  
Indianapolis, IN

**Introduction:** High-saturation oxygen in select preterm infants may prevent progression of stage 2 retinopathy of prematurity (ROP).<sup>1</sup> To date, it is unclear if high-saturation oxygen targets are capable of reducing the need for treatment with laser or intravitreal bevacizumab. The objective of this study is to evaluate the impacts of a high-saturation oxygen protocol in preventing the need for intervention with laser or intravitreal bevacizumab (surgical intervention) in select preterm infants.

**Methods:** A high-O<sub>2</sub> sat protocol was implemented on July 1st 2020, where preterm infants with corrected GA $\geq$ 32 weeks and type 2+ ROP had goal O<sub>2</sub> sat limits set between 97-99%. Data was retrospectively collected between January 2017 and December 2022. Neonates with type 2+ ROP diagnosed prior to July 2020 were classified as cohort A (standard oxygen cohort, N=122), while neonates diagnosed after September 2020 were classified as cohort B (high O<sub>2</sub> sat cohort, N=42). A favorable outcome was defined as resolution of ROP without interventional treatment.

**Results:** Gestational age, birth weight, and incidence of bronchopulmonary dysplasia were similar between Cohort A and Cohort B. 55.7% of neonates in cohort A and 35.7% in cohort B required interventional treatment (OR=0.4412; 95% confidence interval 0.2136-0.9111, p= 0.027). All data calculations were done using Stata statistical software, College Station, US.

**Conclusion/Relevance:** The supplemental oxygen cohort demonstrated a significant decrease in interventional treatment (p=0.027). There was no difference in pulmonary pathologies or length of stay. This study supports potential benefits of using high O<sub>2</sub> sat therapy to prevent disease progression in select type 2+ ROP patients.

**References:** 1. Colaizy TT, Longmuir S, Gertsch K, Abramoff MD, Klein JM. Use of a supplemental oxygen protocol to suppress progression of retinopathy of prematurity. *Invest Ophthalmol Vis Sci.* 2017 Feb 1;58(2):887–91.  
2. Early Treatment for Retinopathy of Prematurity Cooperative Group. Revised indications for the treatment of retinopathy of prematurity: results of the early treatment for retinopathy of prematurity randomized trial. *Arch Ophthalmol.* 2003;121:13.

## Effect of Intravitreal Aflibercept Versus Laser Photocoagulation for Retinopathy of Prematurity: Results from the Phase 3 BUTTERFLEYE Trial

Faruk H. Orge, MD (On behalf of the BUTTERFLEYE Study team)

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**Introduction:** Intravitreal anti-vascular endothelial growth factor agents may demonstrate a favorable benefit-risk profile in retinopathy of prematurity (ROP).<sup>1,2</sup> The randomized, open-label, non-inferiority, Phase 3 BUTTERFLEYE trial (NCT04101721) evaluated the efficacy and safety of intravitreal aflibercept injection (IAI) versus laser photocoagulation in infants with ROP.

**Methods:** Treatment-naïve infants (gestational age  $\geq$ 32 weeks or birthweight  $\geq$ 1500 g) with ROP were randomized 3:1 to receive IAI 0.4 mg or laser at baseline. The primary endpoint was the proportion of infants without active ROP and unfavorable structural outcomes at Week 52 of chronological age (non-inferiority margin: 5%). Secondary endpoints included safety.

**Results:** Overall, 120 infants (IAI 0.4 mg: n=93; laser: n=27) were treated. Mean (SD) gestational age at birth was 27.3 (2.7) weeks. Treatment success rate (IAI versus laser) was 79.6% versus 77.8% (adjusted difference [95.1% CI]: 1.8% [-15.7%, 19.3%]). Mean (SD) time required to administer IAI versus laser was 10.7 (17.2) versus 129.2 (95.6) minutes/infant (nominal  $P < 0.0001$ ). Ocular treatment-emergent adverse events (TEAEs) were reported in 18.3% and 25.9% of infants in the IAI and laser groups, respectively. Serious ocular TEAEs were reported in 6.5% and 11.1% of IAI- and laser-treated infants, respectively. One death was reported in the IAI group and was unrelated to treatment.

**Conclusion/Relevance:** Active ROP and unfavorable structural outcomes were absent in a numerically greater proportion of IAI- than laser-treated infants, although the 5% non-inferiority margin was not met. Other efficacy and safety endpoints for IAI 0.4 mg provide strong evidence for its utility in the management of treatment-requiring ROP.

**References:** 1. Chandra P, Chawla D, Deorari AK, et al. Screening and management of retinopathy of prematurity. *J Neonatol.* 2020;34(1-2):63-82.  
2. Stahl A, Lepore D, Fielder A, et al. Ranibizumab versus laser therapy for the treatment of very low birthweight infants with retinopathy of prematurity (RAINBOW): an open-label randomised controlled trial. *Lancet.* 2019;394(10208):1551-1559.

Paper #36  
Saturday, April 1, 2023  
12:40 PM – 12:47 PM

## **Quantifying Laser Burn Spots to Avascular Retina Post-Bevacizumab Treatment in Retinopathy of Prematurity Infants at Different Age Groups**

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**Introduction:** To quantify laser spots to the avascular retina (PAR) post bevacizumab (IVB) for retinopathy of prematurity (ROP) at different age groups.

**Methods:** A longitudinal study of 142 eyes of 71 infants treated with laser to PAR for type-1 ROP post IVB. The laser spots, power, duration, and interval were noted from 4 groups. Group 1 and 2 had zone 1 and zone 2 ROP respectively who received laser < 60 weeks PMA. Group 3 received laser at > 61 weeks PMA and Group 4 received laser post one year

**Results:** Mean GA and birth weight BW was 25 weeks PMA and 727 grams. 134 eyes had type 1 ROP, and 8 eyes aggressive posterior ROP, of which 82 eyes had zone 1 and 60 eyes had zone 2 ROP at first treatment. 63 infants received IVB prior to laser. The average age at laser for Group 1 and 2 was 42 weeks PMA; group 3, 71 weeks PMA and group 4, 25 months. The average laser spots in right/left eye in group 1 were 2817/2019; group 2, 2242/2274; group 3, 2139/1756 and group 4, 1255/1218 resp. Nonparametric test was used to compare laser shots in right and left eye performed in gr1 and gr2 at < 60 weeks PMA and gr 4 >one year of age was statistically significant ( $p < 0.0001$ ).

**Conclusion/Relevance:** Delaying laser beyond one year of age when treated with IVB to PAR decreases laser shots significantly thereby decreasing laser induced immediate and long-term sequelae in the growing infant eye.

**References:** Chiang MF, Quinn GE, Fielder AR, Ostmo SR, Paul Chan RV, Berrocal A, et al. International Classification of Retinopathy of Prematurity, Third Edition. *Ophthalmology*. 2021 Oct;128(10):e51-e68. doi: 10.1016/j.ophtha.2021.05.031. Epub 2021 Jul 8. PMID: 34247850

## Patient Education in Pediatric Ophthalmology: A Systematic Review

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**Introduction:** Patient and caregiver education has the potential to improve understanding, adherence, and disease outcomes in pediatric ophthalmology.<sup>1</sup> Research suggests that common clinical practices may result in suboptimal patient understanding.<sup>2</sup> With this review, we aim to summarize current literature on patient education interventions in pediatric ophthalmology in order to identify effective teaching methods.

**Methods:** A pre-defined search strategy was used to systematically review the PubMed database. Inclusion criteria included peer-reviewed published studies that utilized an educational intervention regarding any condition in pediatric ophthalmology and measured its impact.

**Results:** The search method yielded 453 studies; 30 passed title and abstract screening and 14 were included in the final analysis. The topics of the interventions were amblyopia (7/14), strabismus (2/14), general pediatric ophthalmology (2/14), cerebral visual impairment (1/14), retinoblastoma (1/14), and congenital cataract (1/14). Methods of teaching included printed information (8/14), multifactorial (3/14), computer-based (2/14), and video (1/14). Most studies found a statistically significant improvement in their outcome measures, including adherence (5/6 with significant improvement), caregiver knowledge (6/6), psychological impact (2/4), visual outcome (2/4), and clinic attendance (1/2).

**Conclusion/Relevance:** The educational interventions varied widely in methodology; nonetheless, they were widely successful across outcome measures. A number of studies featured highly time- and cost-effective interventions that resulted in enhanced knowledge, adherence, and visual outcomes. Educational efforts may be especially beneficial among non-native language speakers, particularly via image-based means of communication. The insights gleaned from this review were used to develop a cartoon on occlusion therapy to be piloted in a pediatric ophthalmology clinic.

**References:** 1. Dixon-Woods M, Awan M, Gottlob I. Why is compliance with occlusion therapy for amblyopia so hard? A qualitative study. *Arch Dis Child*. 2006;91(6):491-494. doi:10.1136/adc.2005.090373  
2. Rahi JS, Manaras I, Barr K. Information sources and their use by parents of children with ophthalmic disorders. *Invest Ophthalmol Vis Sci*. 2003;44(6):2457-2460. doi:10.1167/iops.02-1184

## Comparison of Pediatric Ophthalmology Coverage in the United States: 2007 vs. 2022

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**Introduction:** There is a national shortage of pediatric ophthalmologists (PO) in relation to the US population [1]. The inadequate number of providers is compounded by unequal provider geographic distribution [1,2]. Our goal was to identify the current geographic distribution of PO in the US and understand how coverage has changed over the past 15 years.

**Methods:** Public databases were used to identify PO in the US in March 2022. Addresses were Geo-coded and analyzed using ArcGIS Pro and SPSS. Results were compared to the 2007 AAPOS workforce distribution project [1].

**Results:** 1056 PO were identified, indicating an increase in total PO since 2007. Overall, there were 3.2 PO per million persons in the entire US in 2022 compared to 2.7 PO per million persons in the entire US in 2007. In areas with PO service coverage, there were 5.3 PO per million persons in 2022 compared to 3.7 PO per million persons in 2007. In the 314 counties with  $\geq 1$  PO, the range of PO-per-million persons was 0.4-185.5, which has increased since 2007. Four states had 0 PO coverage in 2022 compared to only one state in 2007.

**Conclusion/Relevance:** The availability of PO varies dramatically based on geographic location. The range of provider-to-million persons has increased in the last 15 years, suggesting a diverging gap in access to care. These results support the need to improve incentive structures to redistribute PO resources to match the unequal health burden in underserved counties and incentivize trainees to pursue careers in pediatric ophthalmology.

**References:** 1. Bernstein BK, Nelson LB. Workforce Issues in Pediatric Ophthalmology. *J Pediatr Ophthalmol Strabismus*. Jan 1 2020;57(1):9-11. doi:10.3928/01913913-20191101-01.

2. Estes R, Estes D, West C, Zabal-Ratner J, Droster P, Simon J. The American Association for Pediatric Ophthalmology and Strabismus workforce distribution project. *J AAPOS*. Aug 2007;11(4):325-9. Doi:10.1016/j.jaapos.2006.08.014.



## Association between Socioeconomic Status and Amblyopia Treatment Compliance

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**Introduction:** Patient compliance with amblyopia treatment remains a major hurdle to optimal outcomes (1). Specifically, individuals of low socioeconomic status (SES) areas have lower rates of compliance with amblyopia treatment (2,3). This study investigates the association between SES and compliance rates of patients enrolled in an online patching tracking platform.

**Methods:** A retrospective chart review included 90 patients enrolled in the Inside Out Medicine (IOM) platform. IOM creates virtual logs which guardians record daily treatment, continuously reviewable by providers. Treatment compliance percentages (number of days of treatment logged/days prescribed) were collected for patients at 30, 60, 90 and 180 days. Demographic, disease-related and SES data (race, insurance status, home address, census tract, median income, and social deprivation index) were gathered. These variables were used as predictors for treatment compliance in a multivariable logistic regression model.

**Results:** Median compliance rates were 48% (30 days), 28% (60 days), 24% (90 days), and 16% (180 days). Subjects were categorized as either compliant (>50th percentile) or noncompliant (<50th percentile). Median income (30 day  $\beta$  1.000;  $p = 0.765$ ), social deprivation index (SDI) (30 day  $\beta$  0.996;  $p = 0.776$ ), race, and insurance status were not significantly associated with treatment compliance at any of the assessed time periods.

**Conclusion/Relevance:** SES is not significantly associated with amblyopia treatment compliance, indicating the accessibility of the platform to individuals of all backgrounds. As enrollment in the platform increases, future research may elucidate this relationship and identify other variables to help understand factors affecting compliance.

**References:** 1. Stewart CE, Fielder AR, Stephens DA, Moseley MJ. Treatment of unilateral amblyopia: Factors influencing visual outcome. *Investigative Ophthalmology and Visual Science*. 2005;46(9):3152-3160. doi:10.1167/iovs.05-0357

2. Loudon SE, Fronius M, Looman CWN, et al. Predictors and a remedy for noncompliance with amblyopia therapy in children measured with the occlusion dose monitor. *Investigative Ophthalmology and Visual Science*. 2006;47(10):4393-4400. doi:10.1167/iovs.05-1428

3. Tjiam AM, Akcan H, Ziyilan F, et al. Sociocultural and psychological determinants in migrants for noncompliance with occlusion therapy for amblyopia. *Graefe's Archive for Clinical and Experimental Ophthalmology*. 2011;249(12):1893-1899. doi:10.1007/s00417-011-1637-5

Rapid Fire Medical Student Paper #4

Saturday, April 1, 2023

2:26 PM – 2:29 PM

## Low-Dose Atropine vs Peripheral Defocus Soft Contact Lenses for Myopia Control

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**Introduction:** This is a preliminary report of a cohort of pediatric myopia patients treated with either 0.01% atropine, 0.05% atropine, or MiSight®.

**Methods:** In this IRB-approved retrospective, descriptive cohort study, we reviewed 163 charts. Inclusion criteria was spherical equivalent (SE) of -2 D to -6 D. Measurements were obtained before treatment and in most recent follow-up. Outcomes were change in SE (primary) and change in axial length (secondary).

**Results:** 105 eyes met inclusion criteria: 53, 41, and 11 eyes were treated with 0.01% atropine, 0.05% atropine, and MiSight, respectively. Mean age was 8.67. Mean follow-up time was 15.39 months. Mean change in SE (in D) was -0.25, -0.38, and -0.25 with 0.01% atropine, 0.05% atropine, and MiSight, respectively ( $P=0.23$ ). 41 eyes had axial length (AL) measurements. Mean change in AL (in mm) was 0.06, -0.02, and 0.05 with 0.01% atropine, 0.05% atropine, and MiSight, respectively ( $P=0.58$ ).

**Conclusion/Relevance:** To our knowledge, this is the first study describing the effects of these therapies in a predominantly Hispanic population. We didn't find differences in effect. Due to limited statistical power, such differences cannot be ruled out. We expect that with more patients, more precise estimates of effects will be obtained, particularly for MiSight, a newer therapy.

**References:** Cooper J, Tkatchenko AV. A Review of Current Concepts of the Etiology and Treatment of Myopia. *Eye Contact Lens*. 2018 Jul;44(4):231-247.

## **What Are Patients Asking Online About Strabismus? An Analysis of the Strabismus Subreddit.**

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**Introduction:** An increasing number of patients seek medical advice on social media websites such as Reddit, a massive online forum for users to anonymously post and comment on any imaginable topic organized as a 'subreddit'. Understanding patients' activity on Reddit regarding strabismus will help assess their concerns and guide patient education.<sup>1</sup>

**Methods:** A cross-sectional study of 709 Reddit posts ([www.reddit.com/r/strabismus/](http://www.reddit.com/r/strabismus/)) from July 2021 to July 2022. Posts were sorted by date, type, content, emotional tone, and users' gender and age (when available). Statistical analysis was performed using SPSS 28.0 (IBM Corp, Armonk, NY). Chi-squared analysis was used for categorical variables.

**Results:** A total of 709 posts were analyzed. Of the 164 (23%) posts in which users identified genders, 85 (52%) were female. The average age was 23.7 years (S.D. 11.4, range 1 - 60 years). The most common content was surgical treatment options (453, 63.9%), non-surgical treatment options (263, 37%), seeking a diagnosis of their condition (190, 26.8%), and sharing personal journeys (136, 19.2%). Of the 289 (41%) posts that conveyed a clear emotional tone, the most common were anxiety (48, 18.3%), happiness (31, 11.8%), insecurity (24, 9.2%), frustration (22, 8.4%), and excitement (22, 8.4%). 'Anxiety' posts had a significantly greater association with pre-surgery concerns whereas 'happy' posts had a significantly greater association with post-operative updates (both  $p=0.003$ ).

**Conclusion/Relevance:** Patients with strabismus who post on Reddit tend to be young adults interested in surgical treatment options. Anxiety was common pre-operatively, and a happy tone predominated in post-operative posts.

**References:** 1)Mahjoub H, Prabhu AV, Sikder S. What are Ophthalmology Patients Asking Online? An Analysis of the Eye Triage Subreddit. *Clin Ophthalmol.* 2020;14:3575-3582. Published 2020 Oct 29. doi:10.2147/OPTH.S279607

## Depictions of Strabismus in Children's Animated Films

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**Introduction:** Strabismus is known to negatively affect patients' self-confidence and ability to interact with society. Strabismus is commonly depicted in animated films marketed to children, and such depictions may affect the perception of strabismus by young impressionable audiences.

**Methods:** We reviewed all 123 animated films released by four major studios (41 from DreamWorks, 26 from Pixar, 23 from Studio Ghibli, and 33 from Walt Disney since 1989) and identified all characters with strabismus. We performed a character trait analysis of all identified characters with strabismus, and a chi-square test was used for statistical comparison of these traits.

**Results:** We identified 45 characters with strabismus, with at least one character identified in 32 of the 123 films (26%). These characters were more likely to be portrayed as unintelligent (40%) than intelligent (2%), villains (20%) than heroes (7%), and followers (31%) than leaders (7%). Twenty-six (58%) did not speak, 24% were portrayed as frightening, 29% had other physical deformities, and 31% were clumsy. The most common type of strabismus was exotropia (53%), followed by esotropia (20%), vertical (13%), and roving eye movements (13%). There was no significant difference in frequency of characters with strabismus between studios.

**Conclusion/Relevance:** Characters with strabismus are common in animated films, where they are significantly more likely to be portrayed negatively than positively. These films are targeted at children, and their negative depictions of strabismus are likely to exacerbate social stigma faced by children with strabismus. Pediatric ophthalmologists should advocate that animation studios refrain from using strabismus to visually convey negative character traits.

**References:** Lukman H, Kiat JE, Ganesan A, Chua WL, Khor KL, Choong YF. Negative social reaction to strabismus in school children ages 8-12 years. *J AAPOS*. 2011;15(3):238-240. doi:10.1016/j.jaapos.2011.01.158  
Holcomb J, Latham-Mintus K. Disney and Disability: Media Representations of Disability in Disney and Pixar Animated Films. *Disability Studies Quarterly*. 2022;42(1).  
Durnian JM, Noonan CP, Marsh IB. The psychosocial effects of adult strabismus: a review. *Br J Ophthalmol*. 2011;95(4):450-453. doi:10.1136/bjo.2010.188425

## Physician Reimbursement for Strabismus Surgery versus Cataract Surgery across Provinces and Territories in Canada

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**Introduction:** Inadequate financial reimbursements in pediatric ophthalmology and strabismus and higher compensation in other subspecialties have been determined to be major causes for declining interest of ophthalmology graduates in this subspecialty, leading to serious workforce concerns. We review physician reimbursements for strabismus surgery and compare them to cataract surgery across provinces and territories in Canada.

**Study Design:** Literature Review.

**Methods:** The manuals for physician remuneration for provinces and territories in Canada were reviewed; strabismus surgery and routine cataract surgery billing codes with their respective compensation were extracted. The data was analysed using appropriate statistical tests.

**Results:** Physician reimbursements for 1-muscle strabismus surgery ranged from \$369 (Ontario, Newfoundland) to \$835 (Yukon), and for 5-muscle strabismus surgery from \$475 (Prince Edward Island) to \$1723 (Manitoba) [ANOVA test statistically significant,  $p=0.00001$ ]. Only 6/12 provinces/territories had special/higher payment codes for complex strabismus procedures. 2/12 did not reimburse for adjustable sutures. 3/12 did not have special codes for re-operations. Mean reimbursement for 1-muscle strabismus surgery versus routine cataract surgery across provinces and territories was \$525 (range: \$369-\$835) and \$522 (range: \$325-\$965), respectively ( $p=0.97$ ). 5/12 provinces/territories paid less for 1-muscle strabismus compared to cataract surgery.

**Conclusion/Relevance:** There exists high variability in payments for the same strabismus procedures across provinces/territories in Canada. Many provinces pay more for cataract versus strabismus surgery despite the usual need for general anesthesia for the latter, with its effects on physician time/effort for surgery and pre/post-operative care. These reimbursement issues may be leading to declining interest in this subspecialty amongst ophthalmology residents.

**References:** 1. Simon JW, Bradfield Y, Smith J, Ahn E, France TD. Recruitment and manpower in pediatric ophthalmology and strabismus. *J AAPOS*. 2007;11(4):336-340.  
2. Bernstein BK, Nelson LB. Workforce Issues in Pediatric Ophthalmology. *J Pediatr Ophthalmol Strabismus*. 2020;57(1):9-11.  
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## Correction of Co-Existing Small Angle Vertical Deviation by Horizontal Muscle Surgery

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**Introduction:** Strabismus is an ophthalmic condition affecting 1-3% of children and refers to a misalignment of the visual axes, resulting in visual impairment and cosmetic changes. Patients can exhibit inward (esotropia), outward (exotropia), upward (hypertropia), and/or downward (hypotropia) deviations, often warranting surgery of at least one extraocular muscles. Small vertical deviations (SVD) may accompany surgery-warranted horizontal deviations (SWHD). This study aims to assess whether SVD with SWHD needs to be specifically targeted for surgical correction or if primary horizontal surgery alone can correct SVD.

**Methods:** A retrospective chart review was conducted to assess the data of patients with SWHD and SVD (defined as 5PD or less). Patients of all ages with no prior history of eye muscle surgery and who had received horizontal muscle surgeries only were included. Patients with restrictive, paralytic, and albinetic strabismus were excluded.

**Results:** Out of 693 horizontal surgery cases performed between 1/1/08 and 5/4/22, 40 patients were found to be eligible. 19 patients were esotropic pre-operatively and 21 were exotropic. The average horizontal deviation pre-operatively was  $35.6 \pm 11.3$  PD. Of these patients, only 3 (7.5%) required future vertical surgeries for persistent visually-significant SVD. 8 (20.0%) of the patients required further horizontal surgeries for either over- or under-correction of their horizontal deviations.

**Conclusion/Relevance:** Primary horizontal surgery alone was successful in correcting a SVD in the vast majority of the patients (92.5%). Patients presenting with SWHD along with SVD can undergo horizontal surgery while deferring vertical surgery, which reduces treatment burden, time under anesthesia, and risks associated with additional surgeries.

**References:** 1. Gunton, K. A., Wasseman, B. N., & DeBenedicts, C. (2015). Strabismus. Primary Care: Clinics in Office Practice, 3(42), 393-407. <https://doi.org/10.1016/j.pop.2015.05.006>

2. Struck, M. C., Hariharan, L., Kushner, B. J., Bradfield, Y., & Hetzel, S. (2010). Surgical management of clinically significant hypertropia associated with exotropia. Journal of AAPOS, 14(3), 216-220. <https://doi.org/10.1016/j.jaapos.2010.01.016>

## Outcomes of Strabismus Surgery in Patients Following Teprotumumab Therapy

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**Introduction:** Teprotumumab was approved for use in Thyroid Eye Disease (TED) in January 2020. To date, no reports have appeared in the literature about the results of patients requiring surgical treatment for symptomatic strabismus in TED following teprotumumab.

**Methods:** We report 7 sequential patients who had surgery for symptomatic diplopia after teprotumumab. Variables analyzed included elapsed months from last teprotumumab dose to the date of surgery, history of previous orbital decompression, primary preoperative horizontal and vertical deviation, surgical procedure, and 2-month postoperative results.

**Results:** Mean age of the 7 patients was 54 years (range, 39-73 years). Two patients had orbital decompressions prior to surgery. The mean elapsed time from treatment to surgery was 5 months (range, 2-7 months). The mean preoperative deviation was 18 prism diopters (PD) horizontally (range, 4-50 PD) and 23 PD vertically (range, 4-40 PD). At the 2-month postoperative visit, mean deviation was 5 PD horizontally (range, 0-15 PD) and 6PD vertically (range, 0-15 PD). Two patients received horizontal muscle surgery, three received vertical surgery, and two received bilateral surgery. Three patients had adjustable sutures. Three patients were diplopia-free after 1 surgery. One patient chose prism spectacles to correct residual diplopia and another used head posture to fuse and were considered treatment successes. Two underwent further surgery and were diplopia-free 2 months postoperatively.

**Conclusion/Relevance:** Patients requiring strabismus surgery for symptomatic strabismus following teprotumumab achieve good outcomes following surgical treatment for TED.

**References:** Smith TJ, Kahaly GJ, Ezra DG, et al. Teprotumumab for Thyroid-Associated Ophthalmopathy. *N Engl J Med.* 2017;376(18):1748-1761. doi:10.1056/NEJMoa1614949

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## Trends in Ocular Injury in Children Two Years and Under from 2017 to 2021 in the United States

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**Introduction:** Epidemiologic trends in pediatric ocular injuries caused by consumer products (CPs) in children two years and under from 2017 to 2021.

**Methods:** This retrospective, observational study used data obtained from the National Electronic Injury Surveillance System (NEISS). Inclusion criteria for this study were pediatric patients two years and under who presented with an eye injury to NEISS EDs between January 2017 and December 2021. Data were stratified by age, gender, race, cause of injury, and disposition.

**Results:** There was an estimated 51,250 (95% CI, 30,471 - 72,030) CP-related ocular injuries between 2017 and 2021, with the highest rates being in 2021. A majority of cases occurred in males (23,093 [12,643 - 33,543]). The most common diagnosis across all age groups was ocular contusion/abrasion (33.06% [32.66%- 33.47%]), followed by chemical burns (21.95% [21.59%- 22.31%]) and foreign bodies (5.50% [5.31% - 5.70%]). Among patients with contusions/abrasions, the most common cause next to unspecified toys was found to be drinking straws (6.10% [5.75% - 6.47%]). Among patients with chemical burns, the most common cause was from laundry soaps or detergents (15.80% [15.14% - 16.49%]). We found a growth in the number of cleaning agent-related ocular injuries from 1,693 (984 - 2,401) in 2017 to 2,726 (1,365 - 4,086) in 2021, representing a 13.96% average annual growth rate. There were 385.31 (0.75%) patients admitted with 21.62% due to an open globe injury.

**Conclusion/Relevance:** There was a steady increase in cleaning agent-related ocular injuries leading to chemical burns from 2017 to 2021.

**References:** Sastry, S. M., Copeland, R. A., Jr., Mezghebe, H. M., Siram, S. M., Spencer, M., & Cowan, C. L., Jr. (1995). Consumer product-related ocular trauma. *J Natl Med Assoc*, 87(5), 349-352. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/7783242>

Patel, P. S., Uppuluri, A., Zarbin, M. A., & Bhagat, N. (2022). Epidemiologic trends in pediatric ocular injury in the USA from 2010 to 2019. *Graefes Arch Clin Exp Ophthalmol*, 260(4), 1387-1394. doi:10.1007/s00417-021-05368-w



## **Pediatric Ocular Injury: Trends, Seasonality, and Burden from a Large Dataset at a Quaternary-Care Hospital**

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Boston, MA

**Introduction:** Ocular traumas comprise a large portion of costly ophthalmic emergency visits. Recent literature using a large database suggests a decline in pediatric ocular injuries but may be limited in accuracy and detail.[1,2] This study aimed to characterize the details in the epidemiology of pediatric closed-globe injuries (CGI) and understand the associated follow-up burden.

**Methods:** ICD-9 and ICD-10 codes were queried retrospectively for pediatric CGI at a large quaternary care center between from 2002-2020. Exclusion criteria were age >18 years, open-globe injuries, non-accidental head trauma, and incomplete documentation. Epidemiological data were recorded, and injuries were characterized according to the revised Birmingham Eye Trauma Terminology.[3] Burden of injury was measured by follow-up visits in the subacute period of 6 months following injury.

**Results:** A total of 1000 patients met inclusion criteria. Age at injury was  $10.1 \pm 4.5$  years. 73.1% were male. Mechanism of injury were 65.4% contusion, 28.1% lamellar, 5.0% chemical burn, and 1.0% thermal burn. Year-over-year incidence increased. Incidence of injuries were highest in the spring and summer months and were associated with higher volume of follow-up visits ( $p=0.0233$ ).

**Conclusion/Relevance:** These data suggest increase in year-over-year burden of pediatric CGI. Moreover, they suggest seasonality, favoring targeted public health interventions to reduce the burden of these injuries on patients and the healthcare system. This dataset is unique in that it involves accurate and detailed longitudinal follow-up, spans a significant number of patients in a major pediatric hospital, thus conferring the benefit of a large dataset.

**References:** 1. Matsa E, Shi J, Wheeler KK, McCarthy T, McGregor ML, Leonard JC. Trends in US Emergency Department Visits for Pediatric Acute Ocular Injury. *JAMA Ophthalmol.* 2018;136(8):895-903.

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## Optical Coherence Tomography Angiography in Pediatric Glaucomas and Glaucoma Suspects

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**Introduction:** We aimed to analyze optical coherence tomography angiography (OCTA) in children with glaucoma, glaucoma suspects, and normal controls.

**Methods:** Ocular history and examination details of patients (<18yrs) with glaucoma (n=33), increased cup-to-disc ratio with normal IOP (glaucoma suspects, n=31), and controls (n=60) were collected (05/2021-08/2022). Patients also underwent Heidelberg OCTA and vessel density and vessel skeletal density were calculated using ImageJ.

**Results:** Average age was  $12.7 \pm 3.4$  years (median 12.6) with no significant difference between the 3 groups ( $p=0.97$ ). Patients with glaucoma had undergone more intraocular surgeries ( $3.2 \pm 2.3$ ,  $p < 0.0001$ ) than controls (0) or suspects ( $0.05 \pm 0.2$ ). LogMar visual acuity was worse in glaucoma patients ( $0.3 \pm 0.4$ ,  $p < 0.0001$ ) than controls ( $0.07 \pm 0.15$ ) or suspects ( $0.03 \pm 0.07$ ). Further, glaucoma patients ( $-1.3 \pm 7.5D$ ) and suspects ( $-1.2 \pm 3.0D$ ) had a more myopic spherical equivalent than controls ( $0.0 \pm 1.8 D$ ,  $p=0.003$ ). However, there was no difference between glaucoma patients, suspects, and controls in vessel density or vessel skeletal density in the retinal superficial vascular complex ( $p=0.66$ ,  $p=0.65$ ) or choroidal deep vascular complex ( $p=0.61$ ,  $p=0.70$ ). Further there was no difference in size of the foveal avascular zone between the 3 groups ( $p=0.08$ ).

**Conclusion/Relevance:** In contrast to adults where retinal and choroidal micro-vasculature changes correlate with diagnosis and progression of primary open-angle and normal-tension glaucoma, similar findings are not recapitulated in children. This may be due to differences in glaucoma pathogenesis in children versus adults.

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## Characterizing Peripapillary Hyper-reflective Ovoid Mass-like Structures (PHOMS) in Pediatric Patients with Optic Nerve Pathologies

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**Introduction:** Peripapillary Hyper-reflective Ovoid Mass-like Structures (PHOMS) are a newly described entity found on optical coherence tomography (OCT). The visual significance of PHOMS has not been elucidated. We sought to characterize the presence of PHOMS in pediatric patients with and without optic nerve pathologies using OCT.

**Methods:** This retrospective study identified 430 pediatric patients (<21) with and without optic nerve head pathology who had at least one optic nerve head volume performed. This included normal patients (145), those with optic neuritis with optic disc edema (45), papillitis (6), optic nerve head drusen (ONHD) (48) and papilledema (185). Demographic information as well as visual and structural outcomes were obtained.

**Results:** PHOMS were found in 4.8% (7/145) of patients without optic nerve pathology, 22.2% (10/45) of patients with optic neuritis with optic disc edema, 50% (3/6) of patients with papillitis, 87.5% (42/48) of patients with drusen and 64.9% (120/185) of patients with papilledema. Eyes with PHOMS had significantly thicker retinal nerve fiber layers (RNFL) ( $p=0.048$ ). 5 cases where PHOMS developed de novo included 1 with ONHD and 4 with papilledema. This occurred over an average of 2.3 years. None of these patients had poor visual outcomes. 16 cases were found in which PHOMS resolved.

**Conclusion/Relevance:** PHOMS are present in most patients with optic disc edema from increased intracranial pressure and those with optic nerve head drusen and rarely in those without optic nerve pathology. We did not find a correlation between the presence of PHOMS and poor visual outcomes.

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## Apparent Diffusion Coefficient (ADC) Differentiates Retinoblastoma from Coats Disease on MRI

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**Introduction:** Coats' disease may be difficult to differentiate from retinoblastoma, clinically and radiologically, particularly in patients with large retinal lesions. We reviewed clinical and magnetic resonance imaging (MRI) findings in a group of patients to determine whether differences in apparent diffusion coefficient (ADC) might be useful in differentiating these disorders.

**Methods:** MRIs were reviewed for 6 eyes of patients with Coats' disease and 29 eyes of patients with retinoblastoma. ADC was measured in randomly sampled points within the lesions. Average ADC was calculated for each affected eye. Internal reliability was confirmed by re-measuring mean ADC for a random sample of patients masked to diagnosis and prior measurements.

**Results:** Mean ADC for retinoblastoma patients (442 mm<sup>2</sup>/s) differed significantly from the mean for Coats' patients (1364 mm<sup>2</sup>/s), ( $p < .001$ ). T-test between baseline and repeat measurements were not significantly different. In our patients a threshold of 900 mm<sup>2</sup>/s was useful in separating the two diagnoses with a high degree of accuracy.

**Conclusion/Relevance:** Determining whether a patient with large retinal lesions has retinoblastoma or Coat's disease is critically important, particularly since retinoblastoma is potentially lethal. ADCs derived from diffusion-weighted MRI appears to be useful in differentiating these two disorders.

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## **Semi-Automated Analysis of Dome-Shaped Macula in Premature and Full-Term Infants Using Handheld Swept-Source Optical Coherence Tomography**

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**Introduction:** Dome-shaped macula (DSM) was described in preterm infants using handheld spectral-domain optical coherence tomography (SD-OCT). This study uses semi-automated foveal analysis of an investigational handheld swept-source optical coherence tomography (SS-OCT) to describe DSM in greater detail.

**Methods:** In this prospective, observational study, awake premature infants were imaged at the time of retinopathy of prematurity (ROP) examinations. Full-term infants were imaged within 72 hours after birth. A semi-automated program measured DSM height and diameter, foveal angle, inner retinal foveal/parafoveal (F/P) ratio, and choroidal thickness at the central fovea and 2-sided parafovea (1.25mm from fovea). A mixed model approach adjusted for multiple eyes and visits.

**Results:** 218 imaging sessions from 80 infants (50 full-terms and 30 preterms) were included (46% female, 38.2±2.9 weeks postmenstrual age (PMA) at imaging, preterm birth weight 1038±335 g, and gestational age 28.7±3.1 weeks). Kappa intergrader agreement was 1.00. DSM was present in 3.3% preterms vs. 5.2% full-terms (p=0.51). DSM diameter was 403.1±60.8 vs. 458.4±62.1 microns (p=0.22), while height was 35.6±14.1 vs. 36.1±7.2 microns (p=0.95). There were no significant associations between DSM and inner retinal F/P ratio (p=0.14), foveal angle (p=0.55), choroidal thickness at the fovea (p=0.32) and parafovea (p=0.71), PMA at imaging (p=0.22), gestational age (p=0.19), birth weight (p=0.48), or subretinal fluid (p=0.74). DSM did not correlate with ROP stage (p=0.99), zone (p=1.00), plus disease (p=0.53), or cystoid macular edema (p=0.29).

**Conclusion/Relevance:** Dome-shaped macula is seen in a small subset of both full-term and preterm infants without obvious associations with foveal development, macular edema, subretinal fluid, or ROP.

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## The Effect of Erythropoietin on Retinal Function in Children Born Prematurely

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**Introduction:** Erythropoietin (EPO) is known to have neuroprotective effects [1]. Here, we analyse the effects of early prophylactic high-dose EPO administration on retinal function in children born preterm.

**Methods:** Randomized, double-blind, prospective study. A total of 87 children born preterm (52 treated with EPO, 35 with placebo) and 52 term-born healthy control (HC) children) aged between 7-15 years underwent a comprehensive eye examination, fullfield electroretinogram (ERG), and color vision testing. Differences in ERG parameters between groups were assessed using generalized estimating equation models after performing sensitivity analyses utilizing multiple imputations on the data set. Visual acuity (VA), refractive error, and colour vision results were summarized per group.

**Results:** Rod-cone b-wave implicit times (ITs) were significantly faster in the EPO subgroup than in HC, and cone b-wave and flicker ITs significantly slower in the placebo subgroup than in HC. No differences in ERG results between the EPO and placebo subgroups, or differences in amplitudes between groups, were observed. Visual acuity, refractive error, and color vision were comparable between groups.

**Conclusion/Relevance:** High-dose EPO administration during the neonatal period appears to have minimal effects on retinal function in children born prematurely. Premature birth with standard care (plus placebo) appears to negatively affect cone pathway development and bipolar function compared to HC. There were no major differences between the secondary clinical outcomes between the three groups. EPO administered in order to minimize adverse medium-term cognitive outcomes in premature babies [2] is therefore more likely to exert positive than negative effects on retinal function.

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## **Risk Factors for the Development of Retinopathy of Prematurity - A National Analysis**

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**Introduction:** Retinopathy of Prematurity (ROP) is a leading cause of blindness in infancy. While risk factors have been identified, few population-based studies have been done to stratify their relative impact.

**Methods:** ROP patients and a control group were identified from the National Inpatient Sample database using a well-validated approach (Lad et al. 2009). Multivariate logistic regression was performed using R 4.2.1.

**Results:** 10,626 patients with ROP and 155,416 without ROP were identified. ROP patients were more likely to identify as Black, have Medicaid, and be in the lowest income quartile ( $p < 0.05$ ). In the south, but not nation-wide, ROP was more likely to affect Hispanics. After controlling for the presence of comorbidities, multivariate logistic regression found that race, insurance, region, and income quartile were not significant predictors of ROP. Low birth weight ( $< 1500\text{g}$ ) and prematurity  $\leq 30$  weeks raised the odds of having ROP twelve-fold (odds ratio (OR) 12.2 [10.5-14.3]) and five-fold (OR 5.5 [4.6-6.5]) respectively ( $p < 0.001$ ). Apnea of prematurity and anemia increased the likelihood of ROP four-fold. Respiratory distress syndrome (RDS) and congenital heart defects (CHD) increased it three-fold ( $p < 0.001$ ).

**Conclusion/Relevance:** This large, nation-wide analysis ( $n = 166,042$ ) found that infants who are Black, have Medicaid, are in the lowest income quartile, or Hispanic and reside in the southern US, were more likely to have ROP, but this appeared to be related to higher rates of low birth weight, prematurity  $\leq 30$  weeks, apnea of prematurity, anemia, RDS, and CHD. Further studies are warranted.

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## **Are Eyes with Nasal Location of Retinopathy of Prematurity at Initial Presentation More Likely to Eventually Require Treatment?**

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**Introduction:** Recognition of factors associated with greater need for treatment may be useful in managing retinopathy of prematurity (ROP). We aim to assess the relationship between nasal versus temporal-only ROP on initial presentation and eventual need for treatment.

**Methods:** All patients screened for ROP between January 2018 and December 2020 were retrospectively reviewed. Data were collected on all patients (n=286) with Stage 1 or higher ROP. Eyes were classified as either nasal ROP or temporal-only ROP on initial presentation of ROP. Data from all ROP screening exams until treatment or completion of screening were reviewed. The primary outcome was treatment-requiring ROP. Additional data collected included: birth weight, patient age, and laterality. Outcomes were compared using univariable and multivariable logistic regression analyses.

**Results:** 542 eyes were included for analysis. Eyes with nasal ROP on initial presentation were more likely to ultimately require treatment (63/197, [32%]) than eyes with temporal-only ROP on initial presentation (13/345, [4%]), (OR: 12.0, 95% CI: 6.40-22.54) using a univariable logistic regression analysis. A separate multivariable regression analysis demonstrated that eyes with nasal ROP remain more likely to require treatment (OR: 3.28, 95% CI: 1.54-6.99) even when also accounting for birthweight (OR: 0.40/100 gm, 95% CI: 0.32-0.51), patient sex, and laterality.

**Conclusion/Relevance:** Eyes with nasal ROP at initial presentation are more likely to eventually require treatment than those with temporal-only ROP at initial presentation, even when accounting for other risk factors. Nasal ROP at initial presentation should prompt particular attention when monitoring for progression of ROP.

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## **Retinopathy of Prematurity Screening: Prevalence and Risk Factors of Ophthalmic Complications in Non-Treated Preterm Infants**

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**Introduction:** Retinopathy of prematurity (ROP) is a vision-threatening disease of premature infants. Infants treated for ROP are routinely followed by ophthalmologists. Practice guidelines recommend that ROP-screened patients who do not meet treatment criteria also receive follow-up after discharge to screen for ophthalmic complications.<sup>1</sup> The purpose of this study was to identify risk factors for the development of strabismus, amblyopia, high refractive error, and cataracts among ROP-screened, non-treated infants.

**Methods:** Retrospective single-center analysis of 309 patients. Clinical variables were screened for association with any ocular finding at follow-up. Univariable and multivariable analyses were used to determine risk factors associated with ocular findings.

**Results:** 309 ROP-screened, non-treated infants were seen at a mean (SD) age of 0.97 (0.69) years post-discharge. In multivariable analyses, a lower occipitofrontal circumference Z-score at discharge was identified as a risk factor for strabismus (OR 1.75, 95% CI 1.20;2.54, p=0.003), amblyopia (OR 1.83, 95% CI 1.08;3.13, p=0.025) and the composite outcome of any ocular finding (OR 1.52 95% CI 1.10;2.04, p=0.011). Patients with a history of necrotizing enterocolitis had higher risk for amblyopia (OR 6.20, 95% CI 1.30;29.4, p=0.02) and high refractive error (OR 7.66, 95% CI 1.43;41.1, p=0.017). Exclusive formula feeding, compared to exclusive breast milk feeding, at discharge was associated with near five-fold higher risk of developing any ocular finding (OR 4.90, 95% CI 1.37;17.5, p=0.014).

**Conclusion/Relevance:** ROP-screened, non-treated infants with low OFC Z-score at discharge, history of necrotizing enterocolitis, or exclusive formula feeding at discharge are at increased risk for ophthalmic complications and may benefit from close follow-up.

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## The Bile Acid-Gut Microbiome Axis and Retinopathy of Prematurity

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**Introduction:** The Smith technique has been proven as a reproducible method to create oxygen-induced retinopathy (OIR) mouse models that replicate retinopathy of prematurity (ROP)<sup>1</sup>. Our previous work in the OIR model has shown the role of bile acids (BA) in retinal diseases<sup>2</sup>, while gut microbiota affects bile metabolism through bile salt hydrolase (BSH)<sup>3,4</sup>. Therefore, we sought to compare the gut microbiome composition and BA profiles between mice treated with OIR and room air (RA), as well as meconium collected from preterm and term infants for clinical translation to ROP.

**Methods:** Cecal samples were collected from OIR and RA on 17-day-old mice. Meconium samples were collected from diapers of 12 preterm and 12 term infants. BA and microbiota were measured with liquid chromatography-tandem mass spectrometry and 16S sequencing.

**Results:** T-tests showed that OIR and preterm samples had higher unconjugated and lower Glycine/Taurine BA. There was also a lower abundance of BSH-producing phyla, such as Firmicutes, Bacteroides, and Actinobacteria, in OIR and preterm. From Spearman's rank correlational analysis, BA vs. phyla relationships differed between term and preterm samples.

**Conclusion/Relevance:** Differences in the results between RA and OIR, as well as term and preterm, support the presence of BA and gut microbiome dysregulation in prematurity. This dysregulation could be reflected in the natural course of ROP. In follow-up studies, we plan to collect BA and microbiota data from serial stool samples to compare with the clinical stage and progression of ROP. This can lay the groundwork for the development of efficacious and safe treatment for ROP.

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## **The Efficacy and Safety of Prophylactic Agents in the Prevention of Retinopathy of Prematurity: A Systematic Review and Meta-analysis**

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**Introduction:** Multiple agents have been investigated for their role in preventing the incidence of retinopathy of prematurity (ROP). However, a general consensus on the efficacy and safety of these agents has not been reached yet. This systematic review and meta-analysis aimed to assess the efficacy and safety of lipids, vitamin A, and propranolol in preventing ROP.

**Methods:** We performed a systematic literature search in Medline, Embase, and CENTRAL, from which we included randomized controlled trials (RCTs) that compared the use of lipids, vitamin A, or propranolol with placebo in preventing ROP in preterm infants with low birthweights. We evaluated the following outcomes: ROP of any stage, ROP stage 1, ROP stage 2, severe ROP, adverse events, and mortality. The risk ratio (RR) was used to represent dichotomous outcomes. Data were pooled using the inverse variance weighting method.

**Results:** Eight RCTs (n= 1101 participants) were deemed eligible. The incidence of severe ROP was significantly reduced with the use of lipid, vitamin A, or propranolol (RR=0.63, 95% CI 0.46-0.86). No significant difference was found between the two groups in the rates of adverse events (RR=0.83, 95% CI 0.59-1.17) or mortality (RR=0.93, 95% CI 0.67-1.30).

**Conclusion/Relevance:** The use of lipids, vitamin A, and propranolol was associated with a significant reduction in the incidence of severe ROP in preterm infants with low birthweights. No significant differences were noted when using lipids, vitamin A, or propranolol in preventing ROP of any stage, ROP stage 1, ROP stage 2, adverse events, or mortality.

**References:** 1. Gilbert C. Retinopathy of prematurity: a global perspective of the epidemics, population of babies at risk and implications for control. *Early Hum Dev.* 2008 Feb;84(2):77-82.  
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Rapid Fire Medical Student Paper #22

Saturday, April 1, 2023

3:20 PM – 3:23 PM

## **Effects of Improved Oxygen Management Practices and Technology on Management of Retinopathy of Prematurity in Sub-Saharan Africa - SIBA Phase 2**

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**Introduction:** A retinopathy of prematurity (ROP) epidemic looms over sub-Saharan Africa (1). 'Stop Infant Blindness in Africa' (The SIBA Project), an initiative of Children's Eye Foundation of AAPOS and IPOSC, offers training and equipment needed for ROP management to three Phase 1 sites with plans to scale to nine Phase 2 sites. This study aims to establish a baseline to better understand hurdles for proper ROP management in sub-Saharan Africa.

**Methods:** Nine sites in Benin Republic, Botswana, Ethiopia, Ghana (2 sites), Kenya, Nigeria, Tanzania and Zimbabwe were selected. Site visits were conducted and REDcap surveys were distributed via email. The 59 question survey was developed by the SIBA Committee and Neonatal Advisory Committee.

**Results:** 7/9 sites completed surveys and 4/9 sites were visited. Most sites had 25% of the total oxygen lines needed (n=4), but all lacked sufficient medical air lines, gas blenders, and oxygen sensors with current supplies under 50%, 16%, and 25% of total need, respectively. ROP burden ranged from 10-29% of babies screened at sites with adequate screening (n=3). The largest reported obstacles included screening problems (n=6), equipment shortages (n=5), and shortage of ROP trained personnel (n=4).

**Conclusion/Relevance:** There were significant needs for equipment and training at all sites. Further data on ROP frequency and severity, and blindness from 2 years before vs. after supplying equipment and training will be used to determine SIBA's impact. In analyzing these measures and implementing improved oxygen management practices and technology, this project will help mitigate the epidemic of childhood blindness due to ROP in sub-Saharan Africa.

**References:** (1) - Wang D, Duke R, Chan RP, Campbell JP. Retinopathy of prematurity in Africa: a systematic review. *Ophthalmic Epidemiol.* 2019;26(4):223-230. doi:10.1080/09286586.2019.1585885

## Quantitative Comparison of Vessel Characteristics of Plus Disease Images Published in the International Classification of Retinopathy of Prematurity Over Time

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**Introduction:** Plus disease, a vessel characteristic usually present in treatment-indicated (i.e. type 1) retinopathy of prematurity (ROP), was first defined in the International Classification of ROP (ICROP) in 1984, revisited in 2005,[1] and redefined in 2021.[2] The diagnosis of plus disease is subjective, even among experts. This study quantitatively compares posterior pole vessel characteristics in plus disease images published in the various iterations of ICROP.

**Methods:** We included images representing plus disease published in all iterations of ICROP. We used a semiautomated computer program, ROPTool, to trace/analyze all major vessels and calculate the following vascular indices: dilation index (DI), tortuosity index (TI), and combination dilation/tortuosity indices: sum of adjusted indices (SAI) and tortuosity-weighted plus (TWP).[3] Analysis was performed by quadrants (looking at the 2 most dilated/tortuous quadrants) and by eye (average of four quadrants).

**Results:** We included 6 images of plus disease with 71 vessels. ROPTool indices were lowest for ICROP3 by quadrants and by eye. ICROP vs. ICROP-revisited vs. ICROP3, by quadrants: TI (25.2 vs. 34.1 vs. 22.6), DI (22.8 vs. 20.1 vs. 16.8), SAI (21.6 vs. 21.4 vs. 17.6), TWP (20.7 vs. 21.6 vs. 17.1); and by eye: TI (10.3 vs. 14.8 vs. 8.0), DI (10.1 vs. 9.5 vs. 8.1), SAI (10.0 vs. 10.2 vs. 8.5), TWP (9.5 vs. 10.2 vs. 7.5).

**Conclusion/Relevance:** Images of plus disease in ICROP3 are less tortuous and dilated than those in previous iterations of ICROP. This has important clinical implications as it may lower clinicians' threshold to diagnose plus disease and treat less severe ROP.

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## Ocular Blood Flow Association with Retinopathy of Prematurity Disease Staging Using Laser Speckle Contrast Imaging

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**Introduction:** Diagnosing and staging ROP in preterm infants is crucial to initiating early treatment and preventing irreversible vision loss. Current methods of diagnosing ROP are invasive and stressful to the infant and can only provide subjective assessments of the retina.<sup>1-4</sup> Laser speckle contrast imaging (LSCI) is a non-invasive imaging technique that analyzes blur rate of red blood cells to generate blood flow measurements and objectively assess for stages of ROP. We tested the hypothesis that ocular blood flow metrics measured by LSCI will be associated with more advanced stages of ROP.

**Methods:** In this prospective study, preterm infants at risk for ROP as well as healthy controls were enrolled (n=60). Demographics and clinical risk factors were obtained as potential predictors. Ocular exams were performed via standard binocular indirect ophthalmoscopy and LSCI. Correlation coefficients, logistic regression, and multivariate regression were used to determine associations between ocular blood flow metrics and ROP severity.

**Results:** 60 preterm infants were enrolled over a 2-year period in this prospective observational study. There is enough evidence to suggest that post-menstrual age (p-value = 0.031,0.019), birthweight (p=0.037,0.027), and weight at exam can serve as linear predictors of blood flow velocity. Peak blood flow velocity index did appear to have an association between mild and severe ROP disease at maximal disease presentation.

**Conclusion/Relevance:** Objective measurements of retinal blood flow captured through LSCI could improve our understanding, diagnosis, and staging of ROP.

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Poster #A1  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Avoiding Bias in Randomized Clinical Trials for Amblyopia

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**Introduction:** High quality randomized clinical trials (RCTs) incorporating comparison with a control group are needed to evaluate emerging therapies. In such studies, it is appealing to allow participants who are not improving to stop early and allow alternative treatment, analyzing the last visit on randomized treatment. We studied the impact of this strategy.

**Methods:** We performed new analyses of publicly-available de-identified data from a multicenter RCT comparing atropine with part-time patching (follow-up visits at 5-weeks and 16-weeks, prior to the 26-week primary outcome). We re-assigned final outcome visual acuity at the visit of no improvement in visual acuity (hypothetically released to alternative treatment). We compared proportions of participants who would have been released early and compared hypothetical results to published results.

**Results:** In the new hypothetical design, the proportion of patients who would have ended the study early (at 5 weeks) would have been much greater in those randomized to atropine than those patched (25% vs 8%,  $p < 0.001$ ). The proposed outcome of mean improvement in visual acuity at time of no improvement would have been greater in the patching group (2.63 lines vs 1.85 lines, difference 0.78 lines (95% CI 0.43 to 1.13 lines,  $p < 0.001$ ) which differs from the original published results of minimal difference.

**Conclusion/Relevance:** RCTs designed with early release criteria for non-improvement introduce bias into primary outcome assessment if treatments have different rates of improvement. Readers and designers of RCTs need to understand this source of bias.

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Poster #A2

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Natural Language Processing to Identify Amblyopia Patients in the Electronic Health Record

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**Introduction:** Amblyopia is a common pediatric eye disease; pediatric ophthalmologists often need to identify patients receiving amblyopia treatment for quality improvement, maintenance of board certification, pay-for-performance metrics, and clinical research. However, diagnosis billing codes inconsistently identify these patients. Natural language processing (NLP) techniques can interpret free-text notes.<sup>1</sup> This study compares the accuracy of billing codes and NLP models for identifying amblyopia patients.

**Methods:** Billing diagnosis and progress note data from new patient office visits (2015 – 2022) for ages  $\leq 9$  were analyzed. A random sample of 600 visit notes were reviewed for identifying treatment requiring amblyopia (MH, HH, EK, SS) which were compared to billing diagnoses. A dataset of 2484 notes (600 + another 1884 labeled notes) were used to train an NLP classification model using Python scikit-learn library<sup>2</sup> with a 70/30 train/test data split.

**Results:** There were 16,280 visits; 4530 (28%) had a diagnosis code of amblyopia. For the 600 sample notes, the diagnosis billing codes had sensitivity, specificity, and accuracy of 0.70, 0.96, and 0.86 for identifying amblyopia. The NLP model had sensitivity, specificity, and accuracy of 0.95, 0.82, and 0.90 for classifying test data.

**Conclusion/Relevance:** This study demonstrates that billing diagnoses had multiple inaccuracies: false negatives (excluded amblyopia diagnosis) and false positives (patients were evaluated but did not have amblyopia). NLP methods can identify amblyopia patients from progress notes with higher sensitivity and accuracy than billing diagnoses, indicating promise for interpreting EHR notes. Ideally, better structured EHR data is needed for accurately identifying amblyopia patients in treatment.

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Poster #A3

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Recovery from Amblyopia in Adulthood: A Meta-Analysis

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**Introduction:** Effectiveness of traditional amblyopia therapies is largely restricted to childhood, but recovery in adulthood is possible following removal or vision-limiting disease of the fellow eye (FE). Study of this phenomenon is currently limited to isolated case reports and small case series.[1] We set out to (1) define the incidence of meaningful recovery and (2) elucidate the clinical features associated with greater amblyopic eye (AE) gains.

**Methods:** A systematic review of 3 literature databases yielded 23 reports containing 109 original descriptions of patients  $\geq 18$  years with unilateral amblyopia and FE injury. Two meta-analyses were performed: 1. Incidence: 3 case series (42 patients) reporting qualifying patients agnostic to recovery; 2. Clinical features of recovery: 101 patients with any quantifiable AE best-corrected visual acuity (BCVA) improvement.

**Results:** Study 1: 32/42 (76%) and 29/42 (69%) adult amblyopic patients experienced  $\geq 1$  and  $\geq 2$  logMAR lines of AEBCVA improvement with FE disease. Study 2: Among those with improvement, median change in AEBCVA was 5.0 (range: 0.5–19.2) logMAR lines. Recovery occurred across amblyopia types and FE pathologies. Multivariate regression analysis revealed younger age, worse baseline AEBCVA, and worse nadir FEBCVA were independently associated with the greater gains in AEBCVA ( $p$  values  $< 0.006$ ). Disease entities directly affecting FE retinal ganglion cells demonstrated shorter latencies to AEBCVA recovery by 4 months ( $p < 0.0124$ ).

**Conclusion/Relevance:** These results demonstrate that the adult brain harbors the neuroplastic capacity necessary for clinically meaningful recovery and support the potential therapeutic utility of temporary retinal inactivation in adult amblyopia.[2, 3]

**References:** [1] Resnick HH, Bear MF, Gaier ED. Partial recovery of amblyopia following fellow eye ischemic optic neuropathy. *J Neuro-Ophthalmol.* 2022; Online ahead of print. PMID: 36166713

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Poster #A4

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Parental Experience in Amblyopia Treatment and its Correlation with Visual Acuity Outcomes: A Pilot Study

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**Introduction:** Many studies have shown the significant psychosocial impact of amblyopia treatment on both children and parents. This study aims to correlate parental perception of amblyopia treatment with the visual acuity outcomes achieved in treated children.

**Methods:** A total of 22 parents of children undergoing amblyopia treatment within the past 6 months were recruited from a tertiary care academic center. A questionnaire was administered assessing treatment experience, attempts at treatment, administration success, ease of child acceptance, and associated difficulties. Clinical data was collected including age, gender, type of amblyopia, number of clinical visits, and visual acuity at survey completion.

**Results:** The average age was 6.28 years (SD 1.5). Treatment regimens included patching only (6), glasses only (5), patching and glasses (7), atropine and glasses (1), and one child with patching, atropine, and glasses. The mean change in interocular visual acuity at the time of the survey was 0.09 logMAR. Overall, there was a negative correlation between parent-reported difficulty with treatment and change in interocular visual acuity (one-way ANOVA;  $P = 0.02$ ). There was also a trend toward improved interocular visual acuity with increased parent-reported treatment times (one-way ANOVA;  $P = 0.8$ ).

**Conclusion/Relevance:** In this study, children with parents who perceived more difficulty in treatment had less therapeutic effect with amblyopia therapies. These findings support the use of more intensive interventions for parents struggling with amblyopia treatment. Additionally, the results of this pilot study pave the way for future prospective studies to delineate outcomes by treatment type and specific patient and family barriers to care.

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Poster #A5  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### **Perceptual Learning Improves Vision in Adults with Amblyopia and Nystagmus**

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**Introduction:** A computer based technology was used to improve contrast sensitivity and thus visual acuity in adults through perceptual learning. Each subject is training at home in front of a computer three times a week for forty sessions, 30 minutes each. The software is adjusting the training for each patient's specific visual deficiencies and progress from session to session. We evaluated its effect on adults with amblyopia and congenital nystagmus.

**Methods:** 17 subjects with amblyopia (average age 24 years range 9-55) and 16 with congenital nystagmus (average age 20.4 years range 10-47) exercised forty sessions for 30 minutes sessions over three month's period.

**Results:** Visual acuity improved in all amblyopia patients and in 13/16 nystagmus patients from average 0.44 to 0.27 and 0.54 to 0.44 logmar respectively. 6/17 and 4/13 of amblyopia and nystagmus patients improved 3 Snellen lines or more while 11/17 and 9/13 improved 1-2 lines respectively. Average contrast sensitivity improved from 195 to 302 and from 94 to 124 in amblyopia and nystagmus respectively. 9/11 and 6/14 patients regained fusion in Worth-4-Dot test in amblyopia and nystagmus respectively. Average stereoacuity improved from 263 to 132 sec of arc and from 256 to 168 sec of arc in amblyopia and nystagmus respectively.

**Conclusion/Relevance:** These preliminary results shows the efficacy of computer based perceptual learning in improving vision in adults with amblyopia and nystagmus. Final study results including a control group are pending.

**References:** 1. Polat U, Ma-Naim T, Belkin M, Sagi D. Improving vision in adult amblyopia by perceptual learning. Proc Natl Acad Sci U S A. 2004;101(17):6692-7

## Tailoring Amblyopia Treatment with Visually Evoked Potentials (VEPs)

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**Introduction:** Amblyopia is a major public health problem. In up to 1/3 of patients the vision does not reach 20/40 despite the most intensive treatment<sup>1</sup>. Currently we cannot predict the prognosis at the time of diagnosis. We aimed to investigate the value of pattern Visual Evoked Potentials (pVEP) in tailoring the treatment as previous studies suggested that shorter p100 latency is correlated to better visual prognosis.<sup>2,3</sup>

**Methods:** A retrospective cohort study that enrolled 46 patients with amblyopia that underwent pVEP after at least 3 cycles of patching and/or atropine without visual improvement. Subjects with final VA equal or better than 20/60 were defined responders. P100 was defined normal if p100<110ms, mild delay 110-150ms, severe delay >150ms.

**Results:** Responders (n=27) and non-responders (n=19) had similar baseline characteristics, including mean age at the time of VEP (9.0 vs. 8.8 years, p=0.16), age of the initial exam (8.2 vs. 8.0 years, p=0.21), age of the final exam (10.1 vs. 9.6 years, p=0.30) and sex (M/F=17/10 vs. 12/7, p=0.62). The two arms were treated in the same fashion (p=0.51), had similar prevalence of the different types of strabismus (p=0.60) and anisometropia (0.58). Responders had better initial VA (20/76 vs. 20/270, p=0.02) and shorter p100 latency on checkerboard 8x8 (101.0 vs. 108.7, p=0.002). p100 was severely delayed in 3 nonresponders and none responder on the 8x8 checkerboard (p=0.033) and 9 nonresponders and 2 responders on the 128x128 checkerboard (p=0.002).

**Conclusion/Relevance:** Shorter p100 latency on pVEP and initial VA are associated with better response to treatment. This might help to tailor the treatment duration for amblyopia.

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Poster #A7

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Is Electrodiagnostic Testing Useful Following Treatment Failure or Suboptimal Outcome Post Amblyopia Management? A Retrospective Audit

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**Introduction:** Current amblyopia management guidelines suggest electrodiagnostic testing (EDT) should be reserved for children with no improvement in visual acuity despite good compliance with amblyopia treatment<sup>1,2</sup>. We aimed to investigate the extent to which EDT aided diagnosis and management of children with poor acuity post amblyopia treatment.

**Methods:** Our paediatric electrophysiology database was used to identify patients referred due to poor acuity following amblyopia management. Children aged between 5 and 8 at EDT with little or no acuity improvement following treatment (glasses/patching/atropine) were included. Children with structural changes, family history of eye disease or with sudden onset visual loss were excluded. EDT findings were classified as normal; abnormal in keeping with amblyopia; or abnormal in keeping with alternative pathology.

**Results:** 44 children were included, 30 male. At treatment onset, mean acuity of poorer eyes was 0.62 logMAR and mean acuity of better eyes was 0.30 logMAR. By EDT, acuities had improved: poorer eye mean 0.55 logMAR, better eye mean 0.22 logMAR. The mean spherical equivalent was +2.5 dioptres (D). Anisometropia had a mean of 0.5D, median 1.5D.

EDT typically comprised light-adapted ERGs and monocular flash and pattern VEPs. Findings were normal for 31/44 (70%), abnormal in keeping with amblyopia for 10/44 (23%) and suggested an alternative diagnosis in 3 children (7%). No malignancies, retinal dystrophies or acquired forms of cortico-visual pathway dysfunction were found. Poor compliance with treatment was prevalent.

**Conclusion/Relevance:** In conclusion, we found that EDT was not useful for children with sub-optimal compliance with amblyopia therapy and otherwise normal ophthalmic findings.

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Poster #A8  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### **Autism as a Cause of Nutritional Xerophthalmia**

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**Introduction:** Xerophthalmia is a leading cause of blindness in children worldwide, but is most often seen in developing nations. (1) In developed countries, cases of vitamin A deficiency have been reported secondary to restrictive diets and malabsorption. (2) Restrictive diets are relatively common among patients with autism spectrum disorder (ASD). (3) We present six pediatric patients with ASD with varying degrees of xerophthalmia due to limited diets. Xerophthalmia should be considered when there is an abnormal ocular surface in the setting of ASD and a poor diet.

**Methods:** This is a retrospective case series of six patients with ASD and xerophthalmia identified at a single institution between the years of 2018-2022.

**Results:** All patients had diagnosed or suspected autism spectrum disorder with restrictive eating. One patient developed right eye corneal perforation, bilateral severe corneal scarring, and bilateral corneal ectasia. Another patient developed corneal ulcer with subsequent corneal scarring. The other four patients developed ocular surface dryness that resolved following vitamin A supplementation.

**Conclusion/Relevance:** Xerophthalmia may be under-diagnosed, partly due to lack of familiarity. Pediatric providers should include diet history as part of routine clinical history and consider vitamin A deficiency in at risk groups with abnormal ocular surface. Early identification and vitamin A supplementation can prevent irreversible vision loss.

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Poster #A9  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### **Brittle Cornea Syndrome: Clinical Characteristics and Management**

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**Introduction:** To describe the anterior segment findings and management strategy of patients with Brittle cornea syndrome.

**Methods:** Medical records of patients with the diagnosis of Brittle cornea syndrome seen at XXX were reviewed. Ophthalmic examination, medical and surgical treatments, and molecular testing results were noted.

**Results:** Six patients (3 pairs of siblings) were included. The age range of diagnosis was between 5 and 11 years. The visual acuity at presentation was worse than 20/100 in 7 eyes, while better than 20/100 in 5 eyes. Typical findings included high myopia (MRSE range; -5.00 - -18.5D), blue sclera, thin corneas. Overlay graft was performed in 5 eyes and re-graft was needed in one eye. Aggressive intraocular pressure control was managed by topical anti-glaucomatous agents (6/6), cyclodiode laser photocoagulation (2/6). Vision and corneal integrity were preserved in all eyes after at least 4-year follow-up. All patients underwent genetic testing and both were positive for homozygous deletion in the ZNF469 gene.

**Conclusion/Relevance:** The presence of high myopia, blue sclera and thin corneas, keratoglobus-like presentation, should alert pediatric ophthalmologists for an underlying connective tissue disorder including Brittle cornea syndrome. Timely overlay grafts in the management of Brittle cornea syndrome prevent undesirable clinical courses such as spontaneous corneal perforation and help maintain the vision.

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Poster #10

Thursday, March 30, 2023

10:05 AM – 11:05 AM

### **Corneal Neurotization as a Treatment for Neurotrophic Keratopathy Due to Congenital Causes**

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**Introduction:** Corneal neurotization surgery is emerging as a highly effective treatment for neurotrophic keratopathy. Additional studies are shedding light on surgical outcomes, optimal surgical techniques, and patient selection. This study aims to assess the outcomes of corneal neurotization surgery for congenital causes of neurotrophic keratopathy.

**Methods:** This study was conducted as a retrospective review of 7 patients with congenital causes of neurotrophic keratopathy who underwent minimally invasive indirect corneal neurotization surgery. All of the patients were included from two sites participating in an international corneal neurotization registry. Outcome measures included subjective post-operative feedback from families and patients, Cochet-Bonnet aesthesiometry, and episodes of epithelial breakdown.

**Results:** 14 eyes from 7 patients were included in this study. The average age at the time of surgery was 9.3 years old (range 1.6-18.9 years old) and 4 patients were female. The congenital etiologies included pontine tegmental cap dysplasia, Stuve-Wiedemann syndrome, and Ramos-Arroyo syndrome. Pre-operatively all patients had absent corneal sensation readings. The Cochet-Bonnet aesthesiometry measurements improved to 60 mm by 12 months post-operatively for 5 out of the 7 patients, and all patients and families reported subjective improvement of the ocular surface through post-operative feedback questioning. The average number of episodes of epithelial breakdown also decreased post-operatively.

**Conclusion/Relevance:** In our series of neurotrophic keratopathy patients due to congenital causes, corneal neurotization surgery has shown to improve subjective measures of corneal sensation, corneal sensation measured by aesthesiometry, and episodes of epithelial breakdown.

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Poster #A11  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### Clinical Characteristics of Pediatric Keratoconus

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**Introduction:** Pediatric keratoconus (KC) is an often aggressive and vision-threatening disease that, even with the advent of new diagnostic and therapeutic methods, commonly presents at advanced stages.<sup>1,2</sup> The purpose of this study is to review the clinical features and rate of intervention among a cohort of children diagnosed with KC over a 20-year period.

**Methods:** The medical records of all patients < 19 years diagnosed with KC at our institution from January 1, 2001, through December 31, 2020, were retrospectively reviewed.

**Results:** Among a total of 74 patients diagnosed at a mean age of 15.2 years (range, 6.0 to 18.0), 60 (81%) were male, and 62 (83%) were White. Fourteen (19%) had a history of atopy, 12 (16%) had documented eye rubbing, and 5 (7%) had a positive family history. The mean average corneal steepness at first measurement for the 148 eyes was 50.4 (range 42.9-59.25) and 34 patients (45.9%) had Scheimpflug tomography. Thirty-five (47.3%) underwent a procedure during a mean follow-up of 3.8 years (range, 1 to 16), including corneal collagen crosslinking (CXL) in 17 (22.9%), penetrating keratoplasty in 13 (17.6%), and lamellar keratoplasty in 4 (5.4%). Fifteen (88%) keratoplasties were performed prior to 2018 and 16 (94%) CXLs were performed in 2018 or later.

**Conclusion/Relevance:** In this cohort, pediatric KC predominantly affected children in early adolescence and was often advanced at presentation to subspecialists. In the relatively short observation period, nearly half of patients required a procedure, underscoring the need for early identification and close observation of these patients.

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Poster #A12  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### **Three-Year Outcomes of Corneal Collagen Cross-Linking under General Anesthesia in Pediatric and Developmental Delay Keratoconus Patients**

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**Introduction:** Keratoconus is a rapidly progressive disorder with onset in early adolescence and a disproportionately high incidence among individuals with developmental delay. These patients often experience difficulty tolerating corneal collagen crosslinking (CXL) in the clinic resulting in barriers to timely treatment. The purpose of this study is to report 3-year outcomes of pediatric keratoconus patients treated with CXL under general anesthesia.

**Methods:** We conducted a single-institution retrospective chart review of patients with keratoconus who underwent CXL under general anesthesia. Outcomes included best corrected visual acuity, keratometry, anesthesia or surgical complications, and need for repeat crosslinking or corneal transplantation. We used the Pearson chi-square test and the t-test to compare disease characteristics of patients with and without development delay.

**Results:** Forty-five eyes of twenty-seven patients were reviewed, including seven patients with developmental delay (Trisomy 21, autism, and spina bifida). Median Snellen best-corrected visual acuity was 20/30 at baseline and 20/25 at postoperative year 3. Median steep keratometry was 52.1 diopters at baseline and 51.3 diopters at postoperative year 3. No patient developed corneal scarring or hydrops by postoperative year 3. No patient required repeat crosslinking or corneal transplantation by postoperative year 3.

**Conclusion/Relevance:** Pediatric patients, especially those with developmental delay, are at risk for rapid keratoconus progression; long-term outcomes of crosslinking under general anesthesia are favorable.

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Poster #A13  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Outcomes of Surgical Excision for Complex Ocular Choristoma in Children

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Toronto

**Introduction:** Ocular choristomas account for 15% of all congenital corneal opacities. The purpose of this study is to report the outcomes of excision of complex ocular choristomas involving the visual axis and/or extending to the fornix in children.

**Methods:** Retrospective chart review of consecutive cases treated from 2009-21. Demographic data, age at surgery, pre and postoperative visual acuity, procedural details and complications, and systemic associations were recorded.

**Results:** Nineteen cases met inclusion criteria. Eight cases (42.1%) were associated with Goldenhar syndrome, 1 case (5.3%) with congenital alopecia, and 1 case (5.3%) with linear nevus sebaceous syndrome. Mean age at surgery was 3.3 0.8 years. Mean follow-up was 8.3 4.7 years. Mean best corrected visual acuity was 0.40 0.35 logMAR preoperatively, and 0.39 0.38 logMAR at last follow-up ( $p=0.87$ ). Nine patients (47.4%) needed more than one surgery for ocular surface reconstruction and 47.4% had anisometropic amblyopia. Restrictive strabismus was observed in 2 cases (19.0%). Four lesions (21.1%) extended into the anterior chamber, seven (36.8%) extended into the visual axis and 18 extended into the fornix. Amniotic membrane grafting was done in 11 cases (57.9%), corneal grafts in 9 cases (47.4%) and conjunctival autograft in 6 cases (31.6%). Two eyes (1.7%) had self-sealing microperforations during dermoid excision. Wound dehiscence occurred in 2 cases (10.5%) and lipid keratopathy was seen in 1 case (5.2%).

**Conclusion/Relevance:** Although more than one surgery may be necessary to achieve good cosmetic results in patients with complex ocular choristomas, best corrected visual acuity remained stable.

**References:** 1. Karadag R, Rapuano CJ, Hammersmith KM, Nagra PK. Causes of congenital corneal opacities and their management in a tertiary care center. *Arq Bras Oftalmol.* 2020;83(2):98-102.  
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Poster #A14

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Technique for the Management of Extensive Ocular Surface Lipodermoid Involving the Cornea in Children

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**Introduction:** Ocular surface lipodermoids with corneal involvement may require surgical intervention; if deep, ocular surface reconstruction with lamellar corneal tissue or amniotic membrane may be needed. We describe a staged technique using autologous ipsilateral simple limbal epithelial transplantation (SLET).

**Methods:** After verifying sparing of Descemet Membrane, the conjunctival portion of the lipodermoid was debulked in the first stage. Six weeks later, the corneal portion was excised, followed by autologous ipsilateral SLET to promote rapid re-epithelialization of the residual stromal bed. A temporary tarsorrhaphy was used for patient comfort and to expedite ocular surface healing.

**Results:** Three eyes of three children with grade III large ocular surface lipodermoids which encroached the visual axis and hindered proper eyelid closure underwent surgery without complications. In all cases, the visual axis was cleared, and eyelid closure was improved. At last follow-up (mean 35.7 months, median 36.0 months), the bed of the original dermoid showed minimal haze in one case, whilst two eyes developed a small pseudo-ptyerygium; best spectacle corrected visual acuity (BSCVA) improved from 20/200 to 20/70 in the first case, from fix and follow (F&F) to 20/50 in the second case, and remained F&F in the last case, but this child had congenital hydrocephalus with severe developmental delay.

**Conclusion/Relevance:** This surgical technique is a promising option for children with grade III large ocular surface lipodermoids, given its effectiveness in clearing the visual axis and in improving eyelid closure. Moreover, it does not require lamellar corneal transplantation or intervention to the fellow eye.

**References:** 1. Zhong J, Deng Y, Zhang P, et al. New Grading System for Limbal Dermoid: A Retrospective Analysis of 261 Cases Over a 10-Year Period. *Cornea*. 2018;37:66-71. doi:10.1097/ICO.0000000000001429.

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Poster #A15

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Ciclosporin 1mg/ml Cationic Emulsion Reduces Need For Topical Corticosteroids In Vernal, Atopic And Blepharokeratoconjunctivitis**

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**Introduction:** Topical ciclosporin A 1mg/ml cationic emulsion (CsA) has recently received marketing authorisation in North America for vernal keratoconjunctivitis (VKC). It may reduce the need for topical corticosteroids and contribute to maintenance treatment of VKC, and also atopic and blepharokeratoconjunctivitis (AKC, BKC).

**Methods:** We reviewed the medical records of 485 children treated with CsA between 2015 and 2021, including 209 with VKC, 99 with AKC and 145 with BKC.

**Results:** Median age at start of treatment was 9.7 years (IQR 7.2 to 12.8 years), 333 boys (62.5%). Data were available for 12 months before/after starting CsA in 227 cases. The median number of inflammatory episodes requiring topical corticosteroids fell from 3 (IQR 2-4) to 1 (IQR 0-2), excluding steroid prescriptions concomitant with the first CsA prescription; Wilcoxon signed ranks, 2 tailed,  $p < 0.01$ . The number of clinic visits fell from a median of 4 (IQR 3 to 6) to 3 (IQR 2 to 5); Wilcoxon signed ranks, 2 tailed,  $p < 0.01$ . Stinging was a common adverse effect (4.7%); skin rash was unusual (0.6%). The most common reasons for discontinuation was a perception that the medication was no longer needed (32.8%) or the family not requesting, or the general practitioner not issuing, a repeat prescription (18.8%).

**Conclusion/Relevance:** Csa 1mg/ml cationic emulsion reduces the need for topical corticosteroids and hospital visits and may improve the quality of life of children and families. Information and communication need to improve to raise awareness of VKC, AKC and BKC as chronic conditions requiring long-term treatment.

**References:** 1. Dahlmann-Noor, A et al. Steroid-sparing effect of ciclosporin A 1mg/ml: five-year case series of 107 children and young people with vernal keratoconjunctivitis. *BMJ Open Ophthalmology* (accepted for publication)  
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Poster #A16  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Socioeconomic Status and Visual Outcomes in Infantile Aphakia

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**Introduction:** Factors related to visual outcome in congenital cataracts are an active area of investigation. No studies to date have explored the relationship between socioeconomic factors (SES) and final visual acuity (VA) in infantile aphakia.

**Methods:** This retrospective study included 35 patients who had cataract surgery (CE) between 2010-2022 for whom visual acuity was recorded at age 4.5 years. SES data consisting of adjusted gross income (AGI), community opportunity index (COI), distance to hospital (DH), and distance to the nearest pediatric ophthalmologists (DPO) were collected.

**Results:** Of 35 subjects (24 bilateral cataracts, 11 unilateral cataracts) 14 (60%) developed glaucoma, 13 (37.1%) had additional ocular pathology on presentation, and mean overall final logMAR BCVA was  $0.89 \pm 0.708$  (~20/155). Worse final VA was correlated with higher AGI ( $R = 0.448$ ,  $p = 0.007$ ), COI ( $R = 0.311$ ,  $p = 0.069$ ), greater DH ( $R = 0.307$ ,  $p = 0.072$ ), greater DPO ( $R = 0.0207$ ,  $p = 0.838$ ), and DPO greater than 15 miles from residence ( $R = 0.035$ ,  $p = 0.842$ ). Worse final Va was significantly correlated with an intraocular lens ( $R = 0.421$ ,  $p = 0.012$ ) and the presence of additional ocular pathology ( $R = 0.410$ ,  $p = 0.014$ ).

**Conclusion/Relevance:** Development of glaucoma and presence of additional ocular pathology may have mitigated the effect of socioeconomic factors on final visual outcomes in infantile aphakia. More studies are needed to assess the impact of SES.

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Poster #A17

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Assessing the Effect on Visual Quality in Pediatric Cataracts by the Use of a Novel Tool: Double Pass Aberrometer**

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**Introduction:** HD Analyzer (HDA) uses double-pass technology providing an objective quantified measurement of vision quality, reflected by Ocular Scatter Index (OSI); OSI above 1 indicates high scatter and is related to lower visual quality. The purpose of this study is to assess the feasibility of using HDA in pediatric population. Further on to assess and quantify the visual significance of partial cataracts in the pediatric population using HDA and to correlate values of ocular scatter index (OSI) with cataract morphology and visual acuity

**Methods:** A prospective pilot study of 21 children with pediatric cataract. All children underwent a comprehensive ocular examination including HDA assessment of the cataract

**Results:** The study included 9 boys, 12 girls, median age 6.90 years (4 months-15 years). 17/21 were able to perform the HDA exam successfully. Visual acuity ranged from 0.4 to 0.8 Snellen. We found a correlation between OSI values and cataract morphology or opacity location. Posterior cataracts showed higher OSI index as compared to anterior cataracts. OSI, ocular scatter index, was elevated in all eyes.

**Conclusion/Relevance:** HDA is a feasible exam in toddlers and children. OSI index is increased in eyes with congenital cataract as compared to clear lens and correlates with lens morphology, location and visual acuity. Study of a larger pediatric population will enable the assessment of normative pediatric OSI values and threshold. We suggest adding the HDA in the arsenal of tools while assessing severity of pediatric cataract.

**References:** 1. P Artal, A Benito, G M. Pérez. et. al. An Objective Scatter Index Based on Double-Pass Retinal Images of a Point Source to Classify Cataracts, 2011; 6(2), PLoS One.  
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Poster #A18  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **An Evaluation of the Prevalence of Systemic Conditions in Patients with Bilateral Congenital Cataracts**

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**Introduction:** Congenital cataracts may be idiopathic or result from inheritance, systemic syndromes, congenital infection, or ocular developmental anomalies. Standard evaluation of bilateral congenital cataracts in absence of family history includes laboratory testing for congenital infection or metabolic syndromes and genetic consultation (1,2). This study investigates the results of systemic evaluation for bilateral congenital cataracts at our institution.

**Methods:** Retrospective chart review identified 102 patients from age 0 to 24 months who were diagnosed with congenital cataract(s) between January 1, 2015 and October 1, 2022. Data included family history, laterality, and laboratory and genetic evaluation. Prevalence of positive findings in the evaluation was determined.

**Results:** Fifty patients (49%) had bilateral cataracts. Fourteen of these had a positive family history; seven were attributed to Trisomy 21. Two were attributed to Lowe syndrome, which was identified after a genetics consultation due to developmental delay and seizures. One was found to have X-linked oculofaciocardiodental syndrome on genetic testing. One was found to have congenital rubella syndrome as a result of laboratory work up. Fourteen were evaluated with an unrevealing laboratory work up.

**Conclusion/Relevance:** Systemic evaluation of many patients with bilateral congenital cataracts was not necessary in the setting of known family history (28%) or diagnosis of Trisomy 21 (14%). Genetics evaluation confirmed Lowe syndrome in patients who also had seizures (4%) and identified rare genetics conditions such as X-linked oculofaciocardiodental syndrome (2%). Developmental delay was a frequent initial manifestation in patients with genetic syndromes. TORCH infection (2%) and metabolic disease was rare.

**References:** 1. Wilson E. Pediatric Cataracts: Overview. Nov 2015. American Academy of Ophthalmology. <https://www.aao.org/pediatric-center-detail/pediatric-cataracts-overview>. Accessed Sept 2022.  
2. Lim Z, Rubab S, Chan YH, Levin AV. Pediatric cataract: the Toronto experience-etiology. Am J Ophthalmol. 2010 Jun;149(6):887-92. <https://pubmed.ncbi.nlm.nih.gov/20430363/>. Accessed Sept 2022.



Poster #A19  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Pathologic Calcification Contributes to the Formation of Pediatric Cataracts of Different Etiologies**

Sarah H. Rodriguez; Peter J. Minogue; Viviana M. Berthoud; Eric C. Beyer

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Chicago

**Introduction:** Our recent studies in mice suggest that a crucial event for the development of cataracts is the formation of calcium-containing deposits (apatite) that are detectable by microCT scanning and histochemical staining (1-3). This investigation examines the generality of pathologic mineralization as a novel mechanism of cataract formation by studying lens material from different human cataract surgeries.

**Methods:** Human lens material was obtained from routine cataract surgeries performed on 4 patients with dense, white cataracts: a 10-month-old with nystagmus and presumed delayed presentation with congenital cataracts, a 9-year old with a uveitic cataract, a 17-year-old with a traumatic cataract, and a 17 year old with type 1 diabetes. Insoluble fractions of disrupted mouse or human lenses were stained with Alizarin red.

**Results:** The aspirated material from human cataract surgeries contained particles that stained with Alizarin red and had a similar appearance to the insoluble, Alizarin red-stained particles detected in the homogenates of cataractous mouse lenses.

**Conclusion/Relevance:** These results extend the generality of calcium crystal formation from mouse models to human cataracts. We hypothesize that pathologic mineralization may have a mechanistic role in formation of mature cataracts of different etiologies.

**References:** 1. Gao, J., Minogue, P.J., Beyer, E.C., Mathias, R.T., and Berthoud, V.M. Disruption of the lens circulation causes calcium accumulation and precipitates in connexin mutant mice. *Am J Physiol Cell Physiol* 2018; 314, C492 - C503.

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Poster #A20  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Mydriasis in Paediatric Cataract Surgery Using Intracameral Solution**

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**Introduction:** Achieving and maintaining reasonable dilatation in children undergoing cataract surgery is unpredictable with topical drops besides their systemic side effects. Our aim was to study the efficacy and stability of pupillary dilatation using commercially available intracameral combination of phenylephrine, lidocaine and tropicamide in pediatric cataract surgery

**Methods:** Children undergoing cataract surgery were dilated using commercially available combination of phenylephrine 0.31%, tropicamide 0.02% and lidocaine 1%. None of the patients received any preoperative dilating drops. Intracameral injection of 0.025 ml of this solution was given through a paracentesis and the pupil size was measured at different stages of surgery till the completion. Measurements were made from screenshot from recorded videos

**Results:** Cataract surgery was performed in 45 eyes out of which 30 had congenital cataract, 6 had surgery for subluxated lenses, 4 eyes had complicated cataract with synechiae, 5 were associated with retinopathy of prematurity. A minimum of 6 mm dilatation was achieved in most with infants showing the most resistance. The stability of dilatation was maintained in 43/45 eyes till the end of surgery. There were no systemic side effects as these children were monitored under general anaesthesia.

**Conclusion/Relevance:** Cataract surgery was performed in 76 eyes out of which 61 had congenital cataract, 6 had surgery for subluxated lenses, 4 eyes had complicated cataract with synechiae, 5 were associated with retinopathy of prematurity and one patient had congenital cataract with floppy iris syndrome. A minimum of 6 mm dilatation was achieved, with infants showing the most resistance. The stability of dilatation was maintained in 73/76 eyes till the end of surgery. There were no systemic side effects as these children were monitored under general anaesthesia.

**References:** 1. Kaur S, Korla S, Ram J, Gupta PC, Sukhija J. Intracameral anesthetic mydriatic (ICAM) assisted pediatric cataract surgery. *Eur J Ophthalmol.* 2021 Mar 29;11206721211006575. doi: 10.1177/11206721211006575

## Surgical Management and Outcomes of Persistent Fetal Vasculature

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**Introduction:** Persistent fetal vasculature (PFV) is a congenital anomaly of the eye arising from failure of the hyaloid vasculature to regress.<sup>1-3</sup> The aim of the study was to analyze surgical outcomes of PFV in a pediatric population.

**Methods:** This is a retrospective, descriptive chart review study of pediatric patients with PFV who underwent intraocular surgery at Children's Medical Center of Dallas by a single surgeon from 2010 - 2022.

**Results:** Thirty-two patients (37 eyes) were included. Seventeen were female and fifteen were male. Twenty-seven eyes had unilateral PFV (72.97%). Mean follow-up time was  $2.88 \pm 2.35$  years (2 months - 8.3 years). Mean age at the time of surgery was 20.63 months (0.68 months-13.26 years). Combined form of PFV (anterior and posterior involvement) was the most common presentation (22, 59.46%); 15 eyes (40.54%) had isolated anterior involvement. Lensectomy + anterior vitrectomy was done in 27 eyes (72.97%), and pupillary membrane removal + pupilloplasty in 10 eyes (27.03%); 10 eyes had IOL implantation (6 primary, 4 secondary). Early postoperative complications included hyphema (1, 2.70%) and choroidal effusion (1, 2.70%). Long-term complications included phthisis bulbi (1, 2.70%), retinal detachment (1, 2.70%), secondary glaucoma (2, 5.51%), and secondary pupillary membrane (6, 16.21%).

**Conclusion/Relevance:** Good surgical outcomes can be achieved in patients with PFV. The posterior and combined forms of PFV are associated with more postoperative complications. However, close post-operative follow-up and prompt surgical intervention may improve outcomes in these children.

### References:

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2. Li L, Fan DB, Zhao YT, et al. Surgical treatment and visual outcomes of cataract with persistent hyperplastic primary vitreous. *Int J Ophthalmol.* 2017;10(3):391-399. Published 2017 Mar 18. doi:10.18240/ijo.2017.03.11
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Poster #A22

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## The Rate of Emmetropization after Early Cataract Removal: A Comparison Between Eyes With PFV and Eyes with Simple Congenital Cataract

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**Introduction:** To evaluate the rate of emmetropization of eyes after congenital cataract surgery comparing between persistent fetal vasculature (PFV) vs. simple congenital cataract eyes.

**Methods:** Retrospective study of 75 eyes with PFV or simple congenital cataract, who underwent surgery before age 7 months (unilateral/first operated eye), during 2007-2018 at a tertiary referral center, with follow-up  $\geq$  one-year.

**Results:** 27 eyes (36%) had PFV, 48 were simple congenital cataracts. Mean age at surgery in children with PFV was  $2.24 \text{ SD} \pm 1.23$  months and  $2.44 \text{ SD} \pm 1.51$  months in the simple congenital cataract group. Mean post-operative follow-up was  $64.94 \text{ SD} \pm 34.67$  months. 60% of the eyes remained aphakic for the entire follow-up.

In aphakic children, the mean post-operative spherical equivalent (SE) in the PFV eye was +18.74D, +15.73D, +13.88D, +12.51D, +11.29D at one-month, one-year, two-years, three-years and five-years respectively. In the simple congenital cataract eye the SE was +23.00D, +20.44D, +17.84D, +17.52D, +18.48D at one-month, one-year, two-years, three-years and five-years respectively. During the entire post-operative course, the SE remained less hyperopic in the PFV eyes ( $p < 0.01$ ).

The rate of emmetropization was similar for PFV and simple congenital cataract eyes. Five-years after surgery the mean myopic shift was -6.82D in the PFV eyes and -5.47D in the simple congenital cataract ( $p > 0.05$ ).

The changes in refraction error did not correlate with either presence of glaucoma, secondary cataract, amblyopia or strabismus.

**Conclusion/Relevance:** Eyes with PFV have a similar rate of emmetropization as other pediatric congenital cataracts. Interestingly, aphakic PFV eyes are less hyperopic during one month and up to five-years after surgery as compared to non-PFV eyes.

**References:** 1. Khokhar SK, Tomar A, Pillay G, Agarwal E. Biometric changes in Indian pediatric cataract and postoperative refractive status. *Indian J Ophthalmol.* 2019;67(7):1068-1072. doi:10.4103/ijo.IJO\_1327\_18  
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Poster #A23  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **A Model to Predict Refractive Shift After Ocular Growth in Children Undergoing Bilateral Cataract Surgery**

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**Introduction:** To develop a model for predicting refractive shift following cataract surgery in children undergoing bilateral cataract surgery between ages 2-18.

**Methods:** A retrospective review was conducted for bilateral cataract surgery in 142 children ages 2-18 with primary intraocular lens (IOL) implantation with at least 1 years of follow up and at least 2 post-operative refraction measurements. Patients with traumatic etiology or ectopia lentis were excluded. A multivariable generalized estimating equation (GEE) model was fit that included univariate patient characteristics associated with post-operative refraction at  $p < 0.02$  as well as two-way interactions between all univariate variables and time-dependent variables.

**Results:** The median age at surgery was 6.3 years with a mean of 7.45 years of follow-up. The mean refractive shift for the patient population was -1.78. Beta values of the final multivariable GEE model to predict post-operative change in refraction include: intercept (0.590,  $P = 0.044$ ), target refraction (-0.093,  $P = 0.505$ ), age at surgery (0.239,  $P < 0.001$ ), age at post-operative exam before age 12 (-0.275,  $P < 0.001$ ), age at post-operative exam after age 12 (0.135,  $P = 0.009$ ), interaction between age at post-operative exam and target refraction (-0.05,  $P = 0.013$ ), interaction between age at post-operative exam after age 12 and target refraction (0.073,  $P = 0.023$ ).

**Conclusion/Relevance:** The multivariable GEE model uses pre-operative factors to predict the amount of refractive shift a child may experience as the eye grows. This information is invaluable in the pre-operative planning before cataract surgery to aid in the selection of intraocular lens to be implanted.

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Poster #A24

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Are Larger Panels better? An Analysis of Comprehensive Next-Generation Sequencing Multigene Panels for the Diagnosis of Inherited Ocular Conditions**

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**Introduction:** Comprehensive next-generation sequencing multigene panels (NGS-MGP) are popular in the diagnosis of pediatric ocular conditions but have variable diagnostic yields (1). Moreover, panels from different laboratories may interrogate different numbers and types of genes, but this variability is not well characterized. In this study, we compare 3 such panels to inform the ophthalmologist's decision-making in diagnostic genetic testing for inherited ocular conditions.

**Methods:** We compared NGS-MGP from 3 commercial laboratories in composition, consensus rate (genes covered by all panels, 'concurrent'), and dissensus rate (genes covered by only one panel, 'standalone'). Comprehensive panel coverage was also compared with that of NGS-MGP targeted to single ocular conditions. Individual genes were analyzed for publication history and association with systemic manifestations.

**Results:** Altogether, the panels tested 1124 discrete genes. 377 were covered by all 3 panels (concurrent) for a consensus rate of 33.5%. 544 genes were covered by only one panel (standalone) for a dissensus rate of 48.4%. Concurrent genes had significantly more publications specifically related to eye conditions than standalone genes ( $P < 0.0001$ ). Moreover, concurrent genes have longer association with ocular conditions than standalone ones ( $P < 0.0001$ ). Finally, standalone genes are significantly more associated with syndromic presentations ( $P < 0.0001$ ).

**Conclusion/Relevance:** The genetic testing of inherited ocular conditions using NGS-MGPs is complicated. While the inclusion of additional (standalone) genes might increase diagnostic yield, these genes are also less well-studied, indicating uncertainty over their role in ocular pathogenesis. Hence, prospective diagnostic yield studies of NGS-MGPs will aid decisions of panel selection for the diagnosis of inherited ocular conditions.

**References:** 1. Patel, A., et al. The Oculome Panel Test: Next-Generation Sequencing to Diagnose a Diverse Range of Genetic Developmental Eye Disorders. *Ophthalmology* 126, 888-907 (2019).

Poster #A25

Thursday, March 30, 2023

10:05 AM – 11:05 AM

### **Genetic Testing Identified Causative Variants in 20% of Early-Onset Bilateral Cataracts Cases**

Erin D. Stahl, MD; Jamie C. Fox, PhD; Dana M. Talsness, PhD; Sharon F. Freedman, MD; Bharti R. Nihalani, MD;  
Deborah K. VanderVeen, MD

**Introduction:** Early-onset cataracts occur in patients younger than 40 years of age. In children, the prevalence is 1-15 per 10,000 [1]. Systemic etiologies or genetic disorders are believed to be the cause of cataracts in young patients. The goal of this study was to identify genetic variants responsible for early-onset idiopathic cataracts as part of Travers's sponsored 'Behind the Blur' testing program.

**Methods:** We analyzed 292 individuals with acquired cataracts (ages 1.5 years to 35 years) via a Next-Generation Sequencing (NGS) panel of 66 genes. All testing was completed at PreventionGenetics, a CLIA-certified laboratory, using exome capture probes (PGxome®).

**Results:** A positive diagnostic outcome was found for 61/292 (20.9%) of patients, while 183/292 (62.7%) and 48/292 (16.4 %) patients had an indeterminate or negative result, respectively. Of the 61 positive cases, 52 (85.2 %) involved single-nucleotide variants, while 9 (14.8%) involved copy number variants. 19 of the positive cases had variants in a crystallin gene (CRYBA1, CRYBB2, CRYAA, and CRYGD), a gene important for lens structure. Using NGS, we identified 1 patient with cerebrotendinous xanthomatosis.

**Conclusion/Relevance:** Through NGS sequencing, we observed a positive diagnostic rate of 20.9%. This study demonstrates the utility of genetic testing in individuals with early-onset cataracts and may help with early diagnosis and to inform patient management.

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Poster #A26

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Prevalence of Cerebrotendinous Xanthomatosis (CTX) Among Patients Diagnosed With Juvenile-Onset Idiopathic Bilateral Cataracts**

Sharon F. Freedman, MD; Bharti R. Nihalani, MD; Erin D. Stahl, MD; Deborah K. VanderVeen, MD

**Introduction:** CTX, a rare bile acid synthesis disorder manifesting diverse signs and symptoms, including childhood-onset bilateral cataracts, is often diagnosed and treated years after symptom onset, increasing risk of irreversible neurologic damage [1]. Caused by mutations in CYP27A1, CTX produces elevated plasma cholestanol (PC) and urinary bile alcohols (UBA). Metabolic testing for CTX among children with idiopathic acquired bilateral cataracts may aid earlier diagnosis and treatment of CTX.

**Methods:** The primary objective of this observational study was to evaluate CTX prevalence in patients aged 2 to 21 years at idiopathic bilateral cataracts diagnosis. Patients with PC levels  $\geq 0.4$  mg/dL or positive UBA prompted CYP27A1 genetic testing at a CLIA-certified laboratory. The secondary objective was to assess other manifestations of CTX in patients with bilateral cataracts.

**Results:** 426 of 442 enrolled patients with a median age of 9.8 years (range, 1 month to 52.6 years) had available PC or urine samples, 28 (6.3%) met genetic testing criteria, and 4 (0.9%) tested positive for CTX. PC was 1.6-3.3 mg/dL in 4 patients who tested positive vs 0.38-0.65 mg/dL for patients who tested negative. 274 patients experienced at least 1 CTX-related symptom other than cataracts. The most common were eye disorders (29.4%), developmental delay (23.1%), and learning disability (21.3%).

**Conclusion/Relevance:** CTX prevalence in idiopathic bilateral cataract patients was higher than population estimates (3-5/100,000) [2]. Ophthalmologists can help diagnose CTX earlier by conducting metabolic testing in young patients with bilateral cataracts.

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Poster #A27  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Diagnostic Yield of Retinal Dystrophies in a Diverse Pediatric Population

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**Introduction:** The advent of gene therapy for retinal dystrophies has focused significant attention on classifying pathogenic (P)/likely pathogenic (LP) variants in retinal dystrophies (1). Free testing for retinal dystrophies has accelerated the rates of variants of uncertain significance (VUS), particularly in ethnicities other than caucasian which is attributed to lack of representation within databases (2,3). We aimed to evaluate the diagnostic yield of genetic testing in a diverse population of pediatric patients with retinal dystrophies and determine genotype-phenotype correlations.

**Methods:** An IRB-approved retrospective review was completed of pediatric patients who underwent genetic testing for retinal dystrophies from 2009-2021. Demographics were collected and genotype-phenotype correlations were evaluated.

**Results:** Of the 95 patients, 59% were male and 49% were caucasian/non-hispanic. Twenty-seven percent had a family history of retinal dystrophy and 36% were associated with a syndrome. A total of 338 variants were identified: 70 P variants, 36 LP variants, and 167 VUS. The most common P/LP variants were ABCA4 (19.8% of P/LP variants), followed by CNGA3 (6.6%), ALMS1 (5.7%), and USH2A (5.7%). The overall positive diagnostic yield was 75.3%, and although not statistically significant ( $p=0.136$ ), varied by race/ethnicity: black (50%), asian (57%), hispanic (76%), and caucasian (82%).

**Conclusion/Relevance:** The overall yield of genetic testing is high for pediatric patients with retinal dystrophies; however rates may vary based on race/ethnicity and further research is warranted to identify P/LP variants in diverse patient populations.

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Poster #A28

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Clinical and Molecular Findings in Children with a Diagnosis of Blue Cone Monochromacy with Longitudinal Follow-up**

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**Introduction:** Blue cone monochromacy (BCM) is a rare, X-linked cone dysfunction syndrome caused by absent OPN1LW/OPN1MW gene expression, with preserved blue-cone function. Childhood presentation and clinical course in molecularly confirmed patients are not well-described.

**Methods:** Retrospective, IRB-approved review of children with a molecular diagnosis of BCM, presenting between January 1, 2008, and June 30, 2022 at Cincinnati Children's Hospital. Presenting characteristics, longitudinal BCVA, refractive error, color vision, stereopsis, contrast sensitivity, and ancillary testing when performed (FAF, ERG, VF) and genotype are described.

**Results:** Eight boys from seven, unrelated families, presented at a median of 2 years (0.17-11y) with follow-up of 6.3 years (1.9-15.5y). All presented with photophobia and nystagmus, with nystagmus absent in 4/8 at the most recent visit (MRV). BCVA was stable from initial recognition acuity to MRV, at a median of 20/125 (20/80-20/300) and 20/125 (20/100-20/200) respectively. Ametropia was common at both initial and MRV with a median spherical equivalent of +4.38D(-2.75-+6.00D), age 1y(0.17-11y) and -1.1D(+3.75—13D), age 9.5y(4-16y). Fundus abnormalities included blunted foveal reflex (8/8). fERG was diagnostic in 2 patients. FAF demonstrated reduced foveal hypoFAF (5/6). 1/6 had a perifoveal hyperfluorescent ring. Visual fields were full (n=7, Goldmann or Arc kinetic perimetry). Initial presentation to clinical diagnosis of BCM was 2.2 years(0-10.7y). All patients had deletion of the locus control region (LCR).

**Conclusion/Relevance:** Diagnostic delay was noted, and BCM should be considered in males presenting with photophobia and nystagmus, with normal fundus with exception of blunted foveal reflex. Significant phenotypic heterogeneity was present, despite same LCR deletion.

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Poster #A29

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Outcomes and Challenges of Voretigene Neparvovec Gene Therapy in the Paediatric Population**

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**Introduction:** This work was conducted to evaluate visual outcomes, safety and complications following subretinal voretigene neparvovec (VN) injections in children with RPE65-mediated retinal dystrophies.

**Methods:** A retrospective review of all paediatric patients treated with VN at Great Ormond Street Hospital (GOSH) was performed. Visual acuity (VA) was measured using Keeler acuity cards, Cardiff cards, Kay pictures or Thomson logMAR chart. Fundus photography, autofluorescence and retinal OCT imaging were examined. Electrodiagnostic tests were also reviewed.

**Results:** 21 eyes from 11 patients (aged between 15 months to 14 years) were treated with VN at GOSH. The pre-operative mean logMAR VA was 1.048. The mean improvement in logMAR VA at the patient's last follow-up visit (between 4 to 12+ months post treatment) was 0.364. This difference in VA at baseline versus post-treatment was not statistically significant over the whole group ( $p=0.265$ ). However, children under the age of 4 showed significant improvement in VA. 10/11 patients reported improved scotopic and functional vision. Three patients developed subretinal infiltrates one week post-operatively but these resolved spontaneously. Three eyes had large retinotomy associated localised RPE atrophy. One patient developed foveal outer retinal atrophy in both eyes following treatment.

**Conclusion/Relevance:** Although there was no statistically significant objective improvement in VA across the entire group of patients, most patients reported improved low illumination and functional vision. Interestingly, VA improvement was more pronounced in younger children. The most common adverse event was the development of subretinal infiltrates which reassuringly were self-limiting. The most severe complication was bilateral foveal atrophy.

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Maguire AM, Russell S, Bennet J, et al. Durability of Voretigene Neparvovec for Biallelic RPE65-Mediated Inherited Retinal Disease: Phase 3 Results at 3 and 4 Years. *J Ophtha*; 2021 Oct;128(10):1460-1468.

Poster #A30  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Patau Syndrome and the Development of Retinal Detachments**

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**Introduction:** Trisomy 13 (Patau syndrome) is associated with microphthalmia, coloboma, and cataract. Despite its rarity and severity, patients are surviving longer and there is a paucity of data on ocular sequelae past infancy. Here we seek to further evaluate the association of retinal detachment and Patau syndrome.

**Methods:** This retrospective case series was approved by the Colorado Multiple Institutional Review Board. 284 charts were reviewed that met the search criteria of having a diagnosis of Trisomy 13. Of these, 12 patients had a confirmed diagnosis of Trisomy 13 and documented eye exam. Data collected included demographic factors, eye exam and ocular history, and verbal/nonverbal status.

**Results:** Five of the twelve patients were seen for only a single visit; none of whom had retinal detachment. Of the seven patients with follow-up, four patients and five eyes had retinal detachments. All four patients with retinal detachments were documented to have iris colobomas, two had chorioretinal and optic nerve colobomas, three patients had cataracts, and two had staphyloma. Of the five retinal detachments, four were macula off. Age when retinal detachment was discovered was two days old, four years old, five years old, and twelve years old. All four patients with retinal detachments were nonverbal.

**Conclusion/Relevance:** While Trisomy 13 was once not thought to be survivable, these complex patients are now making it through childhood and appear to be at high risk of retinal detachment. Early detection is challenging as many Patau patients are nonverbal.

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Poster #A31  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Ophthalmic Features of CHARGE Patients Diagnosed with Cortical Visual Impairment

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**Introduction:** CHARGE Syndrome is a rare and complex condition. The acronym describes characteristic malformations. CHARGE: Coloboma, Heart Defect, Atresia Choanae, Retarded Growth and Development, Genital Hypoplasia, Ear Anomalies/Deafness. In chart review, we found some patients diagnosed with CHARGE syndrome were also diagnosed with Cortical Visual Impairment (CVI). CVI covers a wide range of visual and perceptual impairments resulting from dysfunction of the visual pathways. CVI Range Score 2 assesses severity, where a high score is less severe.

**Methods:** A retrospective chart review was completed on children with confirmed CHARGE syndrome to analyze those also diagnosed with Cortical Visual Impairment, and examined from January 1, 2008 to June 1, 2021.

**Results:** 68 patients were diagnosed with CHARGE, 16 patients (32 eyes) had CVI (23.5%). 21 of the 32 eyes had a coloboma: 6% had iris colobomas, 43% had optic nerve colobomas, and 85% had chorioretinal colobomas. 18% of all eyes had retinal detachment. 87% of patients had a visually significant refractive error. 9 out of 16 patients received a CVI Range. The median CVI Range 2 Score was 6.75 with a range of 2.25-8.25. 62% of patients had diagnosed brain based diseases, such as hypoxia, ventriculomegaly, seizures, hydrocephalus, etc.

**Conclusion/Relevance:** We hypothesize that children diagnosed with CHARGE and CVI may have CVI as a result of brain based diseases that limit vision, in addition to other ocular structural changes from CHARGE syndrome. Patients diagnosed with CHARGE may benefit from CVI screening.

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Poster #A32

Thursday, March 30, 2023

10:05 AM – 11:05 AM

### Changes in Intraocular Pressure due to Body Position in Healthy Pediatric Population

Stephanie Suzanne S. Garcia, MD; Theo Stoddard-Bennett; Philip Villanueva, CO; Soh Youn Suh, MD;  
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**Introduction:** Pediatric examination positioning widely varies, depending on the cooperation and comfort of the patient. However, few studies have investigated the effect of body position on intraocular pressure (IOP) in the pediatric population. This study seeks to determine the effect of body positioning on IOP in healthy children using the iCare IC200.

**Methods:** This is a prospective cohort study. Fifteen healthy children were enrolled and had their IOP assessed using the iCare IC200 in upright (90°), reclined (45°), and supine (0°) positions. The order of body positioning was randomized, with five minutes allotted between measurements to allow IOP equilibration. Data on age, refractive error, and central corneal thickness (CCT) were obtained. Repeated measures ANOVA was used to determine mean IOP differences ( $\Delta$ IOP) due to body positions.

**Results:** Enrolled subjects had a mean age of 10.7 $\pm$ 4.0 years. Mean  $\Delta$ IOP were 3.2 $\pm$ 3.3 mmHg (supine minus upright), 2.0 $\pm$ 3.3 mmHg (reclined minus upright), and 1.2 $\pm$ 2.8 mmHg (supine minus reclined) (ANOVA,  $p < 0.0001$ ). Post hoc pairwise comparison showed statistically significant increases in IOP in supine ( $p < 0.0001$ ) and reclined ( $p = 0.007$ ) positions when compared to upright. Although measured IOP in each position showed significant differences between genders ( $p < 0.5$ ),  $\Delta$ IOP between genders did not. There was a significant positive correlation between age and supine and upright  $\Delta$ IOP ( $r = 0.364$ ,  $p = 0.047$ ). No significant correlation to  $\Delta$ IOP was seen for refractive error and CCT.

**Conclusion/Relevance:** Body position-induced changes in IOP in healthy children are evident and significantly elevated in the reclined and supine positions compared to the upright position.

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Poster #A33

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Corneal Biomechanics and Endothelial Cell Characteristics in Pediatric Glaucomas and Glaucoma Suspects

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**Introduction:** We aimed to analyze corneal biomechanics and specular microscopy findings in children with glaucoma, glaucoma suspects, and controls.

**Methods:** Ocular history and examination details of patients (<18 yrs) with glaucoma (n=33), increased cup-to-disc ratio with normal IOP (glaucoma suspects, n=31), and controls (n=60) were collected (05/2021-09/2022). Patients underwent testing with Ocular Response Analyzer (Reichert) and CellChek Specular Microscope (Konan Medical).

**Results:** Average age was  $12.7 \pm 3.4$  years with no significant difference between the 3 groups ( $p=0.97$ ). Glaucoma patients had undergone more intraocular surgeries ( $p<0.0001$ ) and showed worse LogMar visual acuity ( $p<0.0001$ ) than suspects or controls. Both corneal-corrected-IOP and Goldman-IOP were higher in glaucoma ( $p=0.04$ ) and suspects ( $p=0.001$ ) than controls. Central corneal thickness (CCT) was greater in glaucoma ( $656.5 \pm 85.2$  microns,  $p<0.0001$ ) and suspects ( $592.0 \pm 44.9$  microns,  $p=0.003$ ) compared to controls ( $560.0 \pm 39.8$  microns), however, there was no difference in corneal hysteresis ( $p=0.09$ ). Glaucoma patients had lower endothelial cell density ( $1827.4 \pm 835.5$ ,  $p<0.0001$ ) and greater average cell area ( $592.1 \pm 408.2$ ,  $p=0.0005$ ) compared to suspects ( $2883.4 \pm 335.0$ ,  $352.4 \pm 49.7$ ) and controls ( $2904.5 \pm 396.7$ ,  $351.7 \pm 55.7$ ), but there was no difference in polymegathism ( $p=0.29$ ) or pleomorphism ( $p=0.88$ ). Linear regression analysis of ocular surgeries with endothelial cell density showed a  $R^2=0.61$ .

**Conclusion/Relevance:** Children with glaucoma show thicker corneas with lower endothelial cell density and greater endothelial cell area compared to glaucoma suspects and controls.

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Poster #A34

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Long-Term Glaucoma-Related Adverse Events Following Congenital Cataract Surgery at Age 1-6 Months with Intraoperative Intracameral Triamcinolone

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**Introduction:** To assess the incidence of glaucoma-related adverse events in eyes which received intracameral triamcinolone acetonide at end of procedure for infant lensectomy at 1-6 months of age and to compare our results with the Infant Aphakia Treatment Study (IATS). We hypothesized that intraocular steroids reduced this long-term risk due to persistent decreased postoperative inflammation, which may reduce anterior chamber fibroization

**Methods:** Chart review study; patient list obtained by running the appropriate CPT codes for infant lensectomy and age <6 months at surgery. Glaucoma-related adverse events were defined similarly as diagnostic criteria defined by IATS. To allow for triamcinolone wash-out, intraocular pressures beyond 8 weeks postoperatively were considered for the above diagnosis. Eyes with acquired cataract were excluded.

**Results:** Sixty-nine eyes were followed for a median of 3.7 years [(IQR: 1.97-5.31), range = 0.02-8.41 years]. 30% eyes were noted to be steroid responders, within the first 8 weeks postoperatively. At 1 year (n = 62), incidence of glaucoma/glaucoma-suspect was 17.7% (95% CI: 8.2 – 27.3%) and 11.3% (95% CI: 3.4 – 19.2%) had glaucoma; at 5 years (n = 20), incidence of glaucoma/glaucoma-suspect was 20% (95% CI: 2.5 – 37.5%) and 15% (95% CI: 0 – 30.7%) had glaucoma; similarly as IATS. Overall, among glaucoma/glaucoma-suspect eyes (n = 21), 19% had persistent fetal vasculature, 29% had microcornea. Additionally, we found that 24% had poorly dilating pupil. Of the remaining 48 eyes, 12 (25%) had a diagnosis of glaucoma/glaucoma-suspect.

**Conclusion/Relevance:** Intraocular triamcinolone use has similar incidence of glaucoma-related adverse events and inflammation may be a less significant risk factor.

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## Association Between Vascular and Structural Parameters by Optical Coherence Tomography Angiography in Primary Congenital Glaucoma

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**Introduction:** To determine the association of structural and vascular parameters using optical coherence tomography (OCT) angiography (-A), in patients diagnosed with primary congenital glaucoma (PCG). And to model the relationship between vascular and structural parameters.

**Methods:** 40 patients diagnosed with PCG were recruited (only one eye per patient was included). All study participants underwent a comprehensive ophthalmologic examination. Peripapillary and macular vascular measurements were obtained using Angioplex™ OCTA with a 4.5x4.5mm optic nerve head scan and 6x6mm macular scan. Structural parameters were collected: circumpapillary Retinal nerve fiber layer (cpRNFL) thickness (global and quadrants), ganglion cell-inner plexiform layer complex (GCL+IPL) thickness (average, minimum and sectors), rim area, average and vertical cup to disc (C/D) ratio and cup volume. Local weighted scatterplot smoothing (LOWESS) and linear regression was used to model the relationship between vascular (flux index) and structural (cpRNFL thickness) variables.

**Results:** Global peripapillary values were: Mean flux index (FI) was 0.39 (0.05), mean perfusion density (pPD) was 42.57 (4.56) %, cpRNFL was 78.65 (22.50) microns, average c/p ratio (0.59 (0.18) and global GCL+IPL thickness was 71.71 (14.81) microns and minimum GCL+IPL thickness was 64.18 (18.63) microns. Statistical correlation was found between peripapillary structural, vascular and morphologic parameters (all  $p < 0.023$ ). No-linear model ( $FI = 5.48 + 7.36 \times 10^{-3} \text{ cpRNFL} - 3.36 \times 10^{-5} \text{ cpRNFL}^2$ ) defined better the relationship between structural (cpRNFL thickness) and vascular (FI) damage in PCG. Considering the slope of change, FI decreases as cpRNFL decreases, however a decrease of FI exists even with lower values of cpRNFL thickness ( $< 42$  microns, slope =  $4.5 \times 10^{-3}$ ).

**Conclusion/Relevance:** No-linear relationship between structural and vascular parameters in PCG was described. OCTA measurements could offer useful and objective measurement of damage in early and severe congenital glaucoma, complementary to that offered by OCT.

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Poster #A36

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Characterization of the Iris, Ciliary Body, and Anterior Segment Angles in Congenital Glaucoma using Ultrasound Biomicroscopy: A Case-Control Study**

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**Introduction:** Primary Congenital Glaucoma (PCG) is a rare but devastating cause of irreversible vision loss with variable incidence worldwide. Diagnostic tools for PCG are limited to measurement of IOP, cornea diameter, axial length, refractive error, and cup-to-disc ratio. Clinical data may be limited by cooperation in young children. Ultrasound biomicroscopy (UBM) offers a noninvasive, high-resolution, real-time imaging technique that may provide additional clinical data to evaluate in order to better identify diagnosis or progression in PCG.

**Methods:** The aim of this study was to identify quantitative differences in AS, iris, ciliary body, and angles between 10 PCG subjects and 10 age-matched controls (n=20, 0.25-12.42 years) in 80 UBM images with ImageJ software.

**Results:** 8 parameters were found to be significantly different between glaucoma and control eyes. The data suggests that glaucomatous eyes' irises are longer, more curved, and thinner as seen by iris length (P=0.035), iris convexity (P=0.0002), and mid-iris (P=0.011) and peripupillary iris thicknesses (P=2.170 x 10<sup>-6</sup>), respectively. Glaucomatous ciliary body (CB) was more irregularly shaped with larger angle-opening distance (P=3.018 x 10<sup>-7</sup>) and wider angles between the trabecular meshwork-iris (P=2.035 x 10<sup>-6</sup>), iris-cornea (P=0.013), and ciliary body-cornea (P=0.007).

**Conclusion/Relevance:** These results highlight anatomic differences in PCG patients. Further study will be needed to assess the diagnostic value and relevance of iris and CB measures in the progression or control of disease.

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Poster #A37

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Bruch Membrane Opening Minimum Rim Width in Pediatric Glaucoma using Overhead-Mounted Spectral Domain Optical Coherence Tomography: A Pilot Study**

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**Introduction:** Despite interest in its use in adult glaucoma, Bruch membrane opening-minimum rim width (BMO-MRW) measured by optical coherence tomography (OCT) has not been well studied in childhood glaucoma. This pilot study explores the relationship between BMO-MRW, peripapillary retinal nerve fiber layer (pRNFL) thickness, and clinical optic nerve cupping in childhood glaucoma.

**Methods:** Ongoing prospective observational study using the Glaucoma Module Premium Edition (GMPE) protocol on overhead-mounted Spectralis OCT (FLEX-OCT, Heidelberg Engineering) in children too young to perform tabletop imaging. Included eyes had clinically-indicated examination under anesthesia and FLEX-OCT imaging including pRNFL and GMPE protocols (for global and sectoral BMO-MRW and BMO area). Intraocular pressures, clinical cup-to-disc ratios, and axial lengths were recorded.

**Results:** Included to date are 20 glaucomatous eyes (14 children) and 5 normal eyes (5 children). For glaucomatous eyes, mean axial length was  $23.6 \pm 2.0$  mm and cup-to-disc ratio  $0.60 \pm 0.2$ . In nonglaucomatous eyes, the mean axial length was  $20.8 \pm 0.5$  mm and cup-to-disc ratio  $0.27 \pm 0.1$ . For glaucomatous vs. normal eyes, mean values for global BMO-MRW were  $254.8 \pm 71.8$   $\mu$ m vs.  $362.8 \pm 37.9$   $\mu$ m, respectively ( $p=0.0074$ ); mean values for global pRNFL were  $94.31 \pm 13.2$   $\mu$ m vs.  $110.2 \pm 8.7$   $\mu$ m, respectively ( $p=0.045$ ). Global MRW was positively and strongly correlated with global pRNFL ( $p=0.0007$ ). Increasing cup-to-disc ratio was strongly correlated with lower BMO-MRW ( $p=0.014$ ) but not with lower global pRNFL ( $p=0.35$ ).

**Conclusion/Relevance:** Our pilot data suggests that BMO-MRW may prove valuable in differentiating between glaucomatous and healthy eyes of young children. Further study with larger numbers of glaucomatous and healthy eyes are needed to determine clinical utility.

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Poster #A38  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### Virtual Reality Game-Based Automated Perimetry Performance in Healthy Children

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**Introduction:** Virtual reality may provide an alternative to standard automated perimetry. This study evaluates a virtual reality game-based automated perimetry in a healthy pediatric population.

**Methods:** Ongoing prospective series of pediatric patients at one institution who performed VisuALL perimetry (Olleyes Inc. Summit, NJ). Participants were examined by an experienced pediatric optometrist or ophthalmologist, who found no evidence of ocular disease expected to affect visual fields. Testing was performed binocularly with the child's spectacles. Each child 'flew' a spaceship from the center (home) to 'gather' visualized stimuli using a virtual pointer. Age, refractive error, test duration, false positives, and stereoacuity were evaluated as factors affecting performance on VisuALL, as assessed by mean deviation (MD) $<-2$  dB.

**Results:** Enrolled to date are 191 eyes (96 patients), with mean age  $11.9\pm 3.1$  years. Average MD was  $-1.82\pm 3.5$  dB, with mean foveal sensitivity  $32.0\pm 4.7$  dB. Fifty-nine eyes (30.9%) had MD $<-2$  dB. Better performance was associated with shorter test duration ( $p<0.001$ ) and older age ( $p<0.001$ ). False positives ( $p=0.442$ ), wearing spectacles ( $p=0.092$ ), Titmus stereoacuity ( $p=0.197$ ), and refractive error ( $p=0.120$ ) were not associated with improved performance, with age as a covariate. By questionnaire, 92% of children found the test friendly and simple.

**Conclusion/Relevance:** In a healthy cohort, children enjoyed using VisuALL for virtual reality visual field testing. Age and test duration influenced MD, consistent with previous literature. Limitations were lack of comparison to standard perimetry. Virtual reality game-based perimetry is well tolerated in the pediatric cohort and may prove valuable as an in-office and home-based alternative to standard table-based testing.

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Poster #A39  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### Retest-Variability of a Virtual Reality Perimeter in Children

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**Introduction:** Perimetry in children can be challenging. Some children have limited attention-to-task, which can be exacerbated by the monotony associated with traditional standard automated perimetry. The Olleyes VisuALL-K is a pediatric video game-based static threshold perimeter that utilizes a virtual reality headset. We determined normal threshold sensitivities for two repeat tests using this virtual reality perimetry (VRP) device.

**Methods:** Nineteen normal pediatric participants (age 8 -17 yrs) underwent VRP testing twice. The main outcome measure was threshold sensitivity at the 24-2 test locations for each test. Secondary outcome was test duration.

**Results:** Mean age was  $12.4 \pm 2.7$  (SD) years, 47% female. Mean threshold value across the 53 points for Test 1 was  $30.5 \pm 4$  dB, and mean threshold for Test 2 was  $31.3 \pm 2.8$  dB. The values were more tightly clustered, with smaller variation in Test 2 suggesting a learning effect. The mean threshold difference between tests was 0.77 dB in OD ( $p < 0.001$ , 95% CI 0.53-1.0) and 0.91 dB in OS ( $p < 0.001$ , 95% CI 0.69-1.14). Mean test duration for VRP Test 1 was 5.3 min/eye and for Test 2 4.8 min/eye ( $p = 0.06$ ).

**Conclusion/Relevance:** The Olleyes VRP produces reliable assessment of the visual field in children with good test-retest reproducibility. The short test time, tight variability and moderate learning curve suggests that it will be useful in following field defects.

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Poster #A40  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Transient Narrow Angle Glaucoma of Prematurity: A Novel Glaucomatous Process in Premature Infants**

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**Introduction:** To describe a novel glaucomatous process in premature infants, transient narrow angle glaucoma of prematurity (TGOP), and compare the clinical presentation and treatment to infantile-onset glaucoma secondary to prematurity (IGSP).

**Methods:** Retrospective series (2012-2021) of premature neonates (<37 weeks) who required glaucoma consultation for ocular hypertension, hazy corneas, or increased optic nerve cupping.

**Results:** Fourteen eyes of 7 patients were diagnosed with IGSP and ultimately required surgical intervention. Ten eyes of 5 patients initially presented with a narrow-angle glaucoma with high IOP and corneal edema, all of which resolved spontaneously without surgical intervention, and were retrospectively diagnosed with TGOP.

Patients with TGOP presented at an older age compared to those with IGSP ( $49.1 \pm 8.6$ d vs.  $27.1 \pm 21.8$ d,  $p < 0.05$ ), with shallower anterior chambers (AC), and more robust response to topical antihypertensives ( $-15.4 \pm 7.68$ mmHg vs.  $+0.63 \pm 2.33$ mmHg,  $p < 0.05$ ). No patients with TGOP required surgical intervention and all were successfully tapered off drops. All patients with IGSP required angle surgery to obtain IOP control.

**Conclusion/Relevance:** We present a novel glaucoma in premature neonates distinct from IGSP. These patients differ at presentation by age, AC morphology, and response to drops. While the exact mechanism is unknown, possibilities include transient angle closure due to a large crystalline lens in an eye with small axial length. Anterior choroidal effusions, common in small eyes, may also be a contributing factor. Prospective biometric studies are needed to further elucidate the mechanism behind this distinct pathology, in order to potentially avoid unnecessary surgery in a vulnerable population.

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Poster #A41

Thursday, March 30, 2023

10:05 AM – 11:05 AM

### Ocular Hypertension and Glaucoma in Pediatric Uveitides

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**Introduction:** To evaluate risk factors and clinical outcomes of ocular hypertension (OHT) and glaucoma (GLC) in pediatric uveitides.

**Methods:** Retrospective review at two academic institutions. Demographics; intraocular pressure (IOP); steroid exposure; cup-to-disc (CD) ratio and medical and surgical interventions were evaluated.

**Results:** Thirty-seven patients with OHT and 14 with GLC were included. Mean follow-up was 48±46 [OHT] and 95±59 [GLC] months ( $p<0.01$ ). 57% GLC patients had juvenile idiopathic arthritis (JIA) compared to 22% OHT patients ( $p=0.02$ ). IOP at diagnosis was 29±6 [OHT] and 31±6 [GLC] mmHg ( $p=0.21$ ). Average durations of topical and systemic steroids were 11±27 and 19±26 [OHT] vs 20±39 and 21±27 [GLC] months ( $p=0.37$ ,  $p=0.83$ ). OHT patients were on an average of 2 IOP drops vs 3 in GLC patients ( $p<0.01$ ). All OHT patients were medically controlled; 65% GLC patients required glaucoma surgical intervention ( $p<0.01$ ), including 67% tube shunt, 11% trabeculotomy, 22% surgical iridectomy. Of these, 56% continued IOP drops after surgery and 44% ultimately required additional glaucoma surgeries. At last follow-up, IOP was controlled in 90% in both groups ( $p=1.00$ ). CD ratio was 0.3±0.1 [OHT] and 0.6±0.2 [GLC] ( $p<0.01$ ). 57% GLC patients required additional non-glaucoma related procedures compared to 19% OHT patients ( $p=0.29$ ).

**Conclusion/Relevance:** The risk factors for glaucoma in pediatric uveitides were JIA diagnosis and longer duration of topical steroids. Glaucoma patients were more likely to require glaucoma and non-glaucoma related procedures.

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Poster #A42  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Eye Tracking and Teller Acuity in Children with Cortical/Cerebral Visual Impairment (CVI)**

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**Introduction:** Cortical/cerebral visual impairment (CVI) is the leading cause of pediatric visual impairment in developed countries. Visual assessment is challenging due to neurodevelopmental deficits. Eye tracking shows promise for visual assessment in pediatric CVI, but it has not been fully validated. The aim of this study was to validate an eye tracking measure of grating acuity by correlating to Teller acuity and clinical assessment of visual behavior in children with CVI.

**Methods:** We prospectively recruited children with CVI between the ages of 12 months and 12 years. Eye tracking grating acuity was tested by a preferential looking stimulus on a computer monitor while an infrared camera recorded the direction of eye gaze. Participants also underwent Teller acuity testing by a masked examiner. Clinical visual acuity, based on a 6-level visual behavior scale (VBS), was graded by a pediatric neuro-ophthalmologist. The three methods of assessing visual acuity were correlated.

**Results:** 20 children with a median age of 6 years (range 1 to 10 years) were included. Grating acuity by eye tracking ranged from 0.25 to 20 cpd and was moderately correlated to Teller acuity ( $r=0.57$ ,  $p=0.0085$ ) and VBS score ( $r=0.63$ ,  $p=0.0014$ ). Teller acuity was marginally correlated to VBS score ( $r=0.42$ ,  $p=0.06$ ).

**Conclusion/Relevance:** Grating acuity by eye tracking is more strongly correlated to clinical assessment of visual behavior than Teller acuity testing in children with CVI. This may be due to difficulties assessing the direction of gaze in children with CVI by human examiners. Further research is necessary to explore these differences.

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Poster #A43  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Relevance of MRI Imaging in Paediatric Ophthalmology

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**Introduction:** Several neurological conditions, which can be life threatening, can affect visual pathways or oculomotor pathways and manifest with ophthalmologic disorders in children. MR imaging may allow detailed evaluation and exclusion of underlying central nervous system pathologic findings. No study detailed the findings of MRI performed in children under anaesthesia.

**Methods:** We reviewed all consecutive MRI under general anaesthesia ordered for an ophthalmologic condition in Rothschild's Foundation Hospital in Paris between 2015 and 2018. MRI indications were categorized in ten categories : Abnormal ocular movements, Amblyopia, Anterior segment anomaly, Esotropia, Exotropia, Malformative, Neuro-ophthalmology(including anisocoria and papilledema), Oculomotor palsy, Orbito-palpebral , Posterior segment. MRI were categorized in normal and abnormal, and the abnormalities were categorized in seven categories : Compression, Infection, Malformative, Neoplasia, Non-specific, Pre-chiasmatic, Vascular.

**Results:** 308 children were included. Mean age was 32 months . There was 45 % of girls. 308 MRI were reviewed of which 141 (42.53%) were abnormal. Most represented indications were Abnormal ocular movements (19.2%), Posterior segment (19.2%), Neuro-ophthalmology (18.2%). Anomalies found were mostly Malformative (41.2%), Neoplastic (23.7%), Vascular (13.7%). MRI was always normal concerning intermittent exotropia.

**Conclusion/Relevance:** MRI relevance in paediatric ophthalmology varies with indication. Some indications requires an urgent imaging, whereas MRI can be delayed in other. This study shows a high abnormal rate that when an MRI is ordered in a tertiary care center with high resolution, then helping aetiological approach and managing of disease. Moreover, this study finds that MRI is always normal regarding intermittent exotropia.

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Poster #A44  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Sensorimotor Outcomes in Pediatric Patients with Dorsal Midbrain Syndrome

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**Introduction:** Dorsal midbrain syndrome (DMS) is characterized by vertical gaze limitation, convergence-retraction, eyelid retraction, and pupillary light-near dissociation. Strabismus is a common manifestation of DMS[1], but the potential for restoration of binocular function remains unknown[2]. We evaluated sensorimotor outcomes in pediatric patients with strabismic DMS focusing on identifying predictive clinical factors.

**Methods:** Study approved by hospital IRB. We retrospectively identified patients (18 years) with DMS and strabismus at a tertiary care children's hospital. Data regarding underlying etiology, treatment, and sensorimotor outcomes were collected.

**Results:** Thirty-two patients were included. Mean age was  $10.9 \pm 5.0$  (SD) years, and 28/32 (88%) were male. Mean follow up time was 5.7 (range 0.1-21.6) years. Etiology was pineal tumor in 16/32 (50%). Exotropia occurred most frequently in 27/32 (84%) patients, of whom 16/27 (59%) exhibited convergence insufficiency. In the non-surgical group, 13/20 (65%) had fusion and stereopsis (average 324 arcsec) at the time of diagnosis; 10/20 (50%) had fusion and stereopsis (average 116 arcsec) at last follow-up. In the 12/32 (38%) with surgery, before surgery, 3/12 (25%) had fusion and 3/12 (25%) stereopsis (average 2013 arcsec). After surgery, 4/12 (33%) had fusion and 3/12 (25%) stereopsis (average 100 arcsec). Stereopsis was maintained in one patient and regained in two patients. Motor success defined as  $<10$  PD horizontal deviation, was achieved in 7/12 (58%) at distance and 5/12 (42%) at near.

**Conclusion/Relevance:** DMS commonly includes surgically treatable complex strabismus. Improvement/restoration of stereopsis is achievable, challenging a commonly held belief. Surgical intervention for DMS-related strabismus, particularly in children who demonstrate measurable stereopsis after diagnosis, is generally recommended.

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Poster #A45  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Ocular Torsional Instability – A Neurodiagnostic Sign of Prenuclear Disease

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**Introduction:** Accurate diagnosis of efferent visual system disease in neuro-ophthalmology involves the classification of clinical signs as prenuclear, nuclear, or infranuclear in origin. I describe ocular torsional instability as an easily recognizable clinical sign of prenuclear disease.

**Methods:** Retrospective chart review of patients in whom ocular torsional instability was diagnosed using indirect ophthalmoscopy.

**Results:** Twenty patients were diagnosed as having ocular torsional instability (OTI). Eight of these had neuro-ophthalmologic disease caused by structural injury to prenuclear ocular motor areas. Six patients had infantile strabismus (esotropia in 7, exotropia in 1) associated with various combinations of monocular nasotemporal optokinetic asymmetry (MNTA), latent nystagmus (LN), and dissociated vertical divergence (DVD), indicating prenuclear involvement of subcortical visuo-vestibular pathways within the brain. Three patients presented with intermittent exotropia with DVD signifying early onset, while two had acquired esotropia that was noninfantile in origin. One had partially accommodative esotropia with bilateral inferior oblique overaction, and one presented with acquired esotropia followed by spontaneous secondary exotropia.

**Conclusion/Relevance:** OTI provides a useful clinical sign of prenuclear ocular motor dysfunction. When detected in patients without any signs of infantile or early-onset strabismus, OTI signifies the need for neuroimaging to rule out neurovestibular or cerebellar causes of prenuclear disease.

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## Longitudinal Clinical Features of Pediatric Hereditary Optic Neuropathy

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**Introduction:** Dominant optic atrophy is the most common hereditary optic neuropathy. Most cases are caused by damaging variants in OPA1[1]. Central visual decline typically begins in the first decades of life[2,3], but the clinical features of progression remain largely unknown, particularly among children. We aimed to define the features of pediatric hereditary optic neuropathies and identify reliable biomarkers of disease progression.

**Methods:** Retrospective study of patients with genetically confirmed hereditary optic neuropathies identified patients using diagnostic billing codes applied between 2017-2021. Clinical data including (but not limited to) demographics, visual acuity, and OCT metrics were analyzed across mutation type and time.

**Results:** Twenty-one patients met inclusion criteria (9 with OPA1 variants) and were followed over a median of 5.7 (range: 0.9-16.1) years. Mean age at presentation was similar between those with OPA1 mutations ( $6.8 \pm 2.4$  years) and those without ( $8.26 \pm 3.26$ ;  $p=0.147$ ). Best-corrected visual acuity (BCVA) at presentation was  $0.38 \pm 0.27$  logMAR for OPA1 patients and  $0.44 \pm 0.45$  logMAR for non-OPA1 ( $p>0.3$ ), and the rate of change was similar for OPA1 (0.01 logMAR/year), non-OPA1 patients (0.03 logMAR/year;  $p>0.4$ ). Retinal nerve fiber layer thickness was similar in OPA1 ( $73 \pm 21$   $\mu$ m) and non-OPA1 patients ( $82 \pm 37$   $\mu$ m;  $p>0.2$ ). OPA1 patients had thinner papillomacular bundle (PMB) thicknesses ( $24 \pm 3$   $\mu$ m) compared to non-OPA1 patients ( $39 \pm 19$   $\mu$ m;  $p=0.011$ ).

**Conclusion/Relevance:** Pediatric hereditary optic neuropathies patients exhibit very slow progression of visual acuity and OCT measures. These metrics were reliable, particularly in patients with OPA1 mutations who exhibit preferential involvement of the PMB.

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2. Yu-Wai-Man P, Griffiths PG, Chinnery PF. Mitochondrial optic neuropathies - disease mechanisms and therapeutic strategies. *Prog Retin Eye Res.* 2011;30(2):81-114. doi: 10.1016/j.preteyeres.2010.11.002.  
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Poster #A47

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Artificial Intelligence to Classify Fundus Photographs of Pediatric Pseudopapilledema and True Papilledema

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**Introduction:** Differentiating pseudopapilledema and papilledema in children represents a significant diagnostic dilemma. Although various ophthalmic imaging modalities have been studied, there is no single technique, when interpreted by human observers, that provides accurate diagnosis. The purpose of this study was to use artificial intelligence to develop a deep learning model to differentiate pediatric pseudopapilledema and papilledema using fundus photographs.

**Methods:** We conducted a retrospective, cross-sectional, multi-center study. Four pediatric neuro-ophthalmologists uploaded fundus photographs of children (less than 18 years) who were clinically diagnosed with pseudopapilledema or papilledema. We built and validated a deep learning system to differentiate pseudopapilledema and papilledema using a tri-branch convolutional network, data augmentation techniques, and explainable insights to enhance the robustness of our dataset. Performance was evaluated by calculating the area under the ROC curve (AUC), sensitivity, and specificity, when compared to clinical diagnosis.

**Results:** We included 876 fundus photographs of 147 children with pseudopapilledema and 115 children with papilledema. Mean age was  $10.9 \pm 3.8$  years. The most commonly identified cause of pseudopapilledema was buried (39%) and superficial (20%) optic disc drusen. The most common causes of papilledema were pseudotumor cerebri (77%), tumor (6%), and non-tumor hydrocephalus (6%). The model differentiated pseudopapilledema from papilledema with a mean AUC of  $72.3 \pm 5.8\%$ , sensitivity of  $75.5 \pm 8.4\%$  and specificity of  $69.1 \pm 8.7\%$ .

**Conclusion/Relevance:** AI differentiates pediatric pseudopapilledema and papilledema based on fundus photographs with moderate accuracy, similar to prior reports of expert neuro-ophthalmologists. Future studies will determine whether inclusion of multiple imaging modalities improves the accuracy of the deep learning model.

**References:** Chang MY, Binenbaum G, Heidary G, Morrison DG, Galvin JA, Trivedi RH, Pineles SL. Imaging Methods for Differentiating Pediatric Papilledema from Pseudopapilledema: A Report by the American Academy of Ophthalmology. *Ophthalmology*. 2020 Oct;127(10):1416-1423.

Poster #A48

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **The Diagnostic Utility of Point-of-Care Ultrasound (POCUS) and Optical Coherence Tomography (OCT) for Papilledema in Children**

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**Introduction:** The purpose was to study the diagnostic accuracy of point-of-care ultrasound (POCUS) and optical coherence tomography (OCT) for detecting papilledema in children.

**Methods:** This was a prospective observational study at a tertiary care pediatric hospital. A total of 63 eyes from 32 patients were included in the study. Patients were eligible for the study if they underwent a lumbar puncture with opening pressure and had high-quality POCUS and OCT imaging. The POCUS and OCT parameters were analyzed for diagnostic accuracy.

**Results:** There were 41 (65%) children with papilledema and 22 (35%) without. There were statistically significant differences between the groups in the optic disc elevation ( $p < 0.001$ ) and optic nerve sheath diameter ( $p < 0.001$ ) on POCUS, and in the average retinal nerve fiber layer thickness on OCT ( $p < 0.001$ ). Average retinal nerve fiber layer thickness had the highest diagnostic accuracy with an area under the curve of 0.999 and a 100% sensitivity and 95% specificity for papilledema (threshold value  $\geq 108 \mu\text{m}$ ). Optic disc elevation had an area under the curve of 0.866 and a 93% sensitivity and 55% specificity (threshold value  $\geq 0.5 \text{ mm}$ ). Optic nerve sheath diameter had an area under the curve of 0.786 and a 93% sensitivity and 45% specificity (threshold value  $\geq 5.5 \text{ mm}$ ).

**Conclusion/Relevance:** Both OCT and POCUS are potentially useful tools to help diagnose papilledema in children. In this cohort, the average nerve fiber layer thickness on OCT had the highest diagnostic accuracy.

**References:** 1. Chang MY, Velez FG, Demer JL, et al. Accuracy of Diagnostic Imaging Modalities for Classifying Pediatric Eyes as Papilledema Versus Pseudopapilledema. *Ophthalmology* 2017;124(12):1839-48.  
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Poster #A49  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## An Analysis of Papilledema Using an OCT Scan in the Pediatric Population

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**Introduction:** Optical coherence tomography (OCT) helps quantify and qualify retinal changes. Few studies have explored the benefit of the OCT scan in assessing pediatric patients with papilledema. This project aims to understand further how to clinically apply OCT to monitor the measurement changes in papilledema with treatment, specifically due to idiopathic intracranial hypertension (IIH), in pediatric populations.

**Methods:** In this retrospective study, we reviewed electronic medical records of 95 patients with a diagnosis of papilledema. SPECTRALIS OCT was used to obtain retinal nerve fiber layer (RNFL) thickness measurements. The criteria for stability were three consecutive readings within 95% of average normal pediatric RNFL values. Optic atrophy was defined as average RNFL below 70  $\mu\text{m}$ .

**Results:** 64.9% of patients were white, 70.5% were female, and 58.9% were diagnosed with IIH. Among common associated diagnoses were depression and anxiety (20.6%), migraines (19.0%), and ADHD (15.9%). The age of diagnosis was  $11.8 \pm 4.3$ , and the BMI was  $26.3 \pm 9.8$ . Fourteen patients with IIH met our criteria for stability. The duration to reach stability was  $333 \pm 154$  days. Eleven of all patients met the criteria for atrophy. Atrophy was detected on average  $306 \pm 231$  days after the detection of papilledema. Patients with brain tumors made up 63.8% of those with atrophy, whereas they only made up 15.8% of the total sample population.

**Conclusion/Relevance:** Papilledema from a brain tumor is more likely to result in optic atrophy than those with IIH. Children with papilledema should be followed up with OCT scans for a year to ensure the course reaches stability.

**References:** Kabatas N, Eren Y, Nalcacioglu P, et al. Management of the regression of papilledema with regional axon loss in idiopathic intracranial hypertension patients. *Int Ophthalmol.* Apr 2021;41(4):1467-1477. doi:10.1007/s10792-021-01711-6

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Poster #A50

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Papilledema and Pseudopapilledema in Children: Vascular Density Analysis with OCT-Angiography

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**Introduction:** To compare the radial peripapillary capillary network (RPC) vascular density (VD) measured with optical coherence tomography angiography (OCT-A) between children with papilledema and pseudopapilledema.

**Methods:** This retrospective study included children presenting a unilateral or bilateral swollen optic nerve aspect between June 2020 and June 2021 in a tertiary center. We reviewed the medical records to collect papillary OCT-A examinations and assign the patients to an etiological group between papilledema, pseudopapilledema, inflammatory optic disc edema and healthy control. The mean RPC VD was measured using a customized method on an image processing software. Other outcomes including visual acuity (VA), Frisén score, disc area and retinal nerve fiber layer (RNFL) thickness were also collected.

**Results:** We included 85 eyes from 49 patients among which 16 papilledemas, 39 pseudopapilledemas, 11 inflammatory edemas and 19 healthy controls. Mean age was  $10.1 \pm 3.6$  years. Mean RPC VD was 41.4 % for papilledemas and 43.9% for pseudopapilledemas with a statistically significant mean difference of 2.5% (95% confidence interval [CI], 0.2 to 4.8,  $p=0.04$ ). Compared to papilledemas, healthy subjects showed a significantly higher RPC VD of 44.8% (mean difference 3.4%, 95%[CI] 0.8 to 6,  $p=0.01$ ). There was no statistically significant difference between healthy controls and pseudopapilledemas (mean difference -0.9%, 95%[CI], -3.1 to 1.2,  $p=0.4$ ).

**Conclusion/Relevance:** OCT-A revealed a significantly lower RPC VD in children presenting papilledema than those with pseudoedema or healthy papilla suggesting a possible contribution to the diagnostic process that is to be explored

**References:** Rodriguez Torres Y, Lee P, Mihlstin M, Tomsak RL. Correlation Between Optic Disc Peripapillary Capillary Network and Papilledema Grading in Patients With Idiopathic Intracranial Hypertension: A Study of Optical Coherence Tomography Angiography. *J Neuro-Ophthalmol Off J North Am Neuro-Ophthalmol Soc.* 2021 Mar 1;41(1):48–53.

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Poster #A51  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Evaluation of Papilledema Versus Pseudopapilledema in Children

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**Introduction:** Optic disc drusen (ODD) are present in 2.4% of the population.<sup>1</sup> In children, ODD are uncalcified and buried, presenting a diagnostic challenge. Research into a reliable and safe diagnostic test for ODD is pertinent to avoid unnecessary and invasive workups.

**Methods:** This is a retrospective observational study of pediatric eyes who underwent ophthalmic imaging January 2018-September 2022. Demographic data, clinical information, and imaging data were collected. Patients were separated into three groups; papilledema (PAP), ODD, and optic nerve anomaly (ONA). ANOVA analysis was performed on the average retinal nerve fiber layer (RNFL).

**Results:** Of the 87 analyzed eyes, 43 (49%) had PAP, 14 (16%) ODD, and 30 (34%) ONA. Patients ranged 4-17 years and mean age of diagnosis approached statistical significance ( $p=0.06$ ) for patients with PAP (12.3), ODD (12.0), and ONA (9.5). Imaging accuracy in diagnosing ODD was the highest for FAF and B-scan (100%), followed by OCT (90.9%) and MRI (89.5%). There was a significant difference between OCT-measured mean RNFL thickness between the groups ( $p<0.001$ ;  $192.81 \mu\text{m} \pm 79.60$  PAP,  $129.29 \mu\text{m} \pm 41.92$  ODD, and  $120.43 \mu\text{m} \pm 24.96$  ONA).

**Conclusion/Relevance:** There was no imaging modality that had statistically significant accuracy at diagnosing ODD in the pediatric population. However, variation in mean RNFL on OCT correlated significantly between PAP, ODD, and ONA. Based on these findings, when suspicion for pseudopapilledema is high, this may be validated with the finding of only mildly elevated RNFL on OCT. As RNFL increases, MRI must be considered to evaluate for true papilledema.

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Poster #A52  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Papilledema Secondary to Idiopathic Intracranial Hypertension in Children with Optic Disc Drusen**

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**Introduction:** Recent studies have shown higher rates of optic disc drusen (ODD) among pediatric patients with idiopathic intracranial hypertension (IIH).<sup>1,2</sup> In this study, we retrospectively reviewed pediatric patients with confirmed ODD to evaluate the rate and characteristics of concomitant IIH.

**Methods:** We identified all patients less than 15 years old with an ICD-10 diagnosis of optic disc drusen, anomalous optic nerve, or pseudopapilledema that were evaluated by the pediatric neuro-ophthalmology service during a 3-year period. Of these, only patients with ODD confirmed on B-scan ultrasound were included.

**Results:** Of the 83 patients meeting inclusion criteria, four (4.8%) had a simultaneous or subsequent diagnosis of IIH, meeting the modified Dandy criteria. All four were female, ages 7 to 12 years old. Three had IIH-related symptoms at presentation, while one was asymptomatic. In these cases, concomitant papilledema was originally suspected due to associated symptoms and/or fluctuations in peripapillary retinal nerve fiber layer (RNFL) thickness on serial OCT. All four were treated with oral acetazolamide, which reduced RNFL thickness, decreased disc swelling, and improved symptoms in all cases.

**Conclusion/Relevance:** IIH can co-occur with ODD in pediatric populations. Clinicians should review IIH symptoms and risk factors in every child with ODD, with the standard workup for IIH warranted in clinically suspicious cases. One may also consider obtaining serial OCT scans in these patients, with fluctuation in RNFL thickness serving as a possible indicator of overlying papilledema.

**References:** 1. Birnbaum FA, Johnson GM, Johnson LN, Jun B, Machan JT. Increased prevalence of optic disc drusen after papilledema from idiopathic intracranial hypertension: on the possible formation of optic disc drusen. *Neuroophthalmology*. (2016) 40:171-80.

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Poster #A53

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## The Role of Enucleation in the Development of Nystagmus in Children with Retinoblastoma

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**Introduction:** Nystagmus in children can be debilitating. It is thought that early enucleations result in the development of an eye movement pattern similar to fusion maldevelopment nystagmus syndrome (FMNS) and we were keen to evaluate this in a large cohort of children with retinoblastoma (rb)

**Methods:** Retrospective review of the medical files of children treated for retinoblastoma with unilateral enucleation from 2009 until 2021. Nystagmus type (FMNS or Infantile Nystagmus Syndrome (INS)) was determined clinically and factors for onset were assessed including age at presentation and enucleation, vision, laterality & genetic status.

**Results:** 149 children had a unilateral enucleation. 114 patients had unilateral rb, 35 were bilateral with the other eye remaining. Of 12 infants under the age of 6 months (median age 3 range 1-6) who had a healthy fovea in the other eye, 1 infant developed fusion maldevelopment nystagmus syndrome after enucleation (noticeable at 8 months). 13 patients (9%) of the entire cohort had nystagmus at the end of follow-up (mean 67 months median 67 range 0-152): 1/13 FMNS and 12/13 INS.

**Conclusion/Relevance:** This information is reassuring for parents of infants who are about to undergo an enucleation. Nystagmus is common in this cohort but tends to occur at presentation rather than as a complication of enucleation.

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Poster #A54

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Genetic Testing for Initial Evaluation of Idiopathic Infantile Nystagmus

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**Introduction:** Historically, nystagmus in the pediatric population has been evaluated with history and examination followed by electroretinogram (ERG) and neuroimaging if indicated. Handheld optical coherence tomography may also play a role.<sup>1</sup> Gene testing is now available for a variety of clinical phenotypes across medicine. One inherited retinal disorders (IRD) panel (Invitae Corporation) tests for mutations in 330 genes, many implicated in nystagmus. We recently began using it as first-line evaluation for patients who have nystagmus and report our findings here.

**Methods:** Records of pediatric patients who obtained the IRD panel in the evaluation of infantile nystagmus were retrospectively reviewed. Descriptive statistics included age of onset, age of testing, ocular exam, genetic test results and any additional work up.

**Results:** Twenty-eight patients were identified. Median age of nystagmus onset was 3 months (range 1-60 months). Median age at testing was 14 months (range 2 months - 28 years). 12/28 (43%) obtained a probable causative mutation. The average number of mutations found per patient was 5.3 (range 0-15). Additional studies included: 6 neuro-imaging (3 abnormal) and 3 ERG (2 abnormal). Genetic counselor referral was made in 8, which led to diagnosis in one additional patient. One test result led to important systemic findings.

**Conclusion/Relevance:** First line genetic testing is a resourceful way to diagnose the underlying etiology of infantile nystagmus and avoid unnecessary healthcare costs and anesthesia for this population. Careful physical examination is still required to identify patients who need additional evaluation.

**References:** 1. Richards MD, Wong A. Infantile nystagmus syndrome: clinical characteristics, current theories of pathogenesis, diagnosis, and management. *Can J Ophthalmol.* 2015 Dec;50(6):400-8.

Poster #A55  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Visual Outcomes and Clinical Features of Infants with History of Intrauterine Exposure to Drugs of Abuse (IUDE) and Nystagmus

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**Introduction:** Intrauterine drug exposure(IUDE) to drugs of abuse have been associated with visual/oculomotor sequelae. Small cohort studies have described the incidence of nystagmus in infants with IUDE to be 3.3-70%. The purpose of this study is to further describe visual outcomes and clinical characteristics of infants with IUDE and nystagmus.

**Methods:** Retrospective chart review of the EMR for children with ICD9/10 diagnosis of IUDE and nystagmus seen at Cincinnati Children's Ophthalmology clinic between 1/1/2008- 6/6/2022. Data collection included prenatal/birth history, drug exposure, neonatal abstinence syndrome (NAS) treatment, neuroimaging, and ocular exams at presentation and follow-up.

**Results:** Of 2404 IUDE patients, 118(4.9%) had nystagmus. Infant cohort drugs of abuse exposure: methadone(51.7%), THC(16.9%), heroin(15.3%), cocaine(15.3%), benzodiazepines(11.9%), amphetamines(8.5%), buprenorphine(8.5%), oxycodone(5.1%) buprenorphine/naloxone(3.4%), fentanyl(3.4%), and morphine(3.4%). 34(28.8%) of these patients were treated for NAS. 42/75 patients with neuroimaging had abnormal findings. Teller acuities at presentation ranged from 20/94 to 20/1400. Ophthalmologic sequelae included strabismus(44%), refractive error(23.7%), optic nerve hypoplasia(9.3%), optic nerve pallor(1.6%), abnormal retinal findings(9.3%), and CVI(5.1%).

**Conclusion/Relevance:** 71.2% of Infants with IUDE and nystagmus were exposed to opioids, with 89.3% of those exposed to therapeutic opioid alternatives. 56% of nystagmus patients imaged had abnormal findings, suggesting the importance of neuroimaging children with nystagmus and IUDE.

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Poster #A56  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Ocular Involvement In Pediatric Rhabdomyosarcoma - A Single Center Review

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**Introduction:** The purpose of the study was to describe ocular involvement of rhabdomyosarcoma (RMS) in a large cohort of children.

**Methods:** Retrospective analysis of 77 patients with head and neck RMS seen between 1997 and 2021 at a tertiary care pediatric hospital. The main outcome measures were the incidence, manifestations, and prognostic role of primary and secondary orbital involvement in pediatric RMS cases.

**Results:** Of the 77 patients with rhabdomyosarcoma, 38 patients had ocular manifestations at presentation. 27 patients (35%) had orbital involvement – 15 were primary tumors and 12 by secondary invasion. The most common ocular manifestations were proptosis (37%), restriction of extraocular motility (58%), and ptosis (34%). Cranial nerve palsies were seen at presentation in 19 patients, none of them in the primary orbital RMS group. The most common ocular long-term complications in both groups were bony hypoplasia/facial asymmetry (87% primary, 50% secondary) and keratopathy/dry eye (67% primary, 58% secondary). Visual acuity (VA) at final follow-up was better in the group with primary than secondary orbital cases. 67% had VA  $\geq$ 20/40 in primary orbital cases whereas 67% of patients had VA  $\leq$ 20/200 in secondary orbital RMS ( $p = 0.03$ ). Survival was 100% in the primary orbital RMS group compared to the 40% in the secondary orbital RMS group ( $p = 0.005$ ).

**Conclusion/Relevance:** Almost 50% of patients with pediatric RMS showed ocular signs at presentation and about one third had primary or secondary orbital involvement. Visual outcomes and survival were significantly worse if secondary orbital involvement was present.

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Poster #A57

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Facial Nerve Palsy in Children: Risk Factors for Severe Visual Loss and Exposure Keratopathy

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**Introduction:** To report the ophthalmic findings in a large pediatric facial nerve palsy cohort and assess the risk factors for severe vision impairment (SVI) and exposure keratopathy.

**Methods:** Ocular data of children ( $\leq 16$  years old) diagnosed with facial nerve palsy (N=112) presenting to an eye-care network were analyzed over the past nine years. The studied parameters were etiology of FNP, ocular and imaging findings, degree of lagophthalmos, and degree of vision loss. Risk factors associated with SVI (best corrected visual acuity  $< 20/200$ ) and exposure keratopathy at presentation were evaluated using multivariate analysis and odds ratios (OR).

**Results:** The mean age was  $8.28 \pm 5.03$  years. The most common etiology was idiopathic (61/112; 54.46%) followed by congenital (25/112; 22.32%) and traumatic (15/112; 13.39%). Brain tumors accounted for 5.35% (6/112) of cases. Eight percent of children had bilateral involvement, and 15.17% (17/112) had multiple cranial nerve involvement. Only 9% (11/112) had severe vision loss and 38.4% had exposure keratopathy at presentation. There was no significant risk predictor for SVI in children with FNP. Children with lagophthalmos (83.7% vs. 49.2% OR, 1.68;  $P=0.005$ ) were at higher risk for exposure keratopathy, while tarsorrhaphy (26.2% vs. 73.8% OR, 24.2;  $P=0.003$ ) reduced the chances of exposure.

**Conclusion/Relevance:** Idiopathic etiology is the most common cause of pediatric FNP, followed by congenital. Tarsorrhaphy reduces the chances of ocular surface exposure in children with FNP, irrespective of etiology.

**References:** Shih WH, Tseng FY, Yeh TH, Hsu CJ, Chen 224 YS. Outcomes of facial palsy in children. *Acta Otolaryngol.* 2009;129(8):915-20.

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Poster #A58  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Pediatric Ophthalmologic Outcomes of Marcus Gunn Jaw Winking Synkinesis

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**Introduction:** Marcus Gunn Jaw Winking Synkinesis (MGJWS) is a rare genetic disorder of congenital ocular aberrant innervation seen in 2-13% of patients with congenital ptosis. As existing literature focuses primarily on ptosis, the purpose of this study is to describe comprehensive pediatric ophthalmologic outcomes in MGJWS patients.

**Methods:** A retrospective chart review of pediatric patients with a diagnosis of MGJWS (2012 to 2021) was performed. Data collected from initial and follow-up examinations included visual acuity, refraction, eyelid exam, motility, and alignment. Refractive correction, occlusion therapy or penalization, and ocular surgery were documented.

**Results:** Seventy-four patients were identified. Mean presenting age was  $3.04 \pm 5.12$  years. Follow-up data was available in 52 patients (average follow-up  $8.20 \pm 6.41$  years). At the initial visit, ptosis was present in 75.7% of patients, strabismus in 18.9%, and amblyopia in 16.2%. Of those with follow-up data, amblyopia was present at any point in 50.0%, history of occlusion or penalization therapy in 40.4%, and refractive correction in 42.9%. Eyelid surgery was performed in 15.1% of patients and strabismus surgery in 10.4%. The presence of an abnormal head position (AHP), strabismus, and abnormal motility at the initial visit were associated with an increased risk of eyelid surgery, strabismus surgery, and amblyopia ( $p < 0.05$ ).

**Conclusion/Relevance:** Assessment of AHP, strabismus, and abnormal motility at the initial visit may aid in family discussions through prognostication of MGJWS patients who may develop amblyopia or need surgical repair.

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Poster #A59  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Frequency of Chalazion Surgery in Children First Treated with Oral Antibiotics

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**Introduction:** Doxycycline (older children) and Clarithromycin (younger children) can be used to treat chalazion. We routinely start children with moderate to severe chalazion on oral antibiotics and simultaneously schedule surgery for those with severe chalazion. Parents are instructed to cancel surgery if the Chalazion improves. Here we report on the surgery rate in children treated with oral antibiotics.

**Methods:** Children in one pediatric ophthalmology practice diagnosed with chalazion from 2015 to 2022 were included. Patients were grouped based on antibiotic regimen into three categories: Clarithromycin, Doxycycline, and no antibiotics. Children in the antibiotic groups were subcategorized based on whether surgery was scheduled at the initial chalazion visit.

**Results:** Mean age of the 170 children was  $7.9 \pm 4.9$ . Children treated with antibiotics (Clarithromycin 108, Doxycycline 31) underwent further analysis. At the first visit, surgery was scheduled for 81 children (Clarithromycin 62, Doxycycline 19). In the Clarithromycin group 74.2% (46/62) and 68.4% (13/19) in the Doxycycline group proceeded with surgery. Of the children treated with oral antibiotics and not scheduled for surgery, none later scheduled surgery for chalazion removal. Total surgery rate in the Clarithromycin group was 42.6% (46/108) and 31.9% (13/31) in the Doxycycline group.

**Conclusion/Relevance:** There is little published on the natural history of chalazion and whether oral antibiotics are beneficial. Our study shows that the majority of chalazion treated with Clarithromycin or Doxycycline improve and do not require surgery. Our study suggests that medical treatment may decrease rate of surgery for chalazion, however, no definitive statement can be made without randomized trials.

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doi: 10.1097/ICL.0000000000000859

Poster #A60  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### **Publication Rates for Abstracts Presented at the AAPOS Annual Meeting**

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**Introduction:** AAPOS annual meetings provide opportunities to present research abstracts to a sub-specialty audience. However, these abstracts may undergo less rigorous peer review and may be associated with risks of non-publication or publication bias. This study aims to evaluate and analyze publication rates and potential factors that contribute to non-publication.

**Methods:** We examined all abstracts (papers, hardboard, and electronic posters) accepted for presentation (n=1092) at the AAPOS annual meetings between 2015 and 2019. A comprehensive search was conducted to quantify the abstracts that were published to a peer reviewed journal within three years from presentation.

**Results:** 42% of all presented abstracts went on to be published within three years. The most common journal was the Journal of AAPOS (31%). There were over three times more hardboard posters (n=624) than papers (n=179). Paper abstracts were published at the highest rate (54%) while electronic posters had the lowest rate (36%). The 2018 meeting had the most abstracts (n=308). The 2015 meeting had the lowest publication rate (40%) while the 2019 meeting had the highest publication rate (49%).

**Conclusion/Relevance:** There was an increasing trend in publication rates from 2015 to 2019 but a decreasing trend in publication rates into the Journal of AAPOS. Over half of the abstracts presented at AAPOS remain unpublished into peer reviewed journals within three years. Abstracts accepted as papers are more likely than other types to be published. With less than half of all abstracts being published, there is a significant opportunity to improve publication rates.

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Poster #A61  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Gender Representation in Pediatric Ophthalmology at the American Academy of Ophthalmology Annual Meeting from 2018-2022

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**Introduction:** Pediatric ophthalmology is unique from other ophthalmic subspecialties in that 49.9% of academic pediatric ophthalmologists are female [1]. Despite this growth, gender-based disparities have been identified in pediatric ophthalmology conference leadership [1,2]. These disparities were potentially compounded by the COVID-19 pandemic, which resulted in decreased female participation in academia across all STEM fields [3]. This study aimed to identify trends in female pediatric ophthalmologist representation at the American Academy of Ophthalmology (AAO) Annual Meeting from 2018-2022 to determine if conference participation mirrored gender distribution.

**Methods:** Participant data from 2018-2022 was collected. Extracted data was organized by conference activity (e.g. papers, posters, instruction courses, etc) and analyzed by sex using an online gender-assignment tool. Statistical analysis was performed with Chi-squared and odds ratios (OR).

**Results:** Of the 923 pediatric ophthalmologists who presented from 2018-2022, 46% (426/923) were female. No significant difference was found between female first and female senior authors of papers and posters combined ( $p=.14$ ) or papers or posters individually ( $p=0.69$  and  $p=0.15$ , respectively). There was no significant change in the proportion of total female presenters overall from 2018 to 2019 ( $-3.09$ ,  $p=0.53$ ), 2019 to 2020 ( $0.76$ ,  $p=0.88$ ), 2020 to 2021 ( $9.09$ ,  $p=0.09$ ), 2021 to 2022 ( $-5.68$ ,  $p=0.30$ ), or 2018 to 2022 ( $1.08$ ,  $p=0.84$ ).

**Conclusion/Relevance:** Female representation in pediatric ophthalmology at the AAO annual meeting has remained stable since 2018, despite the COVID-19 pandemic. Considering the increasing proportion of female academic pediatric ophthalmologists, the absence of corollary increases in female participation in conference activities may be of concern.

**References:** 1. Camacci ML, Ikpoh B, Lehman EB, et al. Gender disparities among United States academic pediatric ophthalmologists: an analysis of publication productivity, academic rank, and NIH funding. *Journal of American Association for Pediatric Ophthalmology and Strabismus*. 2020;24(6):337.e1-337.e6. doi:10.1016/j.jaapos.2020.06.013  
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Poster #A62

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Pediatric Chief Medical Officer/ Medical Director Perspectives on the Role of Pediatric Ophthalmologists in their Hospital**

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**Introduction:** With recent cuts in strabismus surgery reimbursement and a declining supply of pediatric ophthalmologists, non-academically affiliated pediatric ophthalmologists must increasingly scrutinize where to dedicate their clinical and surgical bandwidth. The analysis must consider their value to local pediatric hospitals and, thus, the potential to gain financial support from that hospital to meet hospital needs. This study examines the perspective of pediatric hospital Chief Medical Officers (CMO) and Medical Directors regarding the role and value of pediatric ophthalmologists at their hospitals.

**Methods:** A 12-question online survey was distributed to all pediatric hospital affiliated CMO/Medical Directors in the United States. Survey results were compiled and responses were de-identified and analyzed.

**Results:** A total of 25 responses were collected. 68% of the respondents reported that private practice pediatric ophthalmologists provided patient care at their hospital. Majority reported pediatric ophthalmology coverage as moderately or extremely comprehensive. Among the services provided, retinopathy of prematurity screening at the NICU (80%), ED coverage (60%) , and availability to see uninsured and underinsured (60%) were viewed as an extremely important function to their hospital. 2% of the respondents noted that optometrist, physician assistant, or nurse practitioners could completely meet the hospital's eye care needs.

**Conclusion/Relevance:** Our survey highlights that pediatric ophthalmologists play a critical role in the hospital setting from the perspective of CMO and Medical Directors. Pediatric hospitals require the services provided exclusively by Pediatric Ophthalmologists. Pediatric Ophthalmologists can conclude that they are needed by Pediatric hospitals and have the option to use this need to negotiate financial support.

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Poster #A63  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Discrimination, Bullying and Sexual Harassment Experienced by Pediatric Ophthalmologists**

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**Introduction:** Discrimination, bullying, and sexual harassment (DBSH) among healthcare professionals negatively impacts mental health and job satisfaction [1,2]. Understanding the scope and impact of DBSH experienced by pediatric ophthalmologists is paramount to building a healthier and more diverse workforce.

**Methods:** An anonymous survey eliciting self-reported demographics and experiences with discrimination in the professional setting based on gender, race, ethnicity, and sexual orientation was distributed to American Academy of Pediatric Ophthalmology and Strabismus members via listserv. Free-text responses about discrimination were categorized by perceived basis, impact, and source. Fisher's exact tests were used to compare rates of discrimination between groups. Linear regression was used to evaluate satisfaction data.

**Results:** Out of 114 pediatric ophthalmologists who responded, 45 (39.4%) reported that they have been subjected to discrimination, and 29 (25.4%) provided additional information about their experiences. Females (93.1%) were more likely than males (6.9%) to experience discrimination ( $P < 0.0001$ ). Females more commonly encountered discrimination based on gender (63.0%) and pregnancy (37.0%), resulting in humiliation and loss of income. Males reported discrimination based on sexual orientation (50%) impacting residency choice. The most common sources of discrimination were senior faculty (51.7%) and hospital administration (37.9%). Ophthalmologists who experienced discrimination reported lower job satisfaction (mean=3.75 on a scale of 1-5) than those who did not experience discrimination (mean=4.38,  $P=0.03$ ). Three females (11.1%) and no males reported sexual harassment.

**Conclusion/Relevance:** Among female pediatric ophthalmologists, discrimination was relatively common and related to a power differential. Such discrimination should be addressed to combat the negative impact on equity and job satisfaction.

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Poster #A64

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Edutainment Videos for Teaching Pediatric Ophthalmology and Strabismus to Medical Students and Residents: A Pilot Study**

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**Introduction:** Pediatric ophthalmology education in medical schools and ophthalmology residency programs is highly variable in content and scope.<sup>1,2</sup> The purpose of this study was to determine whether videos designed to be educational and entertaining ('edutainment') may enhance trainees' clinical knowledge as well as interest in the field of pediatric ophthalmology.

**Methods:** Medical students and residents from 6 participating U.S. academic institutions watched three edutainment videos related to pediatric ophthalmology and strabismus within one week of starting their ophthalmology exposure. Questionnaires were administered to each participant before and after watching the videos.

**Results:** Twenty-seven participants completed both the pre- and post-video questionnaires, of whom 88.89% (24/27) were medical students and 11.11% (3/27) were residents. For medical students, pre-test scores averaged 45%  $\pm$  11.16, and post-test scores averaged 74.44%  $\pm$  13.14. For residents, pre-test scores averaged 75.56%  $\pm$  10.18 and post-test scores averaged 97.78%  $\pm$  3.85. All (27/27) respondents felt the videos enhanced their understanding of strabismus, and 88.89% (24/27) felt the videos helped them feel more comfortable with examining pediatric patients in ophthalmology clinic. Most (88.89%; 24/27) respondents indicated they were likely or very likely to review study material presented in video form compared to material presented in other formats such as book chapters, journal articles, and lectures. Overall, 48.15% (13/27) of respondents were more interested in the field of pediatric ophthalmology after watching the videos.

**Conclusion/Relevance:** Edutainment videos are an effective adjunct to traditional modes of teaching with the power to enhance trainees' knowledge and interest in pediatric ophthalmology.

### **References:**

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Poster #A65  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **At-Home Pupil Dilation During the COVID-19 Pandemic in the Pediatric Population**

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Northwell Health

**Introduction:** Ophthalmology offices have long in-office wait times, in part due to the need for pupil dilation. There is significant correlation between in-office wait times and overall patient satisfaction. During the COVID-19 pandemic, our office prescribed dilation drops to be given at home prior to some office visits in order to limit patient and staff exposure to COVID-19. The purpose of this study was to assess compliance and satisfaction with at-home pupil dilation.

**Methods:** A survey was emailed to the guardians of all pediatric patients between 6 months and 6 years of age with an office visit between March 2020 to March 2022. We surveyed whether dilation was performed, task difficulty (1-5 scale, with 5 being the most difficult) and preference for future at-home dilation. Reasons for not instilling eye drops were gathered.

**Results:** Of 4976 surveys sent, 466 responses were received; 258 guardians reported they were asked to perform dilation; 69 guardians did not dilate their child's pupils despite being asked. Non-compliance reasons included: giving drops was too difficult (n=24, 47%), drops costing too much (n=21, 41%) and unclear instructions from the office (n=6, 12%). Average difficulty of instillation was  $3.2 \pm 1.5$ . Many guardians (n=153, 59%) preferred to dilate again at home while 105 guardians (41%) reported they would not want at-home dilation.

**Conclusion/Relevance:** At-home dilation is a favorable option to limit airborne disease exposure, improve wait times and increase office efficiency. Future efforts should be explored to address the biggest concerns of difficulty instilling drops and cost of medications.

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Poster #A66

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Patient Characteristics Associated with Telemedicine Utilization in Pediatric Ophthalmology Visits During the COVID-19 Pandemic**

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**Introduction:** While disparities in telemedicine have been cited to impact vulnerable populations like those of lower socioeconomic status, there is need for further investigation in the pediatric ophthalmology population since the onset of the COVID-19 pandemic. Additionally, it is unclear what patient characteristics pediatric ophthalmologists deem important when offering telemedicine and whether this is reflected in telemedicine disparities.

**Methods:** A multicenter retrospective study of patients scheduled with pediatric ophthalmology visits in three academic centers before (March-June of 2019) and during the initial COVID-19 pandemic (March-June of 2020) was conducted, assessing factors associated with visit completion and modality via multivariate regressions. A provider survey with Likert scale-formatted questions inquiring telemedicine preferences was sent to providers in the same institutions.

**Results:** Our sample of 26,508 patients was restricted to those without missing information (n=17,592). The standardized survey had an 85% completion rate, with 17 providers in the final analysis. Characteristics thought to be 'very' or 'extremely' important in telemedicine included established patient status and diagnosis (70.6% and 82.4% of providers, respectively). This was accurately reflected, with follow-up patients and those with extra-ocular diagnoses having greater odds of being seen remotely (p<0.05). 41.2% of providers reported that insurance coverage was 'not at all important' in telemedicine, with no statistically significant difference in likelihoods of receiving a remote visit between MediCal/Welfare and commercially-insured patients.

**Conclusion/Relevance:** While telemedicine implementation was used to improve access to pediatric ophthalmology care during the pandemic, its utilization differed based on patient characteristics like diagnosis and appointment type.

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Poster #A67

Thursday, March 30, 2023

10:05 AM – 11:05 AM

### **Socioeconomic Analysis of Pediatric Closed-Globe Injuries at a Quaternary Care Hospital**

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**Introduction:** While the epidemiology of pediatric open-globe injuries has been examined (1,2), similar studies of pediatric closed-globe injury (CGI), which are more common, are lacking. This study aims to characterize the socioeconomic factors associated with CGI.

**Methods:** ICD-9 and ICD-10 codes were used to identify patients seen at a quaternary care hospital for CGI from 2002-2020. Exclusion criteria were lack of follow-up, >18 years age, other trauma (open-globe, isolated periorbital injuries, abusive head trauma), or no trauma. Patients without trauma served as a control group.

**Results:** Search query results identified 5635 patients; 1000 met inclusion criteria, and 844 patients without trauma served as controls. 33% of the CGIs occurred in the setting of organized sports, 10% related to toy guns (BB, nerf), and 56% related to accident/assault. Patients with CGI were significantly older (10.1 vs 8.2 years,  $p<0.001$ ), with a higher proportion of males (73% vs 54%,  $p<0.001$ ). The racial distribution differed significantly (6% Hispanic, 3% Asian, 58% white, 9% Black, 4% other in the CGI group vs 8% Hispanic, 5% Asian, 51% white, 10% Black, 7% other in the control group;  $p=0.003$ ). More patients with CGI had private insurance versus public (70% vs 57%,  $p<0.001$ ). Fewer patients with CGI required an interpreter (5% vs 8%,  $p=0.005$ ).

**Conclusion/Relevance:** The demographics of patients presenting to this institution with CGI may be more socioeconomically advantaged. Further research and policy may be aimed at making organized sports safer, such as policies recommending eye protection, as well as adding safety mechanisms for toy guns.

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## An Analysis of Pediatric Ophthalmology Content on Instagram

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**Introduction:** Social media has become a means for global health education(1), even within ophthalmology(2). With 70% of users aged under 34(3), Instagram offers pediatric ophthalmologists an opportunity to educate both patients and parents. We aim to formally assess pediatric ophthalmology content on Instagram.

**Methods:** We queried 13 Instagram pediatric ophthalmology-related hashtags as identified using the most common searches per the AAOPOS website. A categorical classification system was used to analyze the "top 9 posts" associated with each hashtag for author, content, format, and engagement level ratio (ELR).

**Results:** A total of 507,798 posts utilized the 13 hashtags sampled in our study. Analysis of the top 117 posts revealed a cumulative 62,692 likes, 2,823 comments, and 432,681 views. Authors had a total of 2,283,963 followers. Patients/families uploaded the greatest number of posts (28.2%), followed by companies (18.8%), optometrists (13.7%), private medical practices (12.0%), other (9.4%), international ophthalmologists (7.7%), board-certified ophthalmologists (6.8%), and academic medical organizations (3.4%). Content was mostly educational (32.5%), followed by patient experience (29.1%), self-promotional (19.7%), career-promotional (9.4%) and other (9.4%). Optometrists authored the highest number of educational posts (34.2%), followed by international ophthalmologists (21.1%), companies (18.4%), medical institutions (10.5%), board-certified ophthalmologists (7.9%), other (5.2%), and patients (2.6%). No difference in ELR was found amongst authors ( $p=0.109$ ), format ( $p=0.551$ ), or content ( $p=0.575$ ). However, educational posts' ELR was higher versus career-promotional posts' ( $5.85\pm 15.14$  vs.  $5.55\pm 6.98$ ;  $p<0.05$ ).

**Conclusion/Relevance:** Although pediatric ophthalmology Instagram posts are dominated by educational content, board-certified ophthalmologists are underrepresented amongst authors.

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Poster #A69  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Social Media and the Strabismus Surgery Experience

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**Introduction:** Visual specialties like ophthalmology can utilize social media to gain perspective regarding patient experiences, outcomes, and epidemiological data[1]. This statement is particularly true for sub-specialties like pediatric ophthalmology and strabismus, in which interventions like strabismus surgery have an impact on patients' appearance as well as psychosocial factors, such as anxiety and depression[2]. We aim to understand patients' strabismus surgery experience via trends on popular social media platforms.

**Methods:** Tiktok and Instagram were searched for: '#strabismus,' '#strabimussurgery,' '#crosseyed,' '#lazyeye.' Data regarding date of post, username, gender, city, state, United States or non-U.S. location, surgical status (pre, peri, post-operative), tone (positive or negative), place of treatment, type of post (photo or video), number of likes/views, and number of followers were recorded for statistical analysis.

**Results:** 790 posts (400 TikTok, 390 Instagram) were included. The majority (87.8%) had a positive tone, particularly for Instagram (97.7% Instagram vs. 78.3% TikTok,  $p < 0.01$ ). TikTok had significantly more likes per follower ( $p < 0.01$ ) and more negative posts ( $p < 0.01$ ). #Lazyeye gained significantly more traction than other hashtags (range  $p < 0.001$  to  $p = 0.006$ ). There were no differences in likes/follower for treatment phase (pre/peri/post), gender, or relative age of poster (adult/parent/child).

**Conclusion/Relevance:** Our findings demonstrate that TikTok and Instagram users tend to share positive strabismus surgical experiences; however, negative posts were associated with more interactive responses from viewers. Colloquial hashtags (e.g. #lazyeye) were more likely to gain traction than medical terms. TikTok posts were associated with more engagement than Instagram, which suggests TikTok may be a better platform for patient outreach.

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Poster #A70  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Characterization of Strabismus in the Veteran Health Administration System

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**Introduction:** There is limited epidemiologic eye disease information, including for strabismus, in the national Veterans Health Administration (VHA) population. Published epidemiologic or treatment data for strabismus in the Veteran population is restricted to case series of traumatic brain injury. This study aims to characterize strabismus in Veterans using VHA electronic medical record (EMR) data.

**Methods:** VHA EMR data was accessed using RStudio databasing tools within the VA Informatics and Computing Infrastructure (VINCI) workspace. All patients with ICD9/ICD10 codes for strabismus through August 2022 were identified. Diagnosis year, diagnosis age, race, ethnicity, and gender were retrieved. Strabismus type was determined using ICD codes. Publicly available VHA enrollment data between 2000 and 2017 were used for prevalence calculations.

**Results:** 315,969 Veterans with  $\geq 1$  ICD code for strabismus were identified. Median diagnosis age was 65 years (mean=62). Veterans with strabismus were primarily male (93%) and white (66%). ICD codes for heterophoria (26.9%), exotropia (24.8%) and esotropia (17.7%) were most common. New strabismus diagnoses increased from 11,129 patients/year between 2000-2009 (range: 9,743-14,091) to 16,542 patients/year between 2010-2019 (range: 15,154-17,646) but decreased to 10,946 patients in 2020. Among enrolled Veterans, strabismus diagnosis prevalence increased from 0.42% in 2000 to 2.97% in 2017.

**Conclusion/Relevance:** This study is the first to characterize strabismus in the national VHA health system. Our data suggest that strabismus diagnoses among enrolled Veterans has increased over time except a decrease in 2020 corresponding to the COVID19 pandemic. Additional work, however, is necessary to further characterize strabismus risk and treatment in Veterans.

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Poster #A71  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Evaluation of Publicly Available Online Source Material for Amblyopia

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**Introduction:** Social media is a method for quick, casual, and widespread dissemination of information, and patients increasingly turn to this tool to learn about health conditions. Instagram allows images and words to be tagged so they can be easily searched by users. However, information presented in posts is subject to limited oversight. This study reviewed the quality of publicly available information regarding amblyopia on Instagram.

**Methods:** We performed an analysis of the top 30 publicly available posts on Instagram tagged with the search term amblyopia. The posts were analyzed and scored out of 40 using the Currency, Reliability, Authority, and Purpose (CRAP) Test, which assesses credibility and quality of online content.

**Results:** Posts were stratified by source. 16 were posted by providers, including ophthalmologists, optometrists, and opticians. 9 were from companies that sell products for amblyopia treatment (patches, vision therapy). 5 were from individuals personally affected by amblyopia. Mean CRAP score for the groups were 26, 14, and 8, respectively. A one-way ANOVA revealed a statistically significant difference in quality by these criteria ( $p < 0.001$ ). Tukey's HSD test for multiple comparisons showed a higher mean CRAP score in posts by providers than those by companies marketing amblyopia treatment and by individuals.

**Conclusion/Relevance:** Quality of information among Instagram posts for amblyopia varied by source. Posts by providers were of higher quality than by individuals affected with amblyopia or by companies selling products for amblyopia. Although broader awareness of health information is valuable, widespread access to poor quality data remains a source of concern.

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Poster #A72  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Evolution of Myopia in Children with Stickler Syndrome

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**Introduction:** High myopia is a key feature of Stickler syndrome. It is known to be axial, and present very early in life. Its evolution over childhood, however, is not well described.

**Methods:** Files of children with genetically confirmed Stickler syndrome, regularly followed in our department, a tertiary referral center, between October 2010 and 2021, were retrospectively reviewed.

**Results:** Twenty-nine such cases were included. Myopia was present in 26 children (90%), including 16 children with high myopia (55%); one child was hyperopic and one was emmetropic. The prevalence of myopia did not change over the follow-up. Myopia refractive values also remained stable over time, from the first examination - most often during the first weeks of life - to adolescence. Axial length of myopic children was higher than normal from the first measurements, and evolved parallel to normal eye growth, in a higher corridor, with a sharp increase in the first year of life, and a very slow increase after age 3.

**Conclusion/Relevance:** Myopia is a frequent feature of Stickler syndrome. It is congenital and non-progressive. This is explained by an excessive growth of the globes in utero, driven by vitreous collagen, while the normal growth after birth is explained by a normal composition of the sclera. There is therefore, as a general rule, no indication for treatments to slow myopia progression in Stickler syndrome.

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Poster #A73

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Effect of COVID-19 Lockdown on Myopia Progression of School-aged Children: A Retrospective Chart Review**

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**Introduction:** Studies have attributed myopia progression to the increase in the use of digital devices and a decrease in time spent outdoors. This work aims to study the effect of COVID-19 lockdown on myopia progression in children, comparing across the years and within different age groups.

**Methods:** This was a retrospective chart review of school-aged children with myopia who presented to the pediatric ophthalmology clinic of a tertiary care center between January 2020 and December 2021 (during COVID-19 lockdown). Annual myopia progression rate was computed (back to January 2016) by dividing the absolute value of the spherical equivalent(SE) difference of each 2 consecutive visits by the duration (in years). Patients were then divided into 3 age-groups for analysis.

**Results:** 443 charts of myopic school-aged children were reviewed. Their average age was  $11.81 \pm 3.67$  years with an average of  $3.85 \pm 1.67$  visits across the years. The mean myopic SE increased over time: SE in 2021 was significantly higher than the mean SE in 2016, 2017, 2018 and 2019. Mean SE in 2020 was significantly higher than that in 2016 and 2017. There was no statistically significant difference in the mean annual progression (in Diopters/year). For the 3-10 years-old group, the annual SE progression tended to be highest for the year intervals 2020-2021 and 2019-2020 compared to previous years.

**Conclusion/Relevance:** Children had more myopia in 2021 and 2020 (during lockdown) compared to previous years. The myopia annual progression tended to be highest in the interval 2020-2021 especially for the younger age group, however the difference was not statistically significant.

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Poster #A74  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Pediatric Myopia Prevalence Before and After the Initial COVID-19 Pandemic

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**Introduction:** Pediatric myopia prevalence is predicted to increase from 41.9% to 58.4% by 2050.<sup>(1,2)</sup> Myopia progression has been associated with time spent in indoors and near-work. However, the effect of lock-down and remote learning during COVID-19 on pediatric myopia is unknown. This study aimed to compare the prevalence and degree of myopia in children in an urban setting before and after the early COVID-19 pandemic.

**Methods:** We conducted a retrospective review of refractive error in children aged 7–12 at our institution before (December 2018 to May 2020) and after (June 2020 to November 2021) the start of the pandemic. Myopia was defined as spherical equivalent  $\leq -0.5$  diopters (D) by cycloplegic refraction at least 30 minutes after eyedrop instillation. Those with significant ocular comorbidity were excluded.

**Results:** 734 patients were included - 275 patients in the 'before' group and 459 in the 'after' group. The prevalence of myopia was 56.7% in the 'before' group and 59.9% in the 'after' group. The mean spherical equivalent refraction (SER) in all patients changed from -0.91D to -1.11D ( $p=0.249$ ), while the SER in patients with myopia changed from -2.36D to -2.41D ( $p=0.522$ ). Children aged 7-9 demonstrated higher prevalence (56.4% vs. 49.7%) and degree (-0.89D vs. -0.62D,  $p=0.21$ ) of myopia after the initial lock-down period compared to before.

**Conclusion/Relevance:** There was a trend towards higher prevalence and degree of myopia after the initial COVID-19 pandemic overall and in children aged 7-9. This may be related to change in activities during the initial COVID-19 lock-down period.

**References:** 1. Holden BA, Fricke TR, Wilson DA, et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. *Ophthalmology*. 2016;123(5):1036-1042. doi:10.1016/j.ophtha.2016.01.006  
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Poster #A75  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Myopia Control with Extended Depth of Focus Multifocal Contact Lenses

Carolyn R. Lederman, MD

**Introduction:** To investigate the effectiveness of the NaturalVue multifocal lens, a daily disposable soft contact lens with extended depth of focus (center distance) design, in slowing myopic progression over multiple years.

**Methods:** 24 patients aged 8-13 years old with -1 to -6 D spherical equivalent and less than or equal to 1 D astigmatism were fitted with NaturalVue multifocal contact lenses. Patients were followed for up to three years. Patients with prior atropine treatment were excluded. All patients showed at least -0.50 D of myopic progression prior to wearing the lenses. Only data from the right eye was used. The change in myopia prior to and post contact lens fitting was analyzed. 24 patients were followed for one year, 12 patients were followed for two years, and 5 patients were followed for three years.

**Results:** Compared to baseline progression rate, the NaturalVue multifocal contact lens significantly slowed myopic progression for all time points analyzed (paired t-test, p-value < 0.0001). Prior to fitting contact lenses, average progression of myopia was  $0.80 \pm 0.38$  D (n=24) per year. At one year after lens wear, average progression was  $0.10 \pm 0.15$  D (n=24) per year. At two years, average progression was  $0.13 \pm 0.13$  D (n=12) per year. At three years, average progression was  $0.20 \pm 0.13$  D (n=5) per year.

**Conclusion/Relevance:** Treatment with NaturalVue multifocal contact lenses, a high add, daily wear, soft contact lens, significantly reduces myopic progression over time.

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Poster #A76

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Myopia Control - A Retrospective Analysis of Low-Dose Atropine and Peripheral Defocus Contact Lenses at an Urban Academic Institution**

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**Introduction:** The prevalence of myopia is increasing and by 2050 50% of the global population is expected to be affected<sup>1</sup>. We aimed to compare the efficacy of myopia control of low-dose atropine and MiSight (CooperVision) peripheral defocus contact lenses.

**Methods:** One hundred thirty-eight patients using low-dose atropine 0.05% (N=54) or MiSight lenses (n=84) were retrospectively reviewed for spherical equivalent refractions and axial lengths at initiation of treatment and at 6-months follow-up.

**Results:** MiSight patients were significantly older ( $10.8 \pm 2.3$  years, range 5-15 years) than patients on atropine ( $8.6 \pm 2.4$  years, range 2-13 years,  $p < 0.0001$ ). However at initiation of treatment, MiSight patients had less myopic spherical equivalent ( $-3.2 \pm 1.4$  D vs.  $-3.8 \pm 2.3$  D,  $p = 0.004$ ), but showed no difference in axial lengths ( $24.8 \pm 0.8$  mm vs.  $24.8 \pm 1.3$  mm,  $p = 0.96$ ). At 6-months follow-up, there was no significant difference ( $p = 0.67$ ) in myopic progression between the MiSight patients ( $-0.04 \pm 0.13$  D) and the atropine group ( $0.01 \pm 0.3$  D). Collection of 1-year data for spherical equivalents and axial lengths is ongoing.

**Conclusion/Relevance:** MiSight and Atropine 0.05% are equally effective forms of myopia control in the short-term. MiSight contact lenses and atropine were safely prescribed in patients as young as 5-years and 2 years of age, respectively.

**References:** 1. Holden BA, Fricke TR, Wilson DA, et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. *Ophthalmology*. 2016 May;123(5):1036-42.  
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Poster #A77

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Peripheral Hemorrhagic Detachment of the Internal Limiting Membrane in Abusive Head Trauma**

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**Introduction:** Retinal hemorrhage is a cardinal manifestation of abusive head trauma (AHT) in children. While macular retinoschisis has been described previously, and is a well-recognized marker for abuse, this is the first case series to demonstrate similar lesions in the retinal periphery noted at autopsy.

**Methods:** As the primary ocular pathology resources for the Philadelphia Medical Examiner, we identified 5 cases of deceased victims of AHT, as determined by non-ophthalmic findings, who demonstrated peripheral hemorrhagic detachment (PHD) of the internal limiting membrane. We utilized autopsy reports with text and images to characterize this novel finding.

**Results:** Age ranges were 2 months to 4 years (4 male, 1 female) with 10 eyes available for microscopic analysis. All cases showed PHD of the internal limiting membrane in at least one eye. Extensive and deep retinal hemorrhages were seen in all cases bilaterally, with four extending into the subretinal space. Evidence of orbital fat hemorrhage was present bilaterally in 4 cases, and unilaterally in 1 case with PHD. Juxtapapillary intrascleral hemorrhage was noted in 3 cases. All cases showed subdural and subarachnoid optic nerve sheath hemorrhage.

**Conclusion/Relevance:** Peripheral hemorrhagic detachment of the internal limiting membrane, presumably due to vitreoretinal traction at the vitreous base, is a newly recognized and potentially specific finding for AHT. These lesions may not be easily visible through clinical examination unless scleral depression is used. The presented findings highlight the importance of autopsy in cases of child abuse.

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Poster #A78

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## The Effect of Erythropoietin on the Macular Structural and Vascular Characteristics in Children Born Prematurely

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**Introduction:** Erythropoietin (EPO) is known to have neuroprotective effects [1, 2]. Here, we evaluate the effects of early prophylactic high-dose EPO on macular structural and vascular characteristics in preterm children using optical coherence tomography (OCT) and OCT angiography (OCTA).

**Methods:** Randomized, double-blind, prospective study. A total of 87 preterm-born children (52 treated with EPO, 35 with placebo) and 52 term-born healthy control (HC) subjects aged between 7-15 years were examined using OCT and OCTA. Superficial plexus OCTA (foveal avascular zone, FAZ; vessel density, VD; vessel length density, VLD) and OCT (central retinal thickness, CRT; total macular volume, TMV) outcomes were analyzed. Foveal hypoplasia was qualitatively graded [3]. Differences in parameters between groups were assessed using generalized estimating equation models after performing sensitivity analyses utilizing multiple imputations on the data set. All examinations and analyses were performed prior to unblinding.

**Results:** FAZ was smaller, and CRT larger, in both pre-term groups compared to HC, with no differences between the EPO and placebo subgroups. The EPO subgroup also had lower VD and VLD compared to HC. Children treated with EPO had smaller VD and VLD than those treated with placebo. Foveal hypoplasia was more common in eyes in the preterm groups (16.7% Placebo, 34.0% EPO) than in the HC group (6.0%).

**Conclusion/Relevance:** Macular structural and microvascular differences between preterm and term infants were observed in this large cohort, with a negative effect of EPO on macular structural and vascular development.

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Poster #A79  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Visual Function and Quality of Life of Retinoblastoma Survivors

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**Introduction:** Retinoblastoma (RB) and its associated treatments can significantly impact visual acuity (VA) and quality of life (QoL). However, little is known regarding other measures of vision, such as contrast sensitivity (CS) or saccades, and how such measures influence QoL or activities of daily living (ADL).

**Methods:** This cross-sectional study included children aged 5-17 years who had completed treatment for RB. Children and parents completed the Pediatric Eye Questionnaire (PedEyeQ) to assess eye-related QoL and the Roll Evaluation of Activities of Life (REAL) to assess ADLs. VA, eye tracking, and CS were assessed, and multivariable linear regression was performed.

**Results:** Mean (SD) age at study enrollment for 23 participants was 9.6 (3.8) years. Treatment included enucleation in 69.6% participants and chemotherapy in 82.6%. Of the subjects who underwent visual testing, decreased saccades was observed in 9/9(100%) and CS in 10/10 (100%). Of the 19 participants who completed PedEyeQ, and REAL, 100% had at least one decreased QoL metric (<90) and 26.3% had at least one decreased ADL.

Multivariable analysis revealed that worse VA was associated with lower functional ability ( $p<0.001$ ). Worse CS was associated with worse parent-perceived impact of disease ( $p=0.002$ ) and parental worry regarding functional status ( $p=0.042$ ). Impaired saccades were associated with parental worry about social interaction ( $p=0.045$ ) and functional status ( $p=0.009$ ).

**Conclusion/Relevance:** RB survivors experience decreased CS, slower saccades, and these were associated with inferior QoL, and ADL. VA, CS, and saccades should be assessed in RB survivors as they have predictive power with QoL.

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## Staging Mexican Retinoblastoma Patients Using The Updated TNM Classification

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Mexico

**Introduction:** Retinoblastoma is the most frequent intraocular malignancy in infancy. Its mortality in Mexico is between 9.1-16%. In 2020, an updated TNM classification for retinoblastoma was published, including intraocular, extraocular, and systemic disease data. This new classification predicts metastatic risk and patient survival. This work analyses retinoblastoma patients of the Hospital Infantil de México Federico Gómez from 2012 to 2020 with this new classification.

**Methods:** Retrospective chart review of patients from 2012-2020 treated at Hospital Infantil de México Federico Gómez including data needed for TNM classification.

**Results:** In total, 150 patients were included. Most patients were male (56.7%). Age at diagnosis was  $2.0 \pm 1.4$  years, and 52.7% presented under 2 years. Most cases were unilateral (74%). The most common presenting feature was leukocoria, followed by strabismus. Most patients presented with cT2b (52.7%), followed by cT3c (14%). Only one patient presented positive nodules, and 8 patients presented metastasis. There were 39 cases (26%) that had positive heritable traits. Most common pathology stage was pT2a (22.7%), followed by pT3b (18%). 93.3% of patients were enucleated, and 74.7% received systemic chemotherapy.

**Conclusion/Relevance:** Results reflect the limitations existing in México, such as lack of genetic analysis, a greater percentage of enucleation and limited access to intraarterial or intravitreal chemotherapy. TNM classification has the advantage of including extraocular disease information as well as information about nodules, metastasis, heritable traits and pathology results, that were not included in previous retinoblastoma classifications.

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Poster #A81

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Histologic Findings in Retinoblastoma with Magnetic Resonance Imaging Detected Post-Laminar Optic Nerve Invasion**

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**Introduction:** Post-laminar optic nerve invasion (PLONI) in retinoblastoma had been reported to associated with enhancement and/or enlargement of post-laminar optic nerve from magnetic resonance imaging (MRI). Our study aimed to verify this association and its clinical implication.

**Methods:** Medical records of retinoblastoma patients from January 2015 to April 2021 were reviewed. Preoperative MRI was reviewed by two independent radiologists and compared with histopathologic findings. In case of disagreement, the final decision was made by the third senior radiologist. All radiologists were masked to the histopathologic findings.

**Results:** Fifty-five eyes of 52 patients were included. The mean age was 21.7 months (1-80 months). Twenty-one eyes were classified as group D and 34 eyes as group E. There were 8 eyes (14.5%) with PLONI on histopathology. Of these, 3 eyes (37.5%) showed optic nerve enhancement on MRI and only 1 eye (12.5%) showed optic nerve enlargement on MRI. There were 47 eyes without PLONI on histopathology. Of these, 10 eyes (21.3%) showed optic nerve enhancement on MRI, 10 eyes (21.3%) showed optic nerve enlargement on MRI, and 5 eyes (10.6%) showed both optic nerve enhancement and enlargement on MRI. Sixteen eyes (29.1%) were treated by primary enucleation (5 eyes with PLONI). Thirty-nine eyes (70.9%) received chemotherapy prior to enucleation (3 eyes with PLONI).

**Conclusion/Relevance:** The association of histopathologic PLONI with enhancement and/or enlargement of optic nerve on MRI was inconsistent. These MRI findings should be interpreted cautiously for predicting high risk retinoblastoma with histopathologic PLONI.

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Poster #A82  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Validation of a Published Model to Reduce Duration of Retinopathy of Prematurity Screening

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**Introduction:** The E-ROP study evaluated 1257 patients screened for retinopathy of prematurity (ROP) and found that no infant born at or after 27 weeks' gestational age and having birth weight over 750g developed treatable disease if they had no ROP at 37 weeks' gestational age. They suggested there is little value in continued screening of infants meeting these criteria who have no ROP at 37 weeks.<sup>1</sup> We attempted to replicate these published data in a larger multi-center cohort to validate or refute this hypothesis.

**Methods:** We conducted a retrospective chart review of every infant treated for ROP from February 2004 through April 2022 at 6 medical centers located in the mid-south USA. We evaluated gestational age, birth weight, and presence or absence of ROP at 37 weeks' gestational age to determine if any treated infants would have been 'missed' using these screening criteria.

**Results:** Of 6,729 infants screened, 298 (4.43%) received treatment. Ten babies who required treatment developed first evidence of ROP after 37 weeks' gestational age. However, only one was >750g birth weight and >27 weeks' gestational age. This patient developed zone 2, stage 3 with pre-plus disease and was treated prematurely because of limited access to care at a remote hospital.

**Conclusion/Relevance:** Our results, in a cohort 5 times that of the original study, replicated that infants >750g birth weight and >27 weeks' gestational age did not develop treatable ROP if they had no ROP at 37 weeks, supporting the termination of examination then in patients meeting these criteria.

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Poster #A83  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Incidence and Implications of Retinopathy of Prematurity Outside Gestational Age and Birthweight Screening Criteria in a Single Metropolitan Area**

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**Introduction:** Internationally accepted Retinopathy of Prematurity (ROP) screening criteria are based, objectively, on gestational age (GA) under 31 weeks and birthweight (BW) of 1500 grams or less and, subjectively, at the discretion of the treating neonatologist for patients with a higher risk clinical course, because disease can occur outside GA/BW risk thresholds. This study aims to examine the descriptive statistics relevant to the subjective screening indication.]

**Methods:** Following IRB exempt status, records for 42 months preceding September 2022 were reviewed for a single U.S. metropolitan area. The records of infants screened in the participating NICUs on ROP rounds were reviewed that did not meet GA and BW criteria. The greatest extent of ROP was recorded, along with the number of exams to clear screening and any treatments performed. These were tabulated for descriptive statistical parameters.]

**Results:** In the forty-two months reviewed, approximately 534 infants were screened. One-hundred six were outside GA and BW criteria. One developed stage 3 with pre-plus disease in zone 2, one stage 2 disease without plus in zone 2, one stage 1 in zone 2, and one stage 2 disease in zone 3. Twenty-three (21.7%) were cleared from screening with one examination. Seventy-nine (74.5%) required multiple examinations, but never demonstrated stage 1 or greater disease.

**Conclusion/Relevance:** Neonatologist judgement in determining infants warranting screening for ROP remains an important indication, though subjective in nature. Until objective measures achieve perfect sensitivity for clinically-relevant disease, a role remains for this subjective criterion.

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Poster #A84

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Application of the Postnatal Growth and Retinopathy of Prematurity (G-ROP) Screening Criteria in the Tertiary Hospital in Bangkok, Thailand**

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**Introduction:** The Postnatal Growth and Retinopathy of Prematurity (G-ROP)<sup>1</sup>, an ROP predictive model, was developed in North America with high sensitivity and fewer infants examined. This study aimed to validate this model for Thai infants by assessing sensitivity and comparing it to the current AAO/AAP screening guideline<sup>2</sup>.

**Methods:** The records of infants screened for ROP were retrospectively reviewed from 2015-2020. G-ROP model was applied to calculate sensitivity for prethreshold type 1, 2 ROP and the reduction of the number of infants examined.

**Results:** Of 129 infants screened, there were 102 infants met G-ROP criteria. The mean gestational age at birth was 29.7±2.7 weeks. The mean birth weight was 1177.8±401.3g. Both G-ROP and AAO/AAP detected prethreshold type 1 ROP in 24 of 24 infants (sensitivity, 100%; 95%CI, 85.8%-100%). Also, they detected all 4 prethreshold type 2 ROP infants with 100 % of sensitivity (95%CI, 39.8-100.0). The reduction in infants receiving examinations using G-ROP was 20.9%.

**Conclusion/Relevance:** G-ROP model provided high sensitivity and lessen unnecessary exams for ROP screening in Thai infants

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Poster #A85

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Retrospective Evaluation of G-ROP and CO-ROP Screening Algorithms in University of Pittsburgh Medical Center Cohort

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**Introduction:** In the US, from the 70,000 infants screened for ROP each year, only 43% develop any ROP, and <10% develop ROP needing treatment.<sup>1</sup> Therefore, investigators have tried to develop new methods for determining more specific screening criteria, including Postnatal Growth and Retinopathy of Prematurity (G-ROP)<sup>1-2</sup> and Colorado Retinopathy of Prematurity (CO-ROP)<sup>3</sup>, to reduce the number of infants being screened while maintaining a high degree of sensitivity. We evaluated these two criteria in our clinical setting.

**Methods:** A retrospective study was conducted on premature infants who received treatment for ROP between 2010-2021 at UPMC Children's Hospital of Pittsburgh and Magee-Women's Hospital. Infants without a known ROP outcome and insufficient weight data were excluded. Sensitivity of the two criteria for treated infants was determined, including early treatment for retinopathy of prematurity (ETROP) Type 1 and non-Type 1 ROP.

**Results:** 138 infants were reviewed. Sufficient data was available for 129 and 102 infants for the G-ROP and CO-ROP criteria, respectively. Using the G-ROP criteria, 3.1% (4/129) of total infants treated were missed (1 Type 1). These infants would not have been screened or received treatment if G-ROP guidelines were followed. Using the CO-ROP criteria, 4.9% (5/102) of total infants treated were missed (2 Type 1).

**Conclusion/Relevance:** While the CO-ROP and G-ROP screening methods could be applicable in certain populations, the sensitivity is less than the current screening guidelines and we would not apply it in its current version in our setting. Adjustments<sup>4</sup> to decrease the number of infants screened without compromising sensitivity need to be investigated.

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Poster #A86

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Artificial Intelligence-Assisted Detection of Referral-Warranted Retinopathy of Prematurity using Smartphone-Based Retinal Fundus Cameras**

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**Introduction:** Retinopathy of prematurity (ROP) screening examinations are essential in curbing ROP-related visual loss.<sup>1</sup> However, access to qualified ROP examiners and widefield digital fundus imaging (WDFI) in developing countries has limited implementation of telemedicine.<sup>1-3</sup> Herein, we investigate whether artificial intelligence (AI) can detect referral-warranted ROP (Type 2/pre-plus or worse ROP, RW-ROP) and treatment-requiring ROP (TR-ROP) from smartphone-based fundus imaging devices (SBFIDs).

**Methods:** As part of an Indian ROP telemedicine screening program, 150 babies who underwent screening for ROP were imaged using the MII Retcam or Keeler MIO SBFID. In total, 1647 images were collected and plus disease labels (normal, pre-plus, plus) from parallel Retcam imaging sessions were applied. MII and MIO images were combined, stratified by patient into training, validation, and test datasets (70/10/20), and used to train a ResNet18 deep learning architecture for binary classification of normal versus pre-plus or plus disease. Median image predictions within babies' image sets were used as patient-level predictions of RW- and TR-ROP.

**Results:** Test dataset RW-ROP sensitivity [95% confidence interval] was 80.0% [28.4%, 99.5%] and specificity was 59.3% [38.8%, 77.6%]. TR-ROP sensitivity was 100% [29.2%, 100.0%] and specificity was 58.6% [38.9%, 76.5%].

**Conclusion/Relevance:** In this pilot study, AI-assisted technician-led ROP screening using two SBFIDs was effective at detecting TR-ROP, and suggests this approach may be feasible in regions where WDFI is not available.

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Poster #A87

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## Monitoring Changes in Retinopathy of Prematurity Severity in South India Using Artificial Intelligence

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**Introduction:** We evaluate whether an artificial intelligence (AI) algorithm for assessing ROP severity in babies can detect changes in disease epidemiology in a telemedicine screening program in South India.

**Methods:** Babies were examined, diagnosed, and imaged at the Aravind Eye Care System in India over two time periods: August 2015-October 2017 and March 2019-December 2020. Eyes were matched by gestational age (GA) and birth weight (BW) at a 1:3 ratio between the two time periods. An AI-derived ROP vascular severity score (VSS) was applied to retinal fundus images obtained at the initial teleretinal screening exam. Average eye-level VSS was calculated and severity across five distinct geographic districts was compared over time using generalized estimating equations (to account for inter-eye correlations, GEE).

**Results:** Among BW- and GA-matched babies, the proportion [95% CI] of babies with type 2 or worse ROP and treatment-requiring ROP dropped from 60.9% [53.8%, 67.7%] to 17.1% [14.0%, 20.5%] ( $p < 0.001$ ) and 16.8% [11.9%, 22.7%] to 5.1% [3.4%, 7.3%] ( $p < 0.001$ ), respectively. Similarly, the median [interquartile range] VSS in the population decreased from 2.9 [1.2] to 2.4 [1.8] ( $p < 0.001$ ).

**Conclusion/Relevance:** In South India, the use of an AI-based measure of ROP severity, when applied at the population level, is strongly suggestive of improvements in primary prevention of ROP in a short period of time, coincidental to the implementation of a large ROP telescreening program.

**References:** Campbell JP, Singh P, Redd TK, Brown JM, Shah PK, Subramanian P, et al. Applications of Artificial Intelligence for Retinopathy of Prematurity Screening. *Pediatrics* [Internet]. 2021 Feb 26; Available from: <http://dx.doi.org/10.1542/peds.2020-016618>

Poster #A88

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Comparison of Two Smartphone-Based Imaging Technologies with Widefield Fundus Imaging for Telemedicine in Retinopathy of Prematurity**

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**Introduction:** To assess the efficacy of two smartphone-based fundus imaging (SBFI) systems used by technicians for retinopathy of prematurity (ROP) screening in an established tele-ophthalmology system.

**Methods:** This prospective study evaluated the MII Retcam in 100 babies (200 eyes) and Keeler MIO devices in 56 babies (112 eyes) by comparing technician-captured images to Retcam images at the same session. Two masked readers evaluated zone, stage, and plus in the SBFI images. Using a cutoff of type 2 or pre-plus in either eye for referral, sensitivity and specificity were calculated against the classification assigned to the Retcam images. A grader-assigned vascular severity score (VSS, from 1-9) was assigned to the SBFI images by a single masked grader and compared using area under the receiver operating characteristic curve (AUROC).

**Results:** Both SBFI devices were effective at detecting treatment-requiring ROP with a sensitivity of 1.0 [0.541-1.0] for MII Retcam, and 1.0 [0.292-1.0] for MIO, with reasonable specificity (0.854 [0.750-.915] for MII Retcam, 0.830 [0.702-0.919] for MIO). The AUROC was 1.0 using VSS alone for screening individual eyes compared to both type-2/preplus and TR-ROP.

**Conclusion/Relevance:** In this pilot study, technician-led ROP screening using SBFI devices did not miss any cases of TR-ROP, and use of a VSS had high diagnostic accuracy for both type 2 and TR-ROP. Assessing vascular severity may improve detection of clinically significant disease in lower field of view imaging systems.

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Patil, J., et al., Smartphone based ROP (S-ROP) screening-opportunities and challenges. *Eye (Lond)*, 2020. 34(9): p. 1512-1514.

Poster #A89

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Association of Device Measured Fibrovascular Ridge Thickness and Clinical Disease Stage in Retinopathy of Prematurity**

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**Introduction:** Accurate diagnosis of retinopathy of prematurity (ROP) is essential to provide timely treatment and reduce risk of blindness. However, all components of the ROP examination are subjective and qualitative (1). This study evaluated associations between optical coherence tomography (OCT) derived retinal thickness measurements at vascular-avascular junction with clinical diagnosis of ROP stage.

**Methods:** OCT-derived ridge thickness manually calculated from OCT B-scans compared with clinical diagnosis of stage from two masked examiners using both traditional stage classifications, and a more granular continuous scale. One OCT volume and en face image per eye for 25 consented patients showing at least 1-2 clock hours of ridge were included in the final analysis.

**Results:** 128 separate OCT eye examinations from 50 eyes of 25 patients were analyzed. Repeatability of scans from same visit produced intraclass coefficient of 0.87 with coefficient of variation = 7.0%. Higher ordinal disease classification was associated with higher axial ridge thickness on OCT, with thickness measurements (mean  $\pm$  standard deviation) of  $264.2 \pm 11.2 \mu\text{m}$  ( $p < 0.001$ ),  $334.2 \pm 11.4 \mu\text{m}$  ( $p < 0.001$ ), and  $495.0 \pm 32.2 \mu\text{m}$  ( $p < 0.001$ ) for stages 1, 2, and 3, respectively, and with continuous stage labels ( $R = 0.59$ ,  $p < 0.001$ ).

**Conclusion/Relevance:** These results suggest that OCT-based quantification of peripheral stage in ROP may be an objective biomarker which may be useful for clinical diagnosis and longitudinal monitoring, and may have implications for disease classification in the future.

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Poster #A90  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Cost-Effectiveness of Addressing Retinopathy of Prematurity in an African Country

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**Introduction:** With the expansion of neonatal care in sub-Saharan Africa (SSA), an increasing number of premature babies are at risk of retinopathy of prematurity (ROP).<sup>1 2</sup> Previous studies have quantified the cost-effectiveness of addressing ROP in middle-income countries,<sup>3</sup> but few have focused on SSA. This study estimates the cost of ROP screening and anti-VEGF injection treatment in Rwanda compared to the economic burden of untreated ROP.

**Methods:** Medical cost data were collected from King Faisal Hospital in Kigali, Rwanda (July 2022). Financial burden of blindness included lost income (with inflation adjustment). Published data on epidemiology and natural history of ROP were used to estimate annual burden and sequelae of ROP in Rwanda.<sup>1</sup> Country-level cost of screening and treating a one-year birth cohort was compared to lifetime cost of not addressing ROP for the same cohort (US dollar).

**Results:** Cost of ROP treatment is \$736 per infant. Lifetime cost of blindness amounts to \$200,339 per infant. Total country-level cost of screening and treating ROP for a one-year birth cohort is \$1,940,122, with the burden of blindness despite adequate treatment being \$5,242,757. Not treating the same cohort results in a lifetime cost of blindness of \$12,362,988. Therefore, country-wide cost savings would be \$5,180,108 (3.57% inflation) or up to \$26,530,097 (7.1% inflation).

**Conclusion/Relevance:** The cost of anti-VEGF treatment for ROP is substantially less than the indirect cost of blindness due to ROP. Allocating additional funding towards expansion of ROP screening and treatment would be an effective means of reducing the economic burden of blindness due to ROP.

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Poster #A91

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Pain and Stress Responses During Retinopathy of Prematurity Screening: Non-Contact Laser Speckle Contrast Imaging versus the Standard of Care**

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**Introduction:** The current standard of care for Retinopathy of Prematurity, binocular indirect ophthalmoscopy (BIO), is widely considered to induce physiologic stress in infants.<sup>1-3</sup> This study compared BIO with laser speckle contrast imaging (LSCI), a method that captures ocular blood flow dynamics and provides quantitative measurements of ROP pathogenesis without contacting the eye.<sup>4</sup> We hypothesized that LSCI will cause less physiologic stress to infants compared to BIO.

**Methods:** In this prospective comparative study, 73 ROP examinations were performed on infants (n=25) with gestational ages between 23-30 weeks and birthweights between 470-1915 grams. Infants received BIO-only or LSCI and BIO. Vital signs were compared pre-, during, and post- examination using Welch's t-test. N-PASS and PIPP-R behavioral pain scores were obtained during the examination and compared using the Wilcoxon rank sum test.

**Results:** Maximum heart rate was higher during BIO (182.7+/-16.8) compared to LSCI (170.7+/-11.3) (p<0.001). Maximum and minimum oxygen saturations were lower during BIO (96.5+/-4, 84.7+/-9.6) compared to LSCI (99.2+/-1.6, 89.9+/-8.3) (p = 0.001 and p=0.013 respectively). BIO was more stressful and painful as revealed by higher median N-PASS (p<0.001) and PIPP-R (p=0.038) scores compared to LSCI. BIO also had greater frequencies of adverse events (e.g. bradycardia, tachycardia) compared to LSCI. However, infants were more tachypneic during LSCI (125.0+/-18.1) compared to BIO (95.7+/-20) (p<0.001).

**Conclusion/Relevance:** LSCI is associated with less physiological stress compared to BIO. Without the use of a speculum, depressor, or bright retinal illumination, LSCI is a gentler method for ROP screening that minimizes the stressful experience for pre-term infants.

- References:**
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Poster #A92  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Comparison of the Timeliness of Diagnosis and Treatment of Strabismus Based on Race and Preferred Language

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**Introduction:** Pediatric strabismus can lead to permanent vision loss if not identified and treated promptly. In the US, racial disparities in eye care access and utilization exist, and higher rates of visual impairment have been found among racial and ethnic minorities.<sup>1</sup> We investigated the effect of race, ethnicity, and language on the timeliness of care and visual outcome of strabismus.

**Methods:** We conducted a retrospective chart review of 433 patients with a diagnosis of strabismus who had strabismus surgery at our institution in 2018-2019. The following variables were collected: date of birth, date of strabismus diagnosis, date of first strabismus surgery, race, ethnicity, language, and development of amblyopia.

**Results:** In this cohort, 47.1% identified as Caucasian, 31.6% as Hispanic, and 6.5% as African-American. English was the preferred language of 84.1%, and 13.9% developed amblyopia. The mean age at diagnosis was 14.2 months, and the mean time between diagnosis and surgery was 14.3 months. Compared to Caucasians, African-Americans were diagnosed and treated at a significantly later age ( $P=0.03$  and  $P=0.02$ , respectively). Compared to English speakers, non-English speakers were treated at a significantly later age ( $P=0.04$ ). Rates of amblyopia did not differ significantly across racial/ethnic groups ( $P=0.46$ ).

**Conclusion/Relevance:** African-American children and children whose preferred language was not English were found to be treated at a later age than Caucasian children and English-speaking children, respectively, though rates of amblyopia were similar. Further research should identify and address the underlying reasons for these differences.

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Poster #A93  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Comparison of Reading Speed in Patients with Strabismus without Amblyopia versus Controls

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**Introduction:** Amblyopia has been shown to slow reading speed. Limited literature exists on reading speed in strabismus without amblyopia. Our study compares reading speed in patients with strabismus without amblyopia versus normal controls.

**Methods:** We conducted a prospective study with 48 participants: 12 childhood-onset (onset <8 years of age) strabismus without amblyopia and 36 age- and education level-matched controls. Inclusion criteria were age 14-50 years, education >9 years, primary language English, BCVA >20/30 distance and >N8 near either eye. Exclusion criteria were presence of other eye or neurological/cognitive conditions which may impact reading, and previous treatment for strabismus/amblyopia. International Reading Speed Texts (IReST) were used for reading speed assessment. Each participant read two passages (passage 1 and 8) following all IReST instructions. Reading time was measured using a stopwatch. Reading speed was calculated in words per minute (WPM).

**Results:** Mean age for strabismus group was 28.3+/-11.1 and control group was 28.2+/-11.0 years ( $p=0.96$ ). Mean education level for strabismus group was 14.2+/-2.4 and control group was 13.8+/-2.5 years ( $p=0.62$ ). Mean reading speed for passage 1 for strabismus group was 192.0 and for control group was 220.0 WPM ( $p=0.01$ ). Mean reading speed for passage 8 for strabismus group was 201.3 and for control group was 226.2 WPM ( $p=0.04$ ).

**Conclusion/Relevance:** Strabismus (without amblyopia) patients had slower reading speed compared to controls. This may be related to fixation switches between eyes; further studies with eye tracking may provide more information. Strabismus, even without amblyopia, may affect reading performance and consequently vision-related quality of life.

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Poster #A94  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **But Doctor, Will I Be Able To Drive?**

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**Introduction:** Binocular diplopia often causes an inability to drive. Strabismus surgery may improve diplopia in primary gaze but, especially with incomitant strabismus, residual diplopia on side gazes may persist. Federal regulations specify the field of view for rear-view mirrors but do not dictate mirror placement in reference to the driver. Knowing the required viewing angles of driving can help strabismologists plan and counsel their patients.

**Methods:** The horizontal angles between the driver's eye (DEA) and the 3 side and rear view mirrors were measured on 25 cars, including sedans, minivans, pickup trucks, and SUVs. To simulate the range of driver positions due to seat adjustments, 5 measurements were taken using a digital protractor and a model driver 69 inches tall: 1) the seat horizontally back and vertically low (BL) 2) the seat horizontally back and vertically high (BH) 3) the seat horizontally forward and vertically low (FL) 4) the seat horizontally forward and vertically high (FH) 5) in a comfortable driving position (CP) for the model driver.

**Results:** The average DEA of the 1) windshield mounted rear-view mirror was 35-55 degrees; 44 degrees in CP, 2) left side-view mirror was 40-51 degrees; 46 degrees in CP, and 3) right side-view mirror was 64-74 degrees; 68 degrees in CP. The DEA of all mirrors was highest in FH position and lowest in BL position.

**Conclusion/Relevance:** Driving requires large viewing angles. Post-strabismus surgery driving counseling should include using head movements to minimize residual diplopia in moderate to extreme gaze positions.

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Poster #A95  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Strabismus Detection and Telemedicine

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**Introduction:** This study aims to ascertain the thresholds for reliable detection of various forms of strabismus by alternate cover testing (ACT) using video evaluation under controlled conditions and varying video scenarios that might mimic real life (1,2). Additionally, assess whether detection thresholds are affected by the level of ophthalmologic training.

**Methods:** Videos were created by one author performing ACT with different types and magnitudes of induced strabismus, in different scenarios. Eleven participants representing several levels of ophthalmologic training watched the videos and were asked to determine the type and magnitude of strabismus.

**Results:** Strabismus was correctly detected 65% of the time. No statistically significant difference was noted in percent correct by training level. Sensitivity was affected by magnitude of prism diopters (PD). A magnitude of 12PD had a statistically significant percent correct followed by 8PD compared to 4PD and ortho. 4ET had statistically significant larger percent correct than 4XT. Forward direction videos had statistically significant higher percent correct than videos with movement and back-lighting. The participant with the highest percent correct had no medical training but was related to the author who made the videos.

**Conclusion/Relevance:** Level of ophthalmologic training was not tightly linked to better strabismus detection via telemedicine. There could be a link to strabismus detection and relationship to the patient. Both magnitude and type of deviation influence detection sensitivity. Eight PD was a relative threshold for detection. Videos with forward facing, without movement or back-lighting, yield the best sensitivity to detect strabismus.

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Poster #A96  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## A Free Software for Measurement of Horizontal Angle of Strabismus Using Digital Pictures

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**Introduction:** To evaluate Strabocheck® in strabismus by assessing its intra- and inter-observer reproducibility. To evaluate the concordance between the values of the prism cover test (PCT) measurements and the Strabocheck® measurement for esotropias.

**Methods:** The method proposed was validated in a group with horizontal strabismus and in a healthy group, using strabocheck.com. Then, a subgroup with esotropia was included. PCT in far and near distance was performed, in addition to the Strabocheck® measurement.

**Results:** One hundred and fifty patients with horizontal strabismus as well as ninety-one healthy patients were first included. The intra-class correlation coefficient (ICC) for intra-observer reproducibility was 0.96 (IC95% 0.957-0.963). The ICC for inter-observer reproducibility was 0.953 (IC95% 0.948-0.957). In the subgroup of fifty-two patients with esotropia the PCT value with the highest ICC with the Strabocheck® measurements was the minimum angle in far vision (0.771).

**Conclusion/Relevance:** Strabocheck.com provides a free, objective, reliable and reproducible measurement of the horizontal deviation, based on digital pictures. It is easily used for adults or very young children, for small and large angles, and for patients with deep amblyopia, with or without glasses and without any other equipment. It can also be used for measuring strabismus under general anesthesia. It tends to correlate well with the minimum angle of deviation in far vision in esotropic patients. It provides a new data of the angle of deviation of strabismus at a 'conversational distance', probably close to 'everyday life angle' and has to be considered as a complementary method for measuring strabismus.

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Poster #A97

Thursday, March 30, 2023

10:05 AM – 11:05 AM

### **Association of Strabismus with Neurodevelopmental Disorders Among Pediatric Patients**

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**Introduction:** We investigated the association between various types of neurodevelopmental diagnoses and strabismus in the pediatric population.

**Methods:** This cross-sectional study analyzed commercial health care claims data in the Optum Labs Data Warehouse, a longitudinal de-identified claims database, between January 1, 2007 and December 31, 2017 [1]. Eligible patients (12,005,189) were less than 19 years of age and had at least one strabismus claim. The comparison group was children with no eye disease codes other than refractive error if reported. Demographic characteristics and neurodevelopmental diagnoses were compared between cases with strabismus and the comparison group.

**Results:** 12,005,189 pediatric patients were included with a mean (SD) age of  $8.0 \pm 5.9$  years at the first claim; 6,095,523 (51%) were male. A strabismus diagnosis was present for 352,636 (3%). After adjusting for confounding factors, there was a statistically significant association between strabismus diagnosis and intellectual impairments (adjusted odds ratio [AOR] 9.15, 95% confidence interval [CI] 8.87-9.44,  $P < .001$ ), communication disorder (AOR 5.87, 95% CI 5.77-5.97,  $P < .001$ ), specific learning disorder (AOR 4.20, 95% CI 4.14-4.25,  $P < .001$ ), autism spectrum disorder (AOR 4.02, 95% CI 3.95-4.09,  $P < .001$ ), tic disorder (AOR 3.30, 95% CI 3.21-3.39,  $P < .001$ ) attention deficit/hyperactivity disorder (AOR 2.21, 95% CI 2.18-2.23,  $P < .001$ ), and other neurodevelopmental disorders (AOR 4.43, 95% CI 4.38-4.48,  $P < .001$ ).

**Conclusion/Relevance:** We found a strong association between diagnoses of strabismus and multiple neurodevelopmental conditions in children. Awareness of this association could be useful for counseling pediatricians and families about the possibility of these conditions in their patients with strabismus.

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Poster #A98  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## The Incidence, Clinical Features, and Management of Essential Infantile Esotropia in The United Kingdom

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**Introduction:** National statistics data suggests a decreasing trend in the incidence of essential infantile esotropia (EIE). The choice and timing of intervention in the management of EIE is often debated. This national study was undertaken to determine the incidence, presentation and management of EIE in the United Kingdom.

**Methods:** A prospective national observational study of newly diagnosed EIE presenting in the United Kingdom between October 2017 to November 2018. Infants with a constant, non-accommodative esotropia  $\geq 20$  prism dioptres (PD) presenting at  $\leq 12$  months of age with no neurological or ocular abnormalities were included. Follow up data was collected after 12 months. Cases were identified through the British Ophthalmology Surveillance Unit (BOSU).

**Results:** A total of 57 patients were reported giving an incidence of 1 in 13,246 live births. The average age of onset was  $1.4 \pm 1.9$  (0-7) months old and the average age of confirmed diagnosis was  $7.1 \pm 2.7$  (2-12) months old. Surgery was undertaken in 46% botulinum toxin (BT) alone in 23%, 9% had BT first then surgery, 5% had surgery augmented with BT, and 17% were observed. At final follow up (median 2.2 years), 40% were prescribed glasses and 35% had amblyopia treatment. Residual esotropia was seen in 56% with 6% overcorrected.

**Conclusion/Relevance:** The incidence of EIE in the United Kingdom is considerably lower than reported in other population based studies. Surgical intervention was the preferred choice of management. A high proportion of cases had a residual esotropia. Amblyopia and refractive correction commonly and influences the timing of surgery.

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Poster #A99  
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10:05 AM – 11:05 AM

## Evaluation of Factors Related to Decompensation in Initially Well Aligned Patients with Accommodative Esotropia

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**Introduction:** Accommodative esotropia (ET) is primarily treated with full correction of hyperopic error. Risk factors that lead to decompensation of patients who are initially aligned with glasses are not clear. The purpose of this study was to identify clinical and sociodemographic factors associated with decompensation of alignment in pediatric patients with accommodative ET.

**Methods:** This was a retrospective cohort study that examined the sociodemographic and clinical factors in patients who were initially well aligned with hyperopic glasses. Patients were deemed to have adequate initial alignment if they had <4 prism diopters (PD) of esotropia and <6 PD of exophoria with glasses. Decompensation of ET at 1 year of follow-up was defined as a need for surgical correction by the pediatric ophthalmologist and/or manifest strabismus of  $\geq 8$  PD of esodeviation with glasses wear. Chi-square test was used for statistical comparisons.

**Results:** Forty patients (21M/19F) aged  $2.91 \pm 1.33$  years at the time of initial hyperopic correction were included. Decompensation of alignment was noted in 6 (15%) patients at one year of follow up. Patients without evidence of stereopsis following initial alignment had higher frequency of decompensation (33.3%) compared to those without (4.3%) ( $p=0.035$ ). Decompensation was observed more frequently in White (2 cases; 50.0%) compared to non-White children (3 cases; 10.7%).

**Conclusion/Relevance:** Presence of stereopsis in patients with accommodative ET may be a protective factor against decompensation of alignment. Racial background may be an important demographic risk factor for decompensation of previously aligned accommodative ET with White children being at higher risk of decompensation.

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Poster #A100  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Can Residents Develop Basic Strabismus Surgery Competencies without any Face-To-Face Teaching?

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**Introduction:** Self-directed learning using educational videos has been proven to develop novice surgeons' surgical skills.<sup>1</sup> However, the validity of using video-based simulation training has not been tested in strabismus surgery.

**Methods:** We recruited 8 first-year residents, all naïve to strabismus surgery. Each filmed their initial attempt at securing a rectus muscle on a foam model eye. They were then provided with videos demonstrating techniques for muscle surgery, with no supplemental guidance. Following self-directed practice using these videos, they then filmed a subsequent attempt, once they felt they had achieved competency. One expert strabismus surgeon (blinded to participants) evaluated the residents' videos of their initial and subsequent muscle surgery, using the validated Ophthalmology Surgical Competency Assessment Rubric (OSCAR)<sup>2</sup>, abridged for simulation purposes, to assess 4 basic skills of strabismus surgery: mounting a needle, scleral passes, surgical knot tying and rectus muscle suturing. This was scored on a modified Dreyfus scale, at Novice, Advanced beginner or Competent level.

**Results:** There was a significant improvement in scores pre- and post-video exposure, in all skills assessed (mean total score 3.0 vs 6.25 out of possible 8,  $p < 0.05$ ). All the participants felt that video-based self-directed learning was useful and they would benefit from improved access to further simulation videos.

**Conclusion/Relevance:** Use of educational videos and recorded simulation is effective for developing competency in basic strabismus surgery skills in this novice cohort. Trainees achieving these competencies are safe to commence live surgical training and further develop their technical and non-technical skills in the operating room.

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Poster #A101

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Strabismus Surgery Simulation Study: Review of the Literature and Comparative Anatomical Study of Eyes used for Strabismus Surgery Simulation**

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**Introduction:** Simulation is an increasingly mandatory component of surgical training. Choosing the most anatomically accurate model eye for strabismus surgery improves transfer of skills learned from simulation to live surgery, ultimately improving patient care. This study reports on existing literature describing strabismus surgery simulation and compares ocular anatomy relevant to strabismus surgery between commonly used animal models for strabismus surgery simulation reported in the literature relative to a non-biologic model.

**Methods:** Literature reviews were performed (MEDLINE, Embase, Web of Science and OpenGrey, English literature, to September 2022), to determine 1) strabismus surgery simulation publications and 2) reported biologic eye models used in strabismus surgery simulation. Anatomic parameters of eye models including extraocular rectus muscle lengths, tendon widths, distance from rectus muscle insertion to the limbus and scleral thickness were compared to those of the non-biologic model.

**Results:** 11 papers and 1 review were found describing strabismus surgery simulation. Biologic eye models reported included cow, goat, pig, rabbit, and human. Considerable anatomic variation exists between different animal eyes relative to the human eye. Minimal literature discussing optimal strabismus surgery simulation models and best practices for teaching exist. The non-biologic eye model demonstrated the most similarity to the human eye, with consistent relevant ocular anatomy for strabismus surgery simulation.

**Conclusion/Relevance:** Strabismus surgery simulation is an integral part of training. The non-biologic eye model has the highest fidelity compared to currently used animal models and is the most anatomically similar to the human eye with consistent relevant ocular anatomy for strabismus surgical simulation.

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Poster #A102  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Simplified Approach to Amniotic Membrane for Restrictive Strabismus Associated with Conjunctival Scarring and Loss of Fornix**

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**Introduction:** Amniotic membrane, which promotes epithelization and has anti-inflammatory properties<sup>1</sup>, has been advocated for restrictive strabismus. Prior case series have used 75-150  $\mu\text{m}$  tissue as a graft sewn or glued into position over bare sclera and extraocular muscles with varying results.<sup>2,3</sup> We report a simplified approach using thicker, umbilical cord-derived tissue.

**Methods:** A retrospective chart review was conducted after the Institutional Review Board approval. Patients with restrictive strabismus associated with conjunctival and forniceal scarring treated with amniotic membrane from a single surgeon were included. All patients had a single sheet of 500-900  $\mu\text{m}$  thick, commercially-available amniotic membrane AmnioGuard® (BioTissue, Inc., Miami, FL) anchored in the cleft between the raw surfaces created after simply severing the cicatricial bands.

**Results:** The six patients in this case series demonstrated marked improvement in restrictive strabismus with no evidence of recurrence during the post-operative follow-up period.

**Conclusion/Relevance:** In this application, amniotic membrane does not function as a graft. Rather, the thicker material persists for several weeks, allowing time for the raw surfaces to re-epithelialize before it is resorbed. This property makes it a useful option for restrictive strabismus associated with loss of fornix architecture due to cicatricial adhesions to the lids or orbital wall.

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Poster #A103  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Single Minimal Conjunctival Incision for Rectus Muscles

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**Introduction:** We tested the feasibility and inflammatory response of surgery for rectus muscles using a small single incision parallel to the muscle insertion

**Methods:** Procedures carried out in all participants included visual acuity, refraction, stereoacuity, cover test, ductions and versions, and funduscopy. Twenty patients diagnosed with non-accommodative esotropia, acute comitant esotropia, and intermittent esotropia who underwent surgery in the medial or lateral rectus, and 5 patients operated in the superior rectus, for DVD or superior oblique palsy, received a single 3-4 mm incision parallel to the muscle insertion (age range: 6-35 years old). After muscle recession or resection, the conjunctiva was closed with a single 8/0 PGA stitch suture. Resolution of postoperative hemorrhage and swelling were evaluated every other day postoperatively, and compared with patients operated previously with fornix or limbal incision.

**Results:** Bulbar conjunctiva inflammatory response was minimal or not apparent in 14 of 25 patients (56%). In 11 patients with apparent conjunctival chemosis, it disappeared in 2.18 (1.07) days (mean (SD)). Postoperative haemorrhage resolved in 8.5 (2.11) days. In previous historical recorded data, chemosis and haemorrhage resolved in 7.5 (2.16) days ( $p < 0.01$ ) and 14.75 (1.83) days ( $p < 0.01$ ), respectively, in 20 patients with limbal incision, and 3.7 (0.9) days ( $p = 0.01$ ) and 12.2 (2.3) days ( $p = 0.01$ ), respectively, in 21 patients with fornix incision.

**Conclusion/Relevance:** A single minimal incision parallel to the muscle insertion may be enough for rectus muscle surgery and induces little inflammatory response and haemorrhage.

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Poster #A104  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Early Successful Strabismus Surgery May Decrease the Risk of Anxiety and Depression in Teenagers

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**Introduction:** Strabismus has been strongly associated with anxiety and depression in adults and teenagers. This study aims to assess if early successful strabismus surgery decreases the incidence of anxiety and depression in teenagers.

**Methods:** This is a retrospective cross-sectional study of pediatric patients who underwent strabismus surgery before 10 years old. The patients had at least one eye examination by either HS, SRK, or SK from July 2019 through June 2022, and their age was 12-19 years old at the time. We considered successful strabismus surgery as residual strabismic deviation less than 12 prism diopters with correction. Exclusion criteria were genetic syndromes, cerebral palsy, developmental delay, neurological diseases (excluding Attention Deficit Hyperactive Disorders), systemic diseases associated with depression, significant structural ocular defects, and autism.

**Results:** Fifty subjects were included in the study (28 female, 56.0%) with a median age of 14 years (IQR 13-16) and a mean follow-up period of 10.3 years ( $\pm 3.2$ ). The incidence of depression was 4.0%, and the incidence of anxiety was 8.0%. 4/50 (8.0%) of patients were on medication for anxiety or depression.

**Conclusion/Relevance:** The incidence of anxiety and depression and medication use for these illnesses in teenagers who had successful strabismus surgery before the age of 10 years was comparable to the general teenage population and significantly lower than previously reported in teenagers with strabismus. Our findings suggest that early successful strabismus correction may lower the risk of developing anxiety and depression in teenagers.

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Poster #A105  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Correlation of Goal-Determined Metric and Patient Satisfaction with Strabismus Surgery Outcomes**

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**Introduction:** The Goal-Determined Metric was created to grade horizontal strabismus surgery in a manner relevant to surgeons' and patients' goal(s). Goals included minimizing diplopia, improving eye contact (reconstructive), reducing torticollis, and binocular potential. We present outcomes of horizontal strabismus surgery performed for reconstructive and diplopia goals, and compare graded outcomes with results from a patient satisfaction survey.

**Methods:** Outcomes of horizontal strabismus surgery performed by two surgeons for reconstructive or diplopia goals (2018-2021) were collected. Inclusion required completed satisfaction survey.

**Results:** 227 of 274 patients met inclusion criteria, median age 41 years (IQR 13-59); 97 patients had surgery for diplopia (75-esotropia, 22-exotropia) and 130 patients for reconstructive goals (57-esotropia and 73-exotropia). For the entire cohort, 87% had excellent outcomes and 78% of patients were 'overall' very satisfied. Subgroup analysis: diplopia-esotropia 95% excellent/82% very satisfied; diplopia-exotropia 64% excellent/59% very satisfied; reconstructive-esotropia 89% excellent/82% very satisfied; reconstructive-exotropia 89% excellent/82% very satisfied. Among those very satisfied with surgery for diplopia, the survey sub-item 'control of diplopia' was achieved in 95%(ET) and 55% (XT), while better alignment perceived in 89% (ET) and 53% (XT). Among those 'very satisfied' with reconstructive surgery, the survey sub-item 'better alignment' was perceived in 78% (ET) and 79% (XT) while increased 'confidence interacting with others' achieved in 54% (ET) and 56% (XT).

**Conclusion/Relevance:** Patient and surgeon perception correlated well after reconstructive surgery and surgery treating esotropia with diplopia. In contrast, over 50% of 'very satisfied' patients treated for exotropia with diplopia reported only modest improvement in diplopia and appearance.

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Poster #A106  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Patient Satisfaction with Strabismus Surgery Postoperative Care Via Telemedicine

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**Introduction:** This study aims to investigate patient's satisfaction through Telemedicine Satisfaction Questionnaire (TSQ) for the use of telemedicine in the postoperative evaluation of strabismus surgery.

**Methods:** A survey using TSQ (14 items, scale 1-5) was conducted in the postoperative evaluation of strabismus surgery. All patients were operated by the same surgeon, from 2020 to 2022 in Curitiba, Brazil. Participants had telemedicine consultation on postoperative 7-10day and attended an office visit on 30th-day. Post operative alignment success was defined as deviation within 10 PD on the 30th-day.

**Results:** Overall, 53 patients were evaluated, 26 were male (49.1%). 28 patients (52.8%) were under 18 yo. Strabismus was as follows: 34 horizontal, 4 vertical and 15 both horizontal and vertical. Surgical success rate was 92,5%. No patient had postoperative complications. Telemedicine was considered a good experience by the TSQ for 85.3% of patients (SD 9%) specially in patients under 18 yo with vertical deviation (mean 91.2%,  $p = 0.04$ ). The mean for quality of care provided (F1) was 4.1 (SD 0.5), similarity to face-to-face (F2) was 4.5 (SD 0.4), perception of the interaction (F3) was 4.5 (SD 0.6), and total mean of TSQ score was 4.3 (SD 0.5).

**Conclusion/Relevance:** A high level of satisfaction was found, TSQ scores averaging 85,3% (SD 9%). The mean score was 4.3 (SD 0.5), similar to literature.

Telemedicine is highly evaluated by patients as a postoperative tool for strabismus surgery evaluation.

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Poster #A107  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Evaluating Surgical Outcomes and Associated Risk Factors in Infantile Esotropia

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**Introduction:** High and wide-ranging reoperation rates for infantile esotropia (IET) make surgical outcomes difficult to predict. Rates between 25% and 80% have been reported and have been shown to vary by age of operation.<sup>1</sup> Further, the epidemiology of this patient population is incompletely understood, with various studies citing incidence rates between 0.1% and 1%.<sup>2</sup>

**Methods:** A retrospective review of strabismus surgeries performed at our institution between 2008 and 2022 identified 49 patients meeting all criteria. Success, reoperation, and subsequent diagnoses were the main outcome measures. Outcomes were analyzed in aggregate and by age, gender, initial outcome, recession amount, and presence of hyperopia. Analysis was done using chi-square, independent samples t-tests, and Pearson chi-square.

**Results:** IET patients accounted for 9% of esotropia patients receiving surgical correction at our institution. The success and reoperation rates were 67% and 65% respectively. While nearly all failed cases underwent reoperation, more than 50% of those in the success group did as well ( $p=0.004$ ). Among failed cases, undercorrection was more common than overcorrection (29% vs. 4%). While success rates did not significantly differ by age group, younger age at operation demonstrated an increased rate of reoperation ( $p=0.04$ ). Outcomes were also evaluated by comorbidity, gender, BMR amount, and initial success.

**Conclusion/Relevance:** Our findings confirm the association between age and reoperation and add to the literature on patient demographics and factors as predictors of surgical outcomes. These results can aid physicians in surgical decision making and in guiding families to understanding expectations with this diagnosis.

**References:** 1. Simonsz HJ, Kolling GH. Best age for surgery for infantile esotropia. *Eur J Paediatr Neurol EJPN Off J Eur Paediatr Neurol Soc.* 2011;15(3):205-208. doi:10.1016/j.ejpn.2011.03.004  
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Poster #A108  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Risk Associations and Surgical Outcomes in a Retrospective Study of Divergence Insufficiency Esotropia**

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**Introduction:** Divergence insufficiency (DI) esotropia demonstrates increasing incidence(1). Greater understanding of risk associations and surgical response may improve risk assessment and management(2).

**Methods:** Patients undergoing horizontal strabismus surgery between 2013-2020 at one institution were reviewed; those with greater esotropic deviation or worse control at distance were included. Patients with prior surgery or alternate etiology for deviation were excluded. Distance-near disparity and surgical outcomes were analyzed relative to age at surgery, surgical approach and dose, reoperation rate, and refractive error and correction using univariate and covariance analyses.

**Results:** Thirty-seven patients met criteria; average age at surgery was 66.6 years (range 19-88). Surgical approaches included medial rectus recession (31 patients; 84%), lateral rectus strengthening (4 patients; 11%) and recess/resect (2 patients; 5.4%) resulting in over-corrections in 3 patients (8%) and under-corrections in 10 patients (27%). Four patients (11%) underwent reoperation within 1 year. Ratios for distance deviation compared to total millimeters of medial recession were 2.5 for those with symptom resolution and 2.8 for those with under-corrections; a lateral strengthening ratio of 1.2 correlated with symptom resolution compared to 2 for over-correction. Analysis of covariance demonstrates significant correlations between the number of surgeries and distance-near disparity ( $p=-0.04$ ), use of progressive add lenses (PAL) and distance-near disparity ( $p=-0.02$ ), and PAL and number of surgeries ( $p=0.008$ ).

**Conclusion/Relevance:** This analysis supports prior work demonstrating favorable response to surgery for DI and a potential role for PAL in DI risk. We identify an optimal target ratio of 2.5 between distance deviation and millimeter of medial recession.

**References:** 1. Chen X, Marsh JD, Zafar S, Gerber EE, Guyton DL. Increasing incidence and risk factors for divergence insufficiency esotropia. *J AAPOS Off Publ Am Assoc Pediatr Ophthalmol Strabismus*. 2021 Oct;25(5):278.e1-278.e6.  
2. Crouch ER, Dean TW, Kraker RT, Miller AM, Kraus CL, Gunton KB, et al. A prospective study of treatments for adult-onset divergence insufficiency-type esotropia. *J Am Assoc Pediatr Ophthalmol Strabismus JAAPOS*. 2021 Aug 1;25(4):203.e1-203.e11.

Poster #A109  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Exploring the Need for Correction Factors with Bilateral Medial Rectus Recession in Combination with Oblique Muscle Involvement in Esotropic Patients**

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**Introduction:** Previous research has studied the effect of inferior oblique surgery on the long-term horizontal alignment,<sup>1</sup> leading many to consider altering the amount of surgery performed on horizontal muscles when oblique muscles are also corrected. This study assesses the need for a correction factor in esotropic patients undergoing combined bilateral medial rectus and inferior oblique surgery with demonstrated inferior oblique overaction.

**Methods:** Retrospective chart review was performed of patients with a preoperative diagnosis of esotropia who underwent strabismus surgery between 1/2008 through 12/2021 at a single academic institution. 372 patients underwent bilateral medial rectus recession (BMRc) while 68 patients underwent combined BMRc and bilateral inferior oblique myomectomy (BIOM). Exclusion criteria included history of strabismus surgery, presence of vertical deviation, and intermittent esotropia without recorded deviation measurements.

**Results:** Mean age of patients was 9.79 years and 8.63 years in the BMRc only group and BMRc+BIOM group, respectively. Average BMR recession amount was 4.97 mm and 5.35 mm in the BMRc only group and BMRc+BIOM group, respectively ( $p=0.315$ ). Average preoperative deviation of BMRc patients was 37.80 PD of esotropia and 31.30 PD in the BMRc+BIOM group. The average postoperative deviation of BMRc patients was 0.78 PD of esotropia and 4.45 PD in the BMRc+BIOM group, demonstrating an average success rate of 82.0% (305/372) and 72.1% (49/68), respectively ( $p=0.106$ ).

**Conclusion/Relevance:** These surgical outcomes in patients who underwent BMRc or BMRc+BIOM demonstrates that operating on the oblique muscles does not significantly change postoperative deviation, suggesting that a correction factor may not be needed when planning for combined BMRc+BIOM.

**References:** 1. Stager D Jr, Dao LM, Feliuss J. Uses of the Inferior Oblique Muscle in Strabismus Surgery. Middle East Afr J Ophthalmol. 2015;22(3):292-297. doi:10.4103/0974-9233.159723

Poster #A110  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### **Medial Rectus Poster Fixation Suture Reduces the Angle of Esotropia at Distance and Near**

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**Introduction:** Retrospective observational study to determine the effect of medial rectus posterior fixation suture (Faden procedure) on esotropia at distance and near.

**Methods:** We did our study on 86 patients. Their age ranges from 4 to 12 years. From 2017 till 2021. Patients were esotropia either non-accommodative or accommodative esotropia partially or fully with high AC/A ratio. We did measure the angle of esotropia with and without glasses for distance and near. The mean angle of esotropia at distance without glasses was 36.3 ( $\pm 16.1$ ) prism diopter PD, with glasses 13.2 ( $\pm 12.8$ ), at near without glasses 48.5 ( $\pm 15.8$ ) and with glasses 25.7 ( $\pm 9$ ). We did, by same surgeon, bilateral medial rectus posterior fixation suturing, 12.0 mm from original insertion using 5/0 non-absorbable sutures. We measured esotropia one, 3, 6, 12 and 24 months after surgery.

**Results:** Esotropia showed significant decrease (P-Value  $< 0.001$ ) for distance and near without and with glasses. At distance without glasses after one month was 17.3 PD ( $\pm 12.5$ ), 17.1 ( $\pm 11.8$ ) 3 months, 17.2 ( $\pm 13.3$ ) 6 months, 17.2 ( $\pm 14.2$ ) 12 months and 16.8 ( $\pm 14.5$ ) 24 months. With glasses was after one month 2.1, 1.9 (3 months), 2.3 (6 months), 2.2 (12 months) and 1.3 (24 months). Esotropia for near without glasses was 18.8 after one month, 19.6 (3 months), 19.8 (6 months), 19.8 (12 months) and 19.9 (24 months). It was with glasses after one month 3.6, 2.7 (3 months, 3.5 (6 months), 4.3 (12 months) and 3.7 (24 months).

**Conclusion/Relevance:** From this study we conclude that medial rectus posterior fixation suturing (Faden procedure) will significantly reduce esotropia at distance as well as at near.

**References:** Faden Operations - Indications beyond Esotropia and Surgical Results July 2012 *Klinische Monatsblätter für Augenheilkunde* 229(10):995-9

Poster #A111  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## The Long-Term Surgical Outcomes of Esotropic Duane Retraction Syndrome Type 1

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**Introduction:** To evaluate the long-term surgical outcomes of esotropic Duane retraction syndrome (DRS) type 1.

**Methods:** Records of 25 patients with esotropic type 1 DRS who underwent strabismus surgery and were followed up for at least 2 years were retrospectively reviewed. Surgical motor success was defined as esotropia (ET) and exotropia (XT) of 8 prism diopters (PD) or less in the primary position.

**Results:** The 2-year postoperative success rate was 78% and the final success rate was 76% after an average follow-up of  $5.6 \pm 3.4$  years. Mean angle of deviation in the primary position changed from  $20.8 \pm 19.2$  PD ET to  $1.6 \pm 8.6$  PD ET at 1 year and  $1.4 \pm 7.6$  PD XT at 2 years, showing a mean exodrift of  $0.98 \pm 3.8$  PD per year. The average grade of abduction limitation on the affected side improved from -3.7 to -2.0. Abnormal head position of less than 5 degrees was achieved in 21 patients (84%) and 5 patients (20%) required reoperation. Different types of surgeries, including bilateral medial rectus (MR) recession (with or without lateral rectus Y-splitting), unilateral MR recession (with or without posterior fixation suture), and MR recession with superior rectus transposition were performed with success. However, unilateral MR recession was a risk factor for undercorrection ( $p=0.021$ ).

**Conclusion/Relevance:** DRS is complicated to treat due to its wide spectrum of clinical presentations and the treatment of choice varies among surgeons. In this study, the long-term surgical outcomes were favorable in esotropic DRS type 1 except for unilateral MR recession which showed significant undercorrection.

**References:** 1. Akbari MR, Masoumi A, Masoomian B, Mirmohammadsadeghi A, Mehrpour M. Surgical outcome of patients with unilateral exotropic Duane retraction syndrome. *J aapos*. Jun 2020;24(3):133.e1-133.e7.  
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Poster #A112  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Early Surgery for Acquired Non Accommodative Esotropia

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**Introduction:** Acquired non accommodative esotropia presenting over age six years may represent serious neurologic disease. Neuroimaging is usually recommended. Many authorities recommend waiting six months for surgical correction. The effect of waiting upon final stereopsis is not well studied.

**Methods:** Sixteen patients with acquired non accommodative esotropia underwent strabismus surgery. None showed evidence of serious neurologic disease. All patients had normal neuroimaging of the brain and orbits. All had good alignment with resolution of diplopia. One patient had recurrence of esotropia and required a second surgery. The postoperative stereopsis was recorded and correlated with the length of time from the onset of esotropia to surgical correction.

**Results:** Ten patient had surgical correction prior to four months from the onset of diplopia and esotropia. All had some stereopsis; six had normal stereopsis. Four patients had strabismus surgery after four months from the onset of the deviation. None had good or fair stereopsis postoperatively.

**Conclusion/Relevance:** Early surgery for acquired non accommodative esotropia can lead to improved stereopsis. Serious neurologic disease must be ruled out, but a waiting period of six months is arbitrary and unnecessary.

**References:** Sarah M. Jacobs, Amy Green-Simms, Nancy N. Diehl, Brian G. Mohny,  
Long-term Follow-up of Acquired Nonaccommodative Esotropia in a Population-based Cohort,  
Ophthalmology,  
Volume 118, Issue 6, 2011

Poster #A113  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Early Post-Operative Angle as a Predictor of Surgical Success in Patients with Intermittent Exotropia

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**Introduction:** Intermittent exotropia is where divergent strabismus is present at certain times or within certain fixation distances. It is treated surgically with bilateral lateral rectus recession (BLR) or unilateral lateral rectus recession with medial rectus resection (RR). The purpose of our study is to assess the relationship between the initial post-operative deviation and surgical outcomes in exotropes undergoing strabismus surgery.

**Methods:** A retrospective chart review was performed on patients who underwent strabismus surgery for intermittent exotropia between March 2010 and February 2022 at a single institution.

Inclusion criteria: First strabismus surgery, exotropia.

Exclusion criteria: history of prior strabismus surgery, concurrent surgery, vertical realignment of horizontal muscles, botulinum toxin injections in last 6 months, coexistent restrictive or sensory exotropia, constant exotropia at near or distance fixation or clinically significant amblyopia.

**Results:** 97 patients met the criteria. 53 were female and average age was 37 years. 62 had basic intermittent exotropia, 26 convergence insufficiency and 9 had divergence excess exotropia. 93 of the 97 patients underwent RR with the remaining undergoing BLR. Kaplan-Meier survival analysis showed that patients who demonstrated esodeviation of within 10 PD at the first postoperative consultation following surgery had higher rates of surgical success compared to patients who demonstrated esodeviation greater than 10 PD or residual exodeviation at the first postoperative consultation following surgery ( $P < 0.01$ ).

**Conclusion/Relevance:** Overcorrection of within 10 PD at 1 week following surgery showed a more favourable surgical outcome compared to residual exodeviation or esodeviation exceeding 10 PD.

**References:** Ruttum MS. Initial versus subsequent postoperative motor alignment in intermittent exotropia. *J AAPOS*. 1997;1(2):88-91

Scott WE, Keech R, Mash AJ. The postoperative results and stability of exodeviations. *Arch Ophthalmol*. 1981;99:1814-1818

Raab EL, Parks MM. Recession of the lateral recti: Early and late postoperative alignments. *Arch Ophthalmol*. 1969;82:203-20

Poster #A114  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Surgical Outcomes of Medial Rectus Plication Versus Resection in the Treatment of Exotropia**

Andrew Fischer, MD; Twinkle Mehta, MD; Marla Shainberg, CO; Emilia Varrone, MD; Sarah DeVaro, MD;  
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Atlanta, GA

**Introduction:** Strengthening of extraocular muscles in strabismus surgery can be achieved through resection or plication. Evidence supports similar surgical outcomes of the two procedures, but the current study further evaluates a large group of patients with extended follow up.<sup>1</sup>

**Methods:** Adults and children who underwent lateral rectus recession with either ipsilateral medial rectus resection or plication for exotropia between May 2012 and February 2020 were retrospectively reviewed. Patients with follow up less than 6 months, a history of prior strabismus surgery, or a restrictive process were excluded. Surgeries were performed by four surgeons.

**Results:** There were 113 patients who met inclusion criteria, 33 receiving a resection and 80 receiving a plication. No significant difference was noted in baseline characteristics between the groups including gender ( $p=0.5460$ ), mean age ( $p=0.8216$ ), or baseline exodeviation ( $p=0.3096$ ). Mean length of follow up was longer in the resection group compared to the plication group (1056.85 days, 667.89 days;  $p<0.0001$ ). Success rate was similar for plications and resections (48.48%, 43.75%;  $p=0.5460$ ). Mean post-operative exodeviation (11.24 PD, 14.14 PD;  $p=0.1844$ ) and reoperation rate (6.06%, 12.50%;  $p=0.3124$ ) were higher in the plication group but did not meet statistical significance.

**Conclusion/Relevance:** Results suggest the non-inferiority of plication over resection in the treatment of exotropia. However, there may be a trend toward increased reoperation rates and residual exotropia following plication.

**References:** 1. Song D, Qian J, Chen Z. Efficacy of medial rectus plication versus resection for exotropia: a meta-analysis. *Graefes Arch Clin Exp Ophthalmol.* 2022;260(7):2095-2101.



Poster #A115  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## **Evaluation of True Muscle Transplant versus Novel Hang Back Recession in Extra-Large Angle Exotropia: A Randomised Comparative Clinical Trail**

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**Introduction:** Single setting surgical options for extra-large angle exotropia (ELAE) (>60 prism diopters, PD) are limited. Here, often more than two eye or two muscle surgeries are indicated,(1) hence, to explore and to compare single surgical options current randomised comparative trial is undertaken.

**Methods:** A prospective interventional clinical trial is registered, twenty adult patients with ELAE are randomised into two groups. After detailed orthoptic work up, ten patients in group 1 underwent medial rectus resection (5.5-7.5 mm) followed by muscle transplant (effective length 4-5.5 mm) aided lateral rectus recession (9 mm). Ten, group 2 patients underwent medial rectus resection (5.5-7 mm) but the lateral rectus recession (9 mm) is aided with a hang back suture (5-7 mm). The surgical results are compared at baseline and at 3 months.

**Results:** The mean age is comparable ( $P=0.95$ ). The mean correction achieved in group 1 is  $84.8\pm 7.74$  PD and  $85.2\pm 4.84$  PD in group 2, this is statistically not significant ( $p=0.89$ ). All subjects had notable abduction limitation on day 1 but it improved over time. Two patients (> 90 prisms) in each group had more than 15 PD residual deviation, for which contralateral eyes are operated. In four different surgeons experience, the hang back recession is noted to be technically easier and quicker.

**Conclusion/Relevance:** In ELAE eyes, novel hang back recession procedure is as effective as true muscle transplant procedure (80-90 prism correction) with notable ease during intra-operative period.

**References:** 1) Currie ZI, Shipman T, Burke JP. Surgical correction of large-angle exotropia in adults. *Eye (Lond)*. 2003;17(3):334-339. doi:10.1038/sj.eye.6700347

## Outcomes for Two-Muscle Surgery in Large-Angle and Very Large-Angle Exotropia

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**Introduction:** Surgical treatment of large-angle exotropia (LAE) can be challenging for physicians because of the variation in what is considered LAE –usually >40 prism diopters (PD) –and in potential surgical methods.[1-3] The aim of the study was to report surgical outcomes in patients treated for LAE and very large-angle exotropia (VLAE) with 2 muscle surgery.

**Methods:** This was a retrospective study of 23 patients at our institution who underwent surgical treatment for exodeviation >50 (PD). Patients with a prior history of eye muscle surgery, neurologic deficits, and 3 muscle surgery were excluded. The institution's EMR was queried to identify operations from January 1, 2008 to December 31, 2021. Fisher's exact test and Wilcoxon rank sum test were utilized for statistical analysis.

**Results:** LAE and VLAE were defined as  $65 > PD > 50$  and  $PD \geq 65$ , respectively, with mean preoperative exodeviation at distance as 52.3 PD and 68.6 PD ( $p=0.0006$ ). Outcomes for LAE and VLAE were the following: mean follow-up 29.0 weeks and 10.4 weeks ( $p=0.04$ ), success rate 81.8% and 18.2% ( $p=0.008$ ), undercorrection rate 9.1% and 81.8% ( $p=0.002$ ), and mean postoperative exodeviation was  $3.78 \pm 4.84$  PD and  $27.91 \pm 22.91$  PD ( $p=0.002$ ).

**Conclusion/Relevance:** There is a significant difference in surgical outcomes between LAE and VLAE using 2 muscle surgery when a LAE is defined as  $65 > PD > 50$  and VLAE is defined as  $PD \geq 65$ . Based on these results, patients with LAE may experience good outcomes with 2 muscle surgery. Furthermore, these results may potentially suggest a preoperative exodeviation threshold when considering 2 muscle surgery.

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Poster #A117  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Evaluation of Distance Stereoacuity in Children Aged 4-17 Years with a Novel Digital Application

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**Introduction:** Stereopsis is a fundamental skill in human vision . There are several ways to test and quantify distance stereoacuity: traditional and new digital applications are both valid ways to test the stereoacuity. The aim of this study is to compare the results obtained using standard tests for distance stereoacuity measurement with the novel StereoTAB test.

**Methods:** A group of 120 children (69 females), aged between 4 and 17 years old (mean age 9.16), were tested using different tests for the quantification of stereopsis at distance. These tests were Distance Randot Stereotest, M&S random dots and StereoTAB.

**Results:** Stereopsis at distance was statistically significantly better with M&S random dots (2.09) than with Distance Randot test (2.19,  $p < 0.001$ ) or StereoTAB (2.21,  $p < 0.001$ ). A strong correlation was demonstrated between: M&S random dots and Distance Randot (0.83,  $P < 0.0001$ ), M&S random dots and StereoTAB (0.84,  $P < 0.0001$ ), Distance Randot and StereoTAB App (0.88,  $P < 0.0001$ ). The limits of agreement (Bland-Altman) between M&S random dots and Distance Randot was 0.54, between M&S random dots and StereoTAB was 0.55, and between Distance Randot Stereotest and StereoTAB was 0.45.

**Conclusion/Relevance:** The distance stereoacuity based on random dots stereopsis showed that the better values were obtained in order by M&S random dots, Distance Randot test, and StereoTAB. However, the clinical significance of their values is similar, and they can be used interchangeably. The introduction of versatile, fast, and portable stereopsis test which can be used at different distances with children, having various strabismic conditions, is of primary importance.

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Klaehn LD, Kramer AM, Hodge DO, Mohny BG. Stereopsis in children with intermittent exotropia and dissociated vertical deviation. *J AAPOS*. 2021 Oct;25(5):300-301.

Poster #A118  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

### **A Novel Pediatric Eye Test to Assess the Visual Function in a Global Manner: A Prospective Study**

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**Introduction:** NET is a new pediatric eye test which assesses the visual function in non-verbal and verbal developmentally healthy and delayed children, leading to NS. This study presents the NET age norms and assesses its reliability, sensitivity, specificity and validity.

**Methods:** NET is consisted of 6 steps, scored, and the sum leads to NS. To establish the age-norms of NS, 1450 developmentally healthy children with no visual problems (DHVH) were recruited, 0-12+ years old. To establish the reliability, validity, sensitivity, specificity of NS, 233 DHVH, 380 developmentally healthy with amblyopia and 125 developmentally delayed children were recruited (0-12+ years old). Intraclass correlation coefficient (ICC) and their 95% confidence intervals (CI) were calculated. The reliability, the validity of NET, and its sensitivity, specificity and accuracy for diagnosing amblyopia were assessed. (Intra-rater, test-re test, Pearson's correlation coefficient and Spearman's rank).

**Results:** The NS age norms with 25% & 75% quartiles were calculated for every age group. The reliability and validity were very high and a strong positive correlation was found between NET best corrected visual acuity (BCVA) vs. BCVA with established tests in all age groups. The sensitivity, specificity and accuracy of NET in diagnosing amblyopia were all higher than established tests (94.4% vs. 91.7%, 97.9% vs. 89.6%, 97.2% vs. 90% respectively).

**Conclusion/Relevance:** NET is a novel eye test assessing the visual function of developmentally healthy and delayed children in a global manner. This prospective study proves its reliability, validity, sensitivity, specificity and presents the test's age norms.

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2. Oliver Andreas Pfäffli, Bálint Tamási, James V. M. Hanson, Christina Gerth-Kahlert: Colour vision testing in young children with reduced visual acuity. *Acta Ophthalmologica* 2020; 98(1):113-120.  
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Poster #A119

Thursday, March 30, 2023

10:05 AM – 11:05 AM

## **Validation of Cloudscaper Optotypes versus LEA Symbols for Virtual Visual Acuity Measurement in Children 3 to 16 Years Old**

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**Introduction:** Visual acuity (VA) measurement provides prompt data for visual screening and is the critical measure for visual function assessment in clinical trials.<sup>1</sup> The present study aims to compare best-corrected (BC) distance VA results obtained using Cloudscaper symbols (CS), with LEA Symbols in children from 3 to 16 yo.

**Methods:** Cross-sectional study with 560 children. BCVA from the right eye (OD) was virtually assessed using the CS, a new optotype developed by Eyespy 20/20. Both CS and LEA charts were presented on a smartphone. The software registered the time to assess VA, each logMAR stimulus presented, and patient's responses. Subjects were sorted into groups by age ( 3 to <6 yo; 6 to <10 yo; 10-16 yo) and VA level ( $\geq 20/32$ ; <20/32 to 20/63; <20/63 to 20/125).

**Results:** Mean age of 8.8 y.o. (SD3.0 - range 3, 16). Mean logMar OD VA was 0.122 (SD 0.179 - range -0.10, 0.80) with LEA and 0.180 (SD 0.189 - range -0.10, 0.80) with CS. The absolute mean VA difference between CS and LEA in LogMAR was 0.099 (SD 0.082 - range 0.0, 0.14). VA measured by both methods were highly correlated for all age groups (Spearman correlation coefficient: 0.74,  $p < 0.0001$ ). Younger children took longer to perform the test. The first test presented had longer duration, regardless of the optotype tested.

**Conclusion/Relevance:** CS optotypes were equivalent to LEA symbols, and therefore, reliable for visual screening in children.

**References:** 1. Ciner EB, Schmidt P, Orel-Bixler D, et al. Vision screening of preschool children: evaluating the past, looking toward the future. *Optom Vis Sci* 1998;75:571-84

Poster #A120  
Thursday, March 30, 2023  
10:05 AM – 11:05 AM

## Utility of the Red Reflex Test for Detecting Ophthalmic Pathology in the Pediatric Population

Monica Manrique; Isabel Pinnell; Catherine Sano; Md Sohel Rana; Heather De Beaufort; William P. Madigan

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**Introduction:** The red reflex screening test (RRT) is heavily relied upon for early detection of ocular pathologies in children by those in primary care. Limitations in accurately detecting posterior segment pathology (PSP) have been reported<sup>1</sup>. We evaluated the utility of the RRT for detecting anterior segment pathology (ASP) and PSP in children, and the impact pharmacologic dilation and room illumination have on RRT results.

**Methods:** A prospective trial was conducted at our tertiary care institution in which Ophthalmology residents/fellows blinded to the patient's diagnosis performed a standardized RRT both in a dark room and a room with standard illumination, before and after pharmacological pupil dilation. Finally, the patient was examined by a retina specialist unaware of the RRT results to identify any ocular pathology. Analysis of the findings was performed.

**Results:** 112 eyes were analyzed. Mean age was 8.6 ±5.2 years. The RRT showed higher sensitivity and negative predictive value (NPV) for ASP, while specificity and positive predictive value (PPV) were higher for PSP. There were no statistically significant differences between RRT results in ambient light vs. a dark room, for both ASP and PSP. Dilation did not significantly affect RRT results.

**Conclusion/Relevance:** RRT is an effective screening method for children for ASP, providing high sensitivity and NPV. Our study supports the hypothesis that the RRT does not provide acceptable screening for PSP. Changes in pupil dilation and ambient lighting while conducting the RRT does not significantly impact the accuracy of the results.

**References:** 1. Subhi, Y., Schmidt, D. C., Al-Bakri, M., Bach-Holm, D., & Kessel, L. (2021). Diagnostic Test Accuracy of the Red Reflex Test for Ocular Pathology in Infants: A Meta-analysis. *JAMA ophthalmology*, 139(1), 33-40.

Poster #B1  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **IoT Patch with Built-In Micro-Sensor: Real-Time Monitoring of Occlusion Therapy**

Songa Che; Ji-Woo Hwang; A-Uk Kim; Yung-Ju Yoo

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**Introduction:** Various methods have been used to monitor compliance to occlusion treatment. This study aimed to prove the accuracy of an internet of things (IoT) patch in real-time monitoring of occlusion therapy.1

**Methods:** When an IoT patch is placed on the eye, the built-in micro-sensor perceives skin temperature and sends real-time data to a mobile application. The sensor sampling interval was set to 10 s, and real-time data was sent to the application every minute. Subjects wore the IoT patch for 15 or 30 min and recorded the wear time. To evaluate the accuracy of the micro-sensor, the difference between the body temperature and recorded temperature was analyzed. Children with amblyopia wore both conventional and IoT patches and completed an ease-of-use/comfort questionnaire.2

**Results:** Excellent monitoring accuracy and minimal delay in recorded time data was observed in both adults (N=40, 1.4 min) and children (N=30, mean 1.7 min). The difference between the actual occlusion treatment period and the period of use recorded by IoT patch, showed good agreement in both the normal adult group and patient group (95% limit of agreement half widths of 1.8 and 2.0 min, respectively). The IoT patch with a built-in micro-sensor enabled accurate monitoring of patch use in a wide range of temperatures (from 50 to 107?). No significant differences were observed in both ease-of-use and comfort scores.

**Conclusion/Relevance:** The IoT patch with a built-in micro-sensor can accurately monitor treatment compliance. Utilization of an IoT patch may increase compliance to occlusion treatment based on accurate monitoring.

**References:** Wang J, Xu H, De La Cruz B, et al. Improved monitoring of adherence with patching treatment using a microsensor and Eye Patch Assistant. *J AAPOS*. 2020;24(2):96.e1-96.e7. doi:10.1016/j.jaapos.2020.01.006

## **Binocular Treatment for Amblyopia: A Meta-Analysis of Randomized Clinical Trials**

Matilde Roda; Nicola Valsecchi; Natalie di Geronimo

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**Introduction:** To date, there is still no consensus regarding the effect of binocular treatment for amblyopia. The purpose of this systematic review and meta-analysis was to summarize the available evidence to determine whether binocular treatment is more effective than patching in children with amblyopia.

**Methods:** Four electronic databases (PubMed, Scopus, Web of Science, and Cochrane Central Register of Controlled Trials) were searched for studies that compared binocular treatment and patching in children with amblyopia. The outcome measures were visual acuity and stereopsis. Pooled effects sizes were calculated with a random-effect model. The standardized difference in means (SDM) with 95% confidence intervals (CI) was calculated. Sensitivity analysis and assessment of publication bias were performed.

**Results:** Five randomized clinical trials were included. No significant difference in visual acuity between patients treated with binocular treatment and patching was observed (SDM = -0.12; 95% CI: -0.45-0.20; P = 0.464). No significant difference in stereopsis between patients treated with binocular treatment and patching was observed (SDM = -0.07; 95% CI: -0.61-0.48; P = 0.809). For both variables, the between-study heterogeneity was high (respectively, I<sup>2</sup> = 61% and I<sup>2</sup> = 57%).

**Conclusion/Relevance:** This meta-analysis found no convincing evidence supporting the efficacy of binocular treatment as an alternative to conventional patching. Therefore, the binocular treatment cannot fully replace traditional treatment but, to date, it can be considered a valid complementary therapy in peculiar cases. Further studies are required to determine whether more engaging therapies and new treatment protocols are more effective.

**References:** Pineles SL, Aakalu VK, Hutchinson AK, Galvin JA, Heidary G, Binenbaum G, et al. Binocular treatment of amblyopia: a report by the American academy of ophthalmology. *Ophthalmology*. (2020) 127:261–272. doi: 10.1016/j.ophtha.2019.08.024  
Pediatric Eye Disease Investigator Group. A Randomized Trial of Near Versus Distance Activities While Patching for Amblyopia in Children Aged 3 to Less Than 7 Years. *Ophthalmology*. (2008) 115:2071–2078. doi: 10.1016/j.ophtha.2008.06.031  
Holmes JM, Manh VM, Lazar EL, Beck RW, Birch EE, Kraker RT, et al. Effect of a binocular ipad game vs part-time patching in children aged 5 to 12 years with amblyopia a randomized clinical trial. *JAMA Ophthalmol*. (2016) 134:1391–1400. doi: 10.1001/jamaophthalmol.2016.4262



Poster #B3  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Oculomotor Abnormalities and Contrast Balanced Dichoptic Treatments in Amblyopia

Fatema Ghasia; Sinem Beylergil; Jordan Murray; Gokce Cakir; Alexa Kaudy; Aasef Shaikh

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Cleveland Ohio

**Introduction:** The purpose of the study was to examine eye movements while viewing contrast balanced dichoptic movies to gain insights into variable dichoptic treatment response in amblyopic subjects.

**Methods:** Eye movements were recorded using infrared video-oculography during monocular, binocular and dichoptic viewing(DcV) from 9 controls and 28 amblyopes (anisometropic=8, strabismic=12,mixed=8). Subjects were classified as having either no nystagmus(n=12), fusion maldevelopment nystagmus(FMN)(n=5), and patients with nystagmus without FMN/infantile nystagmus(n=11). Eye movements were recorded while subjects watched four movie clips (60 seconds each) with video overlaid with complementary contrast masks with varying FE contrast (100%,50%,25% and 10%). Fixation and pursuit events and the location of FE and amblyopic eye(AE) were recorded. The regions of interest were broadly divided into within FE, AE vs. transition zone only or combined FE and AE and the time spent was computed. Severity of amblyopia and inter-ocular suppression was quantified using dichoptic motion coherence.

**Results:** For controls and anisometropic subjects with less inter-ocular suppression, the time spent in the AE region increased as the FE contrast was lowered. In strabismic/mixed amblyopia subjects with FMN, the eye misalignment increased as the FE contrast was lowered and subjects with FMN were less likely to demonstrate a fixation switch where the AE is looking at the target.

**Conclusion/Relevance:** Fixation stability and eye alignment changes during DcV, which can affect the ability of the AE to attend to stimuli and treatment response. Future treatment devices which track eye movements may be essential in recognizing potential non -responders and customizing the treatment approach.

**References:** 1)Pediatric Eye Disease Investigator G, Holmes JM, Manny RE, et al. A Randomized Trial of Binocular Dig Rush Game Treatment for Amblyopia in Children Aged 7 to 12 Years. *Ophthalmology*. Mar 2019;126(3):456-466. doi:10.1016/j.ophtha.2018.10.032.  
2) Kang SL BS, Otero-Millan J, Shaikh AG, Ghasia FF. Fixational Eye Movement Waveforms in Amblyopia : Characteristics of Fast and Slow Eye Movements. *JEMR* 2019.  
3) Murray J, Gupta P, Dulaney C, Garg K, Shaikh AG, Ghasia FF. Effect of Viewing Conditions on Fixation Eye Movements and Eye Alignment in Amblyopia. *Invest Ophthalmol Vis Sci*. 2022 Feb 1;63(2):33

Poster #B4  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Factors Associated with Visual Acuity Improvement with a Binocular Digital Therapeutic for Amblyopia

Isdin Oke; Eric D. Gaier; Michael X. Repka

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**Introduction:** This study aims to identify factors associated with visual acuity improvement in amblyopic children treated with a binocular digital therapeutic.

**Methods:** This retrospective analysis combined data from a prospective open-label pilot study and a randomized controlled trial of a binocular digital therapeutic. We included all children (4 to  $\leq 12$  years old) with best corrected visual acuity measurements following a 12-week, one hour/day, 6 days/week treatment regimen. Treatment response was defined as  $\geq 1$  logMAR lines improvement in visual acuity of the amblyopic eye. Multivariable logistic regression was used to model the association between treatment response and baseline factors (age, sex, race, amblyopia laterality/type/severity, and prior treatment type/duration), adjusting for adherence (actual divided by prescribed usage).

**Results:** 121 children were included with a median age of 6.0 years (IQR, 5.0-7.0 years); 46% (n=56) were female. The median adherence was 86% (IQR, 68% to 99%). Visual acuity in the amblyopic eye improved by  $\geq 1$  line in 81% (n=98) of children. None of the baseline factors investigated, including those associated with a poorer response to patching (i.e., age, duration of prior treatment), were associated with visual acuity improvement, though the analysis is limited by sample size.

**Conclusion/Relevance:** Visual acuity improved in four of five children treated for 12 weeks with this binocular therapeutic. The benefit observed across clinical factors known to reduce efficacy of patching suggests a broad role for this approach. As current amblyopia treatments become less effective with age,<sup>1</sup> the value of binocular therapy among older children deserves consideration.

**References:** 1. Holmes, J. M., et al. (2011). 'Effect of age on response to amblyopia treatment in children.' Arch Ophthalmol 129(11): 1451-1457.

Poster #B5  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Optical Coherence Tomographic Angiography-Based Retinal Vascular Density Changes at the Macula in Children with Unilateral Amblyopia

Gorka Sesma, MD; Tasnim Almairi, MD; Heba Khashoggi, OD; Fahad Aljohar, OD

King Khaled Eye Specialist Hospital  
Saudi Arabia

**Introduction:** To correlate the Retinal Vascular Density (RVD) changes at macula to the best corrected visual acuity (BCVA) changes following occlusion therapy for amblyopia in children.

**Methods:** In this cohort, children with unilateral amblyopia treated with occlusion were evaluated by OCTA to study RVD in the macula in 2021-22. BCVA (logMAR) before and at each of four OCTA were compared in amblyopic and fellow eyes. The pretreatment determinants on the correlation of BCVA to RVD changes were reviewed.

**Results:** In this cohort of 30 amblyopic and 30 fellow eyes the BCVA improved from median 0.6 (inter quartile range IQR 0.5; 1.1) pretreatment to median 0.4(IQR 0.2; 0.6) posttreatment in amblyopic eyes and from median 0.1 to 0.05 in the fellow eyes. The total change% of RVD in amblyopic eyes was significantly more than in the fellow eye ( $Z = -1.92$ ,  $P = 0.05$ ). The BCVA change in amblyopic eye after median 98 months (IQR 69; 126) of intervention was significantly correlated to the refraction adjusted change in RVD ( $B = -0.029$ , (95% CI  $-0.040$ ;  $-0.018$ ),  $P < 0.001$ ) and was influenced by strabismus [ $B = -0.461$  (95% CI  $-0.586$ ;  $-0.336$ )  $P < 0.001$ ], type of amblyopia [ $B = 0.235$  (95% CI  $0.115$ ;  $0.356$ ),  $P < 0.001$ ], duration of occlusion [ $B = -0.433$  (95% CI  $-0.645$ ;  $-0.221$ ),  $P < 0.001$ ] and occlusion compliance [ $B = 0.236$ , (95% CI  $0.111$ ;  $0.361$ ),  $P < 0.001$ ].

**Conclusion/Relevance:** OCTA based RVD and vision changes at macula and their determinants could help understanding functional and hemodynamic changes in amblyopic eye posttreatment.

**References:** 1. Gunzenhauser RC, Tsui I, Velez FG, et al. Comparison of Pre-Treatment vs. Post-Treatment Retinal Vessel Density in Children with amblyopia. *J Binocul Vis Ocul Motil.* 2020;70(3):79-85. doi: 10.1080/2576117X.2020.1760695.  
2. Huang X, Liao M, Li S, Liu L. The effect of treatment on retinal microvasculature in children with unilateral amblyopia. *J AAPOS.* 2021;25(5):287.e1-287.e7. doi: 10.1016/j.jaapos.2021.05.011.  
3. Nishikawa N, Chua J, Kawaguchi Y, et al. Macular microvasculature and associated retinal layer thickness in pediatric amblyopia: Magnification-corrected analyses. *Invest Ophthalmol Vis Sci.* 2021;62(3):39. doi: 10.1167/iovs.62.3.39.

Poster #B6  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Scleral Lens Visual Rehabilitation After Selective Endothelial Removal in Peters' Anomaly

Lucie B. Moore; Penny Straughn, OD; Casey Beal, MD

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**Introduction:** Peters' Anomaly is a rare congenital anterior segment dysgenesis with variable presentation of corneal opacities. We describe an infant diagnosed with Peters' Anomaly Type 1 who was visually rehabilitated with a novel impression based scleral lens (IBSL) and Selective Endothelial Removal (SERM).

**Methods:** A 0-day old male was seen in the hospital after vaginal delivery for corneal clouding. He was born full term and otherwise healthy. Corneas had central haze right greater than left with iridocorneal adhesions and no cataract. He was started on cyclopentolate/phenylephrine OU. Sensory nystagmus developed at 3 months. Amblyopia was managed with patching OS, and he was fit with gas permeable contact lenses OU. Optical iridectomy and SERM of OD were performed at 6 months old to reduce risk of amblyopia.

**Results:** Impressions for IBSL were performed at 10 months of age, one of the youngest implementations of scleral lens technology in literature and the only reported use in an infant with Peters Anomaly. The back optic zone was maximized secondary to the optical iridectomy of the right and pharmacologically dilated left pupil. The patient was more independent at the 2-week follow-up of wearing scleral lenses daily and continues to improve over the intervening 10 months.

**Conclusion/Relevance:** Treatment options should be tailored to the severity of Peters' Anomaly. IBSL followed by careful visual rehabilitation increased visual function in our patient and showed IBSL to be an encouraging new treatment for children with Peters' Anomaly.

**References:** 1Lesnik Oberstein SAJ, Ruivenkamp CAL, Hennekam RC. Peters Plus Syndrome. 2007 Oct 8 [updated 2017 Aug 24].

In: Adam MP, Ardinger HH, Pagon RA, Wallace SE, Bean LJH, Gripp KW, Mirzaa GM, Amemiya A, editors.

GeneReviews®

[Internet]. Seattle (WA): University of Washington, Seattle; 1993–2022. PMID: 20301637.

2 Kenyon KR. Mesenchymal dysgenesis in Peter's anomaly, sclerocornea and congenital endothelial dystrophy. *Exp Eye Res.* 1975 Aug;21(2):125-42. doi: 10.1016/0014-4835(75)90077-9. PMID: 1100415.

Poster #B7

Saturday, April 1, 2023

9:50 AM – 10:50 AM

## Exposure Keratopathy in Hospitalized Patients at a Tertiary Care Children's Hospital

Leyla Yavuz Saricay, MD; Ryan Gise; Isdin Oke; Eric Gaier; Bharti R. Nihalani; Joseph Griffith; Ankoor S. Shah;  
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**Introduction:** Exposure keratopathy (EK) has been described in hospitalized adult patients particularly in those who are intubated and sedated. Data regarding EK in pediatric inpatients may help inform hospital best practices and reduce visual morbidity. The purpose of this study was to identify the prevalence and management strategies of EK for inpatients.

**Methods:** A retrospective chart review was performed of inpatients at a tertiary care children's hospital seen by ophthalmology for EK between January 1, 2017, through June 30, 2022. Data collected included demographics, location and etiology of injury, ophthalmological exam findings, and treatment. The study was approved by our Institutional Review Boards.

**Results:** Forty-nine patients were identified with a mean age of  $13.5 \pm 10.2$  years. Consultations were most frequent from the cardiac intensive care unit (26.5%). Ophthalmology followed patients for a mean of  $4.4 \pm 3.8$  visits with a mean follow up of  $15.6 \pm 3.1$  days. Bilateral involvement occurred in 71% of cases. Surgical intervention preceded iatrogenic injury of the cornea in 57% of patients, 39% of patients were sedated, and 23% were intubated. Corneal changes included punctate epitheliopathy (59%), epithelial defects (25%), and corneal ulcers (16%). Treatments included artificial tears (100%), antibiotic ointment (85%), tarsorrhaphy (10%), nerve regenerating therapy (6%), amniotic membrane placement (4%), and bandage contact lens (4%). Corneal scarring was identified in 45% of patients at last follow-up.

**Conclusion/Relevance:** EK in inpatients often occurs bilaterally and may result in corneal scarring. Multidisciplinary hospital-based protocols are needed to prevent visual impairment from the consequences of EK.

**References:** 1- Cornea 2019 Sep;38(9):1124-1130. doi: 10.1097/ICO.0000000000001961. Prevalence and Risk Factors of Exposure Keratopathy Across Different Intensive Care Units

Poster #B8  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Rise in The Incidence of Pediatric Severe Blepharokeratoconjunctivitis During The COVID-19 Pandemic

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**Introduction:** Blepharokeratoconjunctivitis (BKC) is a chronic inflammatory disease of the lid margin with secondary conjunctival and corneal involvement, which may lead to irreversible vision loss. A history of recurrent chalazia is associated with BKC and a rise in the incidence of chalazia has been reported and linked to mask use since the emergence of the COVID-19 pandemic. Our aim was to assess the number of new presentations of severe BKC during the COVID-19 pandemic.

**Methods:** A retrospective chart review of all patients under the age of 18 years old with severe BKC was performed between March 2010 and March 2022 at a tertiary referral pediatric hospital. We only included patients with corneal complications secondary to severe BKC, defined as corneal inflammation, new vessel formation, scarring, thinning and lipid deposits. Patients with only mild epitheliopathy and peripheral pannus were excluded. Statistical analysis was conducted using a Poisson regression model using the R Project Program version 4.0.5.

**Results:** A total of 257 children with severe BKC were included with an average age of 8 years at presentation. Since March 2020 there was a significant rise in the number of children presenting with severe BKC compared to the previous 10 years (IRR of 3.03, 95% confidence interval (CI) 2.35-3.89, p-value <0.001).

**Conclusion/Relevance:** A significant rise in BKC over the pandemic is of concern and clinicians and allied healthcare professionals should be aware to aid early recognition and treatment of the disease to prevent vision loss. Increase in mask use is considered as an associated factor.

**References:** 1) Hammersmith KM, Cohen EJ, Blake TD, et al. Blepharokeratoconjunctivitis in children. *Arch Ophthalmol* 2005; 123:1167 - 1670  
2) Hammersmith KM. Blepharokeratoconjunctivitis in children. *Curr Opin Ophthalmol*. 2015 Jul;26(4):301-5.  
3) Silkiss, R. Z., Paap, M. K., & Ugradar, S. (2021). Increased incidence of chalazion associated with face mask wear during the COVID-19 pandemic. *American Journal of Ophthalmology Case Reports*, 22, 101032.

Poster #B9  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Blepharokeratoconjunctivitis Outcomes in Children**

Kamiar Mireskandari; Ramez Barbara; Sina Khalili; Asim Ali

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**Introduction:** Blepharokeratoconjunctivitis (BKC) when severe may lead to irreversible vision loss. Evidence is lacking with regards to this entity in the pediatric age group. We report on a large cohort of patients and their treatment outcomes.

**Methods:** Patients under 18 years of age with severe BKC treated at our tertiary hospital between 2006-2021 and more than 6 months follow-up were reviewed. Data collected included basic demographics, clinical examination findings including extent of corneal involvement, type of systemic or topical antibiotic therapy and time to flare up. |Statistical analysis performed using Kaplan Meier survival analysis and comparing binary outcomes using multiple logistic regression model and univariate regression analysis .

**Results:** 315 eyes of 197 patients with severe BKC fit the inclusion criteria showing female predominance, primarily bilateral disease and an average age of 7.6 years at presentation. The central and peripheral corneas were primarily affected by scarring (37%) and neovascularization (64%) respectively. 73% required systemic antibiotic treatment (erythromycin, clarithromycin, doxycycline or azithromycin) of varying durations and 25% had subsequent flare-ups requiring escalation in treatment at average follow-up of 37 months. No relationship was found regarding the different systemic antibiotics used and reduction of flare-ups over time. At the last visit, 83% had best corrected visual acuity of  $\leq 0.3 \log \text{MAR}$  and 30% had an amblyogenic cylinder of  $\geq 1.5 \text{D}$ .

**Conclusion/Relevance:** This is the largest reported series describing severe BKC outcomes in children, highlighting the incidence of vision-threatening corneal scarring and the need for long-term follow-up for disease recurrence.

**References:** 1) Hammersmith KM, Cohen EJ, Blake TD, et al. Blepharokeratoconjunctivitis in children. Arch Ophthalmol 2005; 123:1167 - 1670

Poster #B10  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Preliminary Outcomes of Cyclosporine Ophthalmic Emulsion 0.05% Use in Pediatric Blepharokeratoconjunctivitis**

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Los Angeles, California

**Introduction:** Pediatric blepharokeratoconjunctivitis (BKC) is a chronic ocular surface inflammatory disease. Most patients respond well to a two-pronged approach of anti-inflammatory and antibiotic therapies<sup>1</sup>. However, in a subset of recalcitrant or steroid-dependent cases, usage of immunomodulators may be necessary<sup>2</sup>. Here, we report our experience using topical cyclosporine 0.05% (CsA0.05%) for the treatment of pediatric BKC.

**Methods:** Retrospective review of pediatric patients treated with topical CsA0.05% for BKC between 2018 - 2021 with at least 6 weeks of follow-up. Eyes with history of infectious disease or prior use of topical/systemic immunomodulators (except corticosteroids) were excluded. Primary endpoint is change in the number of episodes of disease reactivation (flare) before and after the use of CsA0.05%.

**Results:** 40 patients were treated with CsA0.05% BID during the study period. Mean age of patients was 10.0±3.3 years and mean follow-up was 16.6 months (range 1.5 - 63.3 months). The median time between first clinic visit and initiation of CsA0.05% was 9.3 months. Mean number of flares per year was 3.6 prior to CsA0.05%, which reduced to 1.0 while on CsA0.05%. Within the first month of starting CsA0.05%, all patients were able to taper topical corticosteroids usage. Recurrence of inflammation on CsA0.05% occurred in 16.7% of patients, all responded to a single steroid taper. No other adverse effects were identified.

**Conclusion/Relevance:** The efficacy of CsA0.05% in reducing the frequency of acute flares was demonstrated in this study. In addition, in 83% of patients, CsA0.05% was an effective monotherapy for long-term disease control.

**References:** 1. O'Gallagher, Michael, et al. "Topical treatments for blepharokeratoconjunctivitis in children." Cochrane Database of Systematic Reviews 2 (2017).

2. Dahlmann-Noor, Annegret H., et al. 'Cyclosporine A 1mg/ml in pediatric blepharokeratoconjunctivitis: Case series of 145 children and young people.' The Ocular Surface (2022).



Poster #B11

Saturday, April 1, 2023

9:50 AM – 10:50 AM

## **Efficacy of Cyclosporine A Cationic Emulsion (CsA CE) in Patients with Vernal Keratoconjunctivitis (VKC) not Needing Rescue Medication: Pooled VEKTIS**

Kara M. Cavuoto, MD; Dominique Bremond-Gignac, MD, PhD, FEBO; Serge Doan, MD; Pierre-Jean Pisella, MD; Sherif El-Harazi, MD, MPH; Andrea Leonardi, MD

**Introduction:** Analysis of the data from the Phase II/III (NOVATIVE) [1] and Phase III (VEKTIS) [2] trials has demonstrated that cyclosporine A cationic emulsion (CsA CE) is well tolerated in children and adolescents with active vernal keratoconjunctivitis (VKC) [1]. In order to assess its clinical efficacy, we analyzed the effect of CsA CE on keratitis in patients from both trials.

**Methods:** Pooled treatment groups were comprised of the CsA CE 0.1% QID arms from both trials (high-dose); the CsA CE 0.05% QID arm from NOVATIVE and CsA CE 0.1% BID arm from VEKTIS (low-dose); and the vehicle QID arms from both trials (vehicle). Keratitis was assessed by corneal fluorescein staining (CFS) using the modified Oxford Scale. As only the VEKTIS protocol allowed rescue corticosteroid therapy, patients who received rescue therapy were excluded from analysis. Adverse events were monitored and recorded.

**Results:** Of 196 patients included in this analysis, 69 had received high-dose CsA CE, 68 low-dose, and 59 vehicle. Mean CFS scores in the high-dose, low-dose, and vehicle groups, respectively, were  $3.59 \pm 1.00$ ,  $3.72 \pm 0.96$ , and  $3.61 \pm 0.91$  at Baseline;  $1.73 \pm 1.52$ ,  $2.01 \pm 1.52$ , and  $2.45 \pm 1.63$  at Month 1; and  $0.81 \pm 1.09$ ,  $1.10 \pm 1.24$ , and  $1.10 \pm 1.31$  at Month 4. No serious adverse events were reported in any group.

**Conclusion/Relevance:** These data support the efficacy and potentially steroid-sparing benefits of CsA CE 0.1% in children and adolescents with VKC.

**References:** 1. Bremond-Gignac D, Aragona P, Doan S, Amrane M, Ismail D, Montero J, et al. Safety and tolerability of topical cyclosporine A cationic emulsion in patients with active severe vernal keratoconjunctivitis (VKC) in pediatric patients: Pooled results of the NOVATIVE and VEKTIS trials. (Poster 6710-B0165). Presented at Annual Meeting of the Association for Research in Vision and Ophthalmology (ARVO); Vancouver, BC, Canada. April 28–May 2, 2019.

2. Leonardi A, Doan S, Amrane M, Ismail D, Montero J, Nemeth J, et al. A randomized, controlled trial of cyclosporine a cationic emulsion in pediatric vernal keratoconjunctivitis: The VEKTIS study. *Ophthalmology*. 2019;126(5):671-681.

Poster #B12  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Usability of Delivery Aid for Vernal Keratoconjunctivitis Single-Dose Treatment

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**Introduction:** Usability of eye drop containers is particularly important for patient compliance when treating chronic eye diseases like vernal keratoconjunctivitis (VKC), glaucoma and ocular surface disease (1). Factors affecting treatment adherence include the convenience of use of the medication (2). The findings suggest that preferences may differ including the mechanical characteristics of the packaging or what the drop control is like (3). Santen has developed Dropaid VKC Single-Use, a delivery aid for use in combination with Verkazia in single use containers, that aims to help caregivers instill eye drops.

**Methods:** Eligible participants used Dropaid VKC Single-dose to administer CATIONORM PRO emulsion drops to a medical dummy, and then evaluated the usability characteristics of the delivery device by completing a questionnaire. Thirty adult participants were recruited and the usability was assessed through drop control, which was performed by an observer.

**Results:** Thirty patients completed the study. Most of the participants were females between 41 and 50 years old. 56% of the participants had experience using multi dose treatment and 43% using single dose drops, average of 3 to 5 years of overall experience. 76% of the participants found the general usability of the Dropaid VKC Single-dose container very easy, however 53% would recommend its use, 30% maybe and 17% would not recommend it. Most of the participants use the right hand to instil the drops, applying to the left eye first with approximately 2 drops per try.

**Conclusion/Relevance:** Dropaid VKC Single-dose is a helpful tool to help caregivers instill eye drops from single use containers.

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2. Newman-Casey PA, Robin AL, Blachley T, et al. The Most Common Barriers to Glaucoma Medication Adherence: A Cross-Sectional Survey. *Ophthalmology* 2015; 122: 1308-1316.  
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Poster #B13  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Clinical Outcomes in Pediatric Tubulointerstitial Nephritis and Uveitis Syndrome (TINU) - A Multicenter Review**

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**Introduction:** Pediatric TINU is a rare, multisystem inflammatory disease characterized by acute interstitial nephritis and inflammatory uveitis. Few studies describe the long-term outcomes in children. We aim to evaluate the clinical presentation, course of uveitis, and treatment of TINU.

**Methods:** Retrospective review of patients < 21 years of age with TINU from 10 sites across USA and Canada. Clinical diagnosis of TINU required uveitis diagnosed by an ophthalmologist plus 2 of the following - abnormal urinalysis, elevated serum creatinine and elevated urine  $\beta$ 2-microglobulin. Renal biopsy was not mandatory.

**Results:** 110 patients (Median age 13.2 years; 48.2% women) were included. Median follow-up: 1.6 years. Uveitis presentation was symptomatic (90%), anterior (80%), bilateral simultaneous (63.6%), bilateral sequential (30%). 9% were controlled with topical and 7% with systemic glucocorticoids alone. 92 (84%) children required steroid-sparing immunomodulatory treatment (IMT) including Methotrexate (n=44), Mycophenolate (n=39), other (n=9) as the first agent; with 44.5% escalating to biologic agent (Adalimumab [n=33], Infliximab [n=8]). Recurrences of nephritis and uveitis occurred in 15% and 53% respectively. At most recent visit, nephritis was controlled in 90%, while uveitis controlled in only 73.6%. Four patients required glaucoma surgery. Nine patients had mild renal complications. 86.3% had no loss of BCVA, with vision loss occurring in 14% (4.2% lost 1 line, 4.2% lost 2 lines, 5.3% lost > 3 lines)

**Conclusion/Relevance:** Uveitis in TINU is challenging to control, 25% patients had active uveitis despite systemic IMT and 14% had vision loss at the last follow-up.

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2. Mandeville JT, Levinson RD, Holland GN. The tubulointerstitial nephritis and uveitis syndrome. *Surv Ophthalmol.* 2001; 46:195-208.  
3. Tirelli F, Shafer BM, Davidson SL, Lerman MA. Immunomodulation and TNF-a inhibition for tubulointerstitial nephritis and uveitis syndrome: a case series. *J AAPOS* 2021;25:267.e1-6

Poster #B14  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Comparison of Uveitis Incidence by Medication in Juvenile Idiopathic Arthritis and Implications for Screening

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**Introduction:** Though studies have shown that disease-modifying anti-rheumatic drugs (DMARDs) impact uveitis incidence rates, medications are not incorporated into the risk-stratification guidelines.<sup>1,2</sup> We determined uveitis incidence in Juvenile Idiopathic Arthritis (JIA) patients treated with DMARDs, and to evaluate uveitis risk-stratification protocols.

**Methods:** Medical records of JIA patients from 04/2014-04/2022 and >18-months follow-up were reviewed. Exclusion criteria included uveitis history prior to study period and Still's Disease. Patient characteristics, medications, and uveitis status were recorded. Factors associated with uveitis development were analyzed and statistically significant metrics used to determine empiric risk-stratification criteria. These criteria and American College of Rheumatology (ACR) risk-stratification guidelines were applied retroactively to determine predictive power.

**Results:** One hundred eighty-four patients met inclusion criteria. Twenty-one new cases of uveitis developed during the study period. There were no statistically significant differences between no DMARD treatment (None), methotrexate (MTX), and etanercept (ETA) groups in uveitis incidence, while the adalimumab (ADA) and other biologics groups had no uveitis cases. Under the empirically determined criteria the ratio of uveitis incidence between high and low-risk groups was 8.21 (2.68-33.55)  $p < 0.0001$ , while it was 1.90 (0.72-4.93)  $p = 0.15$  under the ACR criteria.

**Conclusion/Relevance:** Patients on MTX, ETA, and no DMARDs were comparable in JIA-associated uveitis incidence, while there were no new cases with ADA or other biologics. Further, we found increased predictive power in the empiric criteria in comparison to current ACR risk-stratification.

**References:** Davies R, De Cock D, Kearsley-Fleet L, et al. The risk of uveitis in patients with JIA receiving etanercept: the challenges of analysing real-world data. *Rheumatology (Oxford)*. Jun 1 2020;59(6):1391-1397.

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Angeles-Han ST, Ringold S, Beukelman T, et al. 2019 American College of Rheumatology/Arthritis Foundation Guideline for the Screening, Monitoring, and Treatment of Juvenile Idiopathic Arthritis-Associated Uveitis. *Arthritis Care Res (Hoboken)*. Jun 2019;71(6):703-716. doi:10.1002/acr.23871

Poster #B15  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Leukemic Relapse in the Anterior Segment of the Eye: A Systematic Review & Meta Analysis**

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**Introduction:** Leukemic relapse in the eye can be a diagnostic challenge in young patients, and limited data exist to identify the most frequent relapse signs. Ocular relapse may be a sign of central nervous system relapse, but systemic studies of the cerebral spinal fluid, bone marrow, and CT/MRI do not invariably identify leukemic relapse. Furthermore, there are little data on the utility of an anterior segment biopsy to aid in detection of systemic recurrence.

**Methods:** A systematic review and meta-analysis of all reported cases of anterior segment leukemic relapse were conducted following PRISMA guidelines. Cases were reviewed if they described a patient with leukemic relapse in the anterior segment of the eye. One hundred and thirteen subjects met criteria for inclusion.

**Results:** The most common signs of anterior segment relapse were conjunctivitis in 67 subjects (59.29%), hypopyon in 62 subjects (54.87%), iris involvement in 45 subjects (39.82%), and AC cells in 28 subjects (24.78%). In subjects with anterior segment biopsy-proven disease, 74.42% (n = 43) showed no systemic relapse.

**Conclusion/Relevance:** A leukemic relapse should be considered in any patient with a history of acute leukemia and an unexplained anterior segment inflammation or iris abnormality. Additionally, a large percentage of patients with biopsy-proven anterior segment leukemic relapse were found to have normal systemic studies, calling into question the utility of relying on systemic evaluations in the event of ocular relapse. Fine needle aspiration of the anterior segment to evaluate for the presence of leukemic cells can provide a reliable and definitive diagnosis of leukemic relapse.

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Poster #B16  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Characterization of the Anterior Eye in Trisomy 21 Patients

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**Introduction:** Trisomy 21 (T21) occurs in 1 in 800 live births, and individuals with T21 are at risk for many medical and ophthalmic conditions. Cataracts are the most frequent vision-threatening intraocular pathology in patients with T21, with an incidence of 15%. Understanding structural features in T21 eyes with and without cataract can aid early detection of childhood cataracts. Structural features can be assessed through ultrasound biomicroscopy (UBM), a non-invasive, high-resolution imaging technique used to visualize the anterior segment of the eye.]

**Methods:** This case-control study utilizes UBM imaging to compare structural features in T21 patients with and without cataract, compared to controls. 5 subjects (9 eyes) with T21 and cataract, and 7 subjects (11 eyes) with T21 without cataract were imaged using UBM, with 4:1 age-matching to healthy controls. Patients ranged from 1 month to 25 years old (mean = 9.06).

**Results:** 31 structural parameters were measured following a prospective image analysis protocol. Student's t-test showed control patients had a thicker maximum iris thickness than T21 patients with ( $p = 0.001$ ) and without cataract ( $p = 0.006$ ). T21 patients with cataract were found to have thinner lenses than T21 patients without cataract ( $p = 0.027$ ) and controls ( $p = 8.61 \times 10^{-5}$ ). This suggests features of the iris are associated with T21 regardless of cataract, while features of the lens were associated only with cataracts.

**Conclusion/Relevance:** These results enhance our understanding of the unique structure of T21 eyes in the presence and absence of cataract, aiding in early diagnosis and treatment of childhood cataracts.

**References:** 1. Newberger DS. Down syndrome: Prenatal risk assessment and diagnosis. American Family Physician. August 15, 2000. Accessed October 4, 2022.

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Poster #B17  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## A Comparison of Aphakic Contact Lenses in Children - 1 Year Follow Up Data

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**Introduction:** The preferred contact lens for pediatric aphakia has historically been Silsoft, a silicone elastomer lens. Sixty-nine eyes of 49 patients were refit into an alternative contact lens in late 2021 due to supply chain disruption. . Three months after initial fitting, 34 patients were successfully wearing an alternative lens. The purpose of this study is to analyze the contact lens preference of these patients 1-year after initial re-fit.

**Methods:** Thirty-three aphakic children refit into an alternative aphakic contact lens were included in the study. Their refractive correction preference after 8-12 months of wear was determined by parent interviews and patient records.

**Results:** Approximately 1-year after the re-fitting, 44% of patients (n=15) remained in the alternative lens (Flexlens Definitive 74, Biofinity XR, or Intelliwave Toric), 29% (n=10) returned to Silsoft, 15% (n=5) underwent secondary intraocular lens placement and 12% (n=4) opted for glasses. There was no significant difference in age in patients who remained in the alternative lens (7.5+/-3.8 years) vs. those who returned to Silsoft (5.7+/-4.0 years, p=0.28). There was also no significant difference in average keratometry readings between the two groups (7.56+/-0.13 mm vs. 7.62+/-0.20 mm, p=0.59).

**Conclusion/Relevance:** One year after the initial alternative contact lens fitting, a little less than half the patients continued with the alternative contact lens despite Silsoft lenses returning to the market.

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Poster #B18  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Primary Iris Claw Intraocular Lens Implantation in Children

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**Introduction:** Few long-term studies support the safety and efficacy of primary intraocular lens (IOL) implantation in the pediatric population in the absence of capsular support. This study aims to report outcomes and complications of primary iris claw IOL implantation in children with ectopia lentis.

**Methods:** The medical records of children who underwent primary iris claw aphakia IOL implantation for ectopia lentis over a period of nine years were reviewed retrospectively. Best-corrected visual acuity (BCVA), intra- and postoperative complications, reoperations, and corneal endothelial cell loss (ECL) were evaluated.

**Results:** 30 eyes of 17 children were included. The mean age at surgery was 9 years (range 4-17). Mean follow-up after surgery was 5.1 years (range 0.5-9.3 years) with 46.7% more than 5 years. Mean BCVA improved from 0.60 to 0.21 logMAR ( $p < 0.001$ ). No eyes had decreased BCVA at the end of follow-up. One (3.3%) intraoperative and 15 (50%) postoperative complications occurred. Eleven reoperations in 8 eyes were needed, 6 (54.5%) for IOL dislocation with the majority secondary to trauma. 73.3% of the complications arose after 18 months of surgery. The mean ECL was 9.1% one year after surgery. Three patients had ECL over 20%, 2 of which were associated with prior IOL dislocation. No patients needed IOL explantation.

**Conclusion/Relevance:** Our study demonstrates that primary iris claw IOL implantation in children resulted in good visual outcomes. A considerable number of late complications occurred. ECL following surgery was similar to that reported in previous studies of secondary implantation.

**References:** 1. Fuerst R, Trivedi RH, Wilson ME, Wolf B. Prospective analysis of Artisan aphakia intraocular lens implantation for nontraumatic ectopia lentis in children. *J AAPOS* 2022; 26(4):171.e1-171.e6

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## **IOL Calculation in Pediatric Cataract with Immersion Ultrasound and SRK/T Formula in a Mexican Population.**

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**Introduction:** Intraocular lens (IOL) calculation in pediatric patients is still a paramount challenge. Many factors influence the refractive outcome such as axial length, method used for keratometry measurement, IOL calculation formula and ocular growth.

**Methods:** Pediatric patients after cataract surgery with IOL implantation were included. IOL was calculated using immersion ultrasound and SRK/T formula. Prediction error was calculated 1 month after surgery. We compared patients with primary versus secondary IOL implantation and those that achieved a prediction error of  $\pm 0.5$  diopters (D) depending on keratometry measurements, axial length and type of IOL versus those who did not.

**Results:** 50 eyes of 37 patients were included. Mean age at IOL implantation was 69.72 months. The average prediction error was  $-1.01(\pm 1.33)$  D, with no difference between primary or secondary IOL implantation ( $p=0.53$ ). The mean prediction error of eyes with an axial length less than 22 mm was  $-1.05(\pm 1.34)$  D, from 22 to 23.5 mm was  $-1.04(\pm 1.34)$  D and axial length greater than 24.5 mm was  $-0.62(\pm 1.45)$  D. The prediction error depending on the method of keratometry measurement was  $-0.853(\pm 1.28)$  D using IOL Master® 500,  $-1.01(\pm 1.42)$  D with mean keratometry for age and  $-1.41(\pm 1.14)$  D with manual keratometry.

**Conclusion/Relevance:** The prediction error of the SRK/T formula showed a refractive undercorrection resulting in insufficient hyperopic refraction. Variables such as primary or secondary IOL implantation ( $P=0.084$ ), axial length ( $P=0.513$ ) and method of keratometry measurement ( $P=0.861$ ) had no statistical difference between patients who achieved a  $\pm 0.5$  D of prediction error and those who did not.

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Poster #B20  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Surgical and Visual Outcomes of Lensectomy with and without IOL Implantation in Microspherophakia: A Retrospective Analysis.**

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**Introduction:** To study the effect of lensectomy with primary intraocular lens (IOL) implantation versus without implantation, on the visual outcome, intraocular pressure (IOP) control, and postoperative complications in microspherophakia (MSP).

**Methods:** A retrospective analysis of children with MSP who underwent surgery in Cairo University Pediatric Ophthalmology and Strabismus unit between January 2016 and December 2021. Diagnosis was based on clinical features with the use of ultrasound biomicroscopy (UBM) in doubtful cases.

**Results:** Twelve patients (mean age of  $5 \pm 3.7$  years) underwent surgery. Four patients (8 eyes) underwent lensectomy with iris claw IOL implantation (Group A); fixated anteriorly in 2 eyes and retropupillary in 6 eyes, while 8 patients (15 eyes) underwent lensectomy without implantation (Group B). Post-operatively, logMAR best corrected visual acuity (BCVA) improved  $4.5 \pm 2.5$  lines (range, 0.7 – 0.0 logMAR VA) in group A versus  $2 \pm 2$  lines (range, 2 – 0.48 logMAR VA) in group B. Preoperative secondary glaucoma (IOP = 21 mmHg) was diagnosed in 8 eyes (32%): two eyes in group A with spontaneous control after surgery, and 6 eyes in group B; one eye was controlled using topical antiglaucoma medications, 2 eyes achieved IOP control after glaucoma surgery(s), and 3 eyes remained uncontrolled despite multiple procedures. Re-enclavation (1 eye), mild pigment dispersion (2 eyes), delayed inflammatory reaction (1 eye) were reported complications in group A. Rhegmatogenous retinal detachment (1 eye) was reported in group B.

**Conclusion/Relevance:** Lensectomy with primary IOL implantation in MSP is a safe option with better visual outcome and control of IOP, whereas aphakia is associated with lower visual outcome, and higher incidence of interactable glaucoma.

**References:** Thau A, Lloyd M, Freedman S, Levin A. New classification system for pediatric glaucoma. *Current Opinion in Ophthalmology*. 2018;29(5):385-394.

Poster #B21  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Safety of Simultaneous Bilateral Intraocular Surgery in Pediatric Patients: Long-Term Outcomes

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**Introduction:** Simultaneous bilateral intraocular surgery (SBIS) is defined as bilateral intraocular surgery completed in one operation. This is an alternative in pediatric patients that have high anesthesia-related risk, difficulty with travel and follow-up, and risk of monocular stimulus deprivation amblyopia.<sup>1-3</sup> The aim of the study was to evaluate the safety of SBIS in pediatric patients under general anesthesia.

**Methods:** This is a retrospective, descriptive, longitudinal study of pediatric patients who underwent SBIS (2009 - 2022) by a single surgeon at Children's medical center of Dallas.

**Results:** Nineteen patients (38 eyes) were included. Mean follow-up was 3.62±2.86 years (3 months – 10.25 years). Mean age at time of surgery was 22.33 months (range 0.91 months – 12.05 years). Cataract extraction with anterior vitrectomy without intraocular lens (IOL) was the most performed procedure (24 eyes, 63.16%). Twelve cases (31.58%) had simultaneous IOL implantation: 8 (21.05%) primary and 4 (10.53%) secondary. Two cases (5.26%) had pupillary membrane removal with pupilloplasty. Anesthesia-related risk was the main reason to perform simultaneous bilateral surgery in 95% of patients. No anesthesia-related complications or post-operative ocular complications were reported.

**Conclusion/Relevance:** SBIS is a safe alternative to sequential surgery in patients with a high risk of anesthesia complications or with other special considerations. Specific surgical asepsis should be rigorously followed to prevent endophthalmitis.

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Poster #B22  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Incidence and Risk Factors of Retinal Detachment after Pediatric Cataract Surgery (A Tertiary Center Model)**

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**Introduction:** To determine the incidence and risk factors of retinal detachment following pediatric cataract surgery and to compare the incidence of retinal detachment in limbal versus pars plicata approach for lens removal.

**Methods:** Retrospective review of data of all children who underwent pediatric cataract surgery during the time period of 2016 to 2021 in Cairo University Children Hospital. Cataract cases due to trauma, acquired systemic or ocular pathology, and cases with ocular anomalies associated with the development of retinal detachment were excluded.

**Results:** Among 568 eyes of 372 children undergoing surgery for congenital cataract (66% via anterior approach and 34% via pars plicata approach), 8 eyes (7 children, 1.4%) developed retinal detachment at a mean time of  $2.14 \pm 1.68$  years after surgery. Five eyes had undergone pars plicata lens removal and 3 eyes had undergone lens removal through a limbal approach ( $p= 0.09$ ).

Secondary glaucoma was detected in 5 of the 8 eyes that developed RD ( $p$  value; 0.0001). One eye was controlled with antiglaucoma eye drops, two eyes needed cyclo-photocoagulation and two eyes needed glaucoma surgeries. Age, sex, reoperation for visual axis opacification, primary IOL implantation and secondary IOL implantation did not affect the incidence of retinal detachment ( $p$  value 1, 0.39, 0.92, 0.59, 0.35 respectively).

**Conclusion/Relevance:** Secondary glaucoma was associated with higher incidence of retinal detachment after congenital cataract surgery. Surgical approach did not affect the incidence. A larger sample is needed to confirm this observation.

**References:** Birgitte Haargaard; Elisabeth W. Andersen; Anna Oudin; Gry Poulsen ; Jan Wohlfahrt; Morten la Cour; Mads Melbye . Risk of Retinal Detachment after Pediatric Cataract Surgery. Investigative Ophthalmology & Visual Science May 2014, Vol.55, 2947-2951.

Poster #B23  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Prevalence of Retinal Detachment in Pediatric Cataract Population**

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**Introduction:** Retinal detachment (RD) following cataract surgery in the adult population has been well documented and if left untreated can lead to irreversible vision loss. We sought to report RD following lens removal surgery in children.

**Methods:** A retrospective chart review was conducted for patients aged 0-18 years with a history of lens removal surgery after January 2001 who developed subsequent RD. Patients with history of traumatic cataract were excluded from the study.

**Results:** A total of 1247 patients between the years 2001 to present were generated by the database. Of those patients, 10 were identified as having RD following cataract surgery (3.5% or 5/145 with ectopia lentis, 0.45% or 5/1102 without ectopia lentis). Average age at time of lens extraction was 7 years old. Duration between lens removal surgery and RD surgery 5.4 years. Nine out of the ten were males, 2 occurred after trauma, 5 were associated with Marfan syndrome, 1 had Marshall syndrome.

**Conclusion/Relevance:** The findings of our study suggest that RD occurs more frequently in eyes with ectopia lentis. In eyes without ectopia lentis, RD was observed more frequently following trauma.

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Olsen T, Jeppesen P. The incidence of retinal detachment after cataract surgery. *Open Ophthalmol J.* 2012;6:79-82. doi: 10.2174/1874364101206010079. Epub 2012 Sep 7. PMID: 23002414; PMCID: PMC3447164.

Poster #B24  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Risk Factors for Endophthalmitis after Pediatric Cataract Surgery Using Insurance Claims Database

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**Introduction:** Children may have a higher risk of endophthalmitis after cataract surgery than adults, but underlying risk factors remain largely unknown. Aphakia was previously reported as a risk factor. This study evaluates the relative odds of other potential factors.

**Methods:** We performed a retrospective cohort study of pediatric cataract surgeries (ages 0-18) in the IBM MarketScan Research Database from 2004-2017. Suspected cases of endophthalmitis were identified by ICD codes and definite cases were confirmed with CPT codes within 7 days of surgery. Odds ratios (OR) were assessed for age, gender, aphakia, concomitant vitrectomy, open globe injury, uveitis, lens displacement, and developmental delay. The first eye in bilateral cases was used.

**Results:** Of 5,304 eyes, 38 (0.34%) had suspected and 18 (0.26%) had definite endophthalmitis. Univariate analyses revealed the following factors associated with both definite and suspected endophthalmitis: aphakia, open globe injury, uveitis, and developmental delay. Due to sample size, multivariate analyses were performed for suspected cases only. Including all patients, only open globe injury (OR 6.7,  $p < 0.001$ ) and developmental delay remained independent predictors (OR 5.5,  $p = 0.02$ ). Excluding children  $< 1$  year old, the following factors remained significant: aphakia (OR 2.54,  $p = 0.03$ ), developmental delay (OR 5.67,  $p = 0.02$ ), and open globe injury (OR 5.25,  $p = 0.001$ ).

**Conclusion/Relevance:** In this retrospective claims analysis of pediatric cataract surgeries, open globe injury and history of developmental delay were shown to be the strongest predictors of endophthalmitis. As previously reported, aphakia may also independently predict endophthalmitis after controlling for these other factors among children  $\geq 1$  year old.

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## Glaucoma following Infantile Cataract Surgery

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**Introduction:** Reported incidence of glaucoma following cataract surgery (GFCS) varies between 8% to 59%. 1-3 Young age at surgery is a major risk factor. We report incidence, risk factors and treatment of GFCS in large cohort of infants.

**Methods:** Chart review of infants operated for cataract surgery over 30-year period with at least 1 year follow-up. Age at surgery, time for GFCS development and type of treatment were noted.

**Results:** 319 eyes (212 patients, 105 males, 105 unilateral) were included. Overall median age at surgery was 50 days (Range, 11-325 days), median follow-up was 8.8 years (Range, 1-26.3 years). GFCS was noted in 29% (93/319 eyes; median age at surgery: 46 days; median follow-up: 14 years). In 82% (76/93) eyes with GFCS, age at surgery was < 3 months ( $p=0.001$ ). Incidence of GFCS was 24%, 38% and 40% in eyes operated in 1st, 2nd and 3rd month compared to 17% in those operated >3 months. Microcornea (44%,  $p<0.0001$ ), poorly dilating pupils (10%,  $p=0.004$ ), anterior segment dysgenesis (3%,  $p=0.02$ ) were independently associated with GFCS, but not persistent fetal vasculature (12%,  $p=0.8$ ). 76% (19/25) eyes that developed glaucoma within 1 year of cataract surgery needed surgical intervention compared to 13% (9/68) that developed >1 year after surgery ( $p=0.0002$ ). Medical treatment was effective in 87% with later onset glaucoma.

**Conclusion/Relevance:** Incidence of GFCS was 29%. Risk was similar among those operated during the first 3 months of life. Early onset cases are likely to require surgery; medical treatment is effective for later onset glaucoma.

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Poster #B26  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Intravitreal Cerliponase Alfa for the Treatment of Neuronal Ceroid Lipofuscinosis Type 2 (CLN2) Related Retinal Dystrophy: A First in Man Report of Ocular Enzyme Replacement**

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**Introduction:** Neuronal Ceroid Lipofuscinosis type 2 (NCL2), known as CLN2 type Batten Disease, is a neurodegenerative condition associated with retinal dystrophy caused by tripeptidyl peptidase 1 (TPP1) enzyme deficiency. Intracerebroventricular infusion of Cerliponase alfa slows the rate of neurodegenerative decline but not retinopathy. We report a first-in-man non-randomised controlled trial of intravitreal Cerliponase alfa for the treatment of NCL2 retinopathy.

**Methods:** Eight patients with confirmed CLN2 Batten Disease who were in the retinal degenerative phase were enrolled. Examination under anaesthesia was performed before every injection, including OCT images. Intravitreal injections of Cerliponase alfa were administered into the right eye (0.2mg in 0.05ml) every 2 months, the left eye was left untreated. Primary outcome: Safety (intraocular complications). Secondary outcome: Efficacy (Preservation of central retinal thickness)

**Results:** Eight children (age 5-9yrs) have had a minimum of 5 (range 5-8) intravitreal injections over a follow-up of 10-12 months. No adverse reactions have been detected. The mean baseline paracentral macular volume was 1.28mm<sup>3</sup> (0.94mm<sup>3</sup>-1.72mm<sup>3</sup>) right, and 1.27mm<sup>3</sup> (0.93mm<sup>3</sup>-1.76mm<sup>3</sup>) left. Over their treatment so far, the paracentral macular volume has reduced by a mean of 0.084mm<sup>3</sup> on the treated eye and 0.086 mm<sup>3</sup> on the untreated eye. There is no statistically significant difference on the rates of retinal thinning between left and right eyes (p=0.641).

**Conclusion/Relevance:** Intravitreal injections of Cerliponase alfa for CLN2- associated retinopathy appears safe with no evidence of intraocular complications. Retinal thicknesses in our cohort suggests advanced disease. There is as yet no statistically significant difference in the rate of thinning between treated and untreated eyes.

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Poster #B27  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **NPHP1-Related Ciliopathies: A New Case and Major Review of the Ophthalmic Manifestations of 147 Reported Cases**

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**Introduction:** The NPHP1-related ciliopathies include 3 overlapping disorders: Juvenile nephronophthisis-1, Joubert syndrome-4 and Senior-Loken Syndrome-1. These are autosomal recessive conditions caused by pathogenic variants in NPHP1. Juvenile nephronophthisis is a tubulointerstitial nephropathy that progresses to end stage renal disease at a mean age of 13 years. Joubert syndrome is a cerebellar ataxia associated with a molar tooth sign on brain imaging. Senior-Loken syndrome is characterized by nephronophthisis and retinal dysfunction. The NPHP1 gene encodes nephrocystin 1, which is likely part of a multifunctional complex located in actin- and microtubule-based structures that appears to function in cell division and signaling. Eye manifestations have been reported among the NPHP1-related ciliopathies, however, this relationship has not been well characterized.

**Methods:** We performed a systematic literature review to summarize ocular manifestations in NPHP1-related ciliopathies, and present a new case of a 29-year-old male with an iris coloboma, nephronophthisis, and homozygous deletions of NPHP1.

**Results:** The literature review revealed 678 individuals with confirmed NPHP1-related ciliopathies; 147 patients had ophthalmic findings. Commonly reported features include retinitis pigmentosa (6.5%), optic nerve atrophy (4.6%), and nystagmus (2.8%). Less commonly reported were dysmorphic palpebral fissures (0.7%), parafoveal flecks (0.4%), and cataracts (0.4%).

**Conclusion/Relevance:** Eye manifestations appear to be highly associated with the NPHP1-related ciliopathies. Colobomas may be an additional feature within the phenotype or an unrelated feature in our case. This report and review contributes to our understanding of the relationship between NPHP1 variants and associated eye manifestations, and may provide an incentive to further investigate the phenotypes.

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Poster #B28  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **The Frequency and Specificity of Choroidal Nodules in Ocular Coherent Tomography (OCT) in Neurofibromatosis -1 (NF-1) Patients Compared to Controls fr**

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**Introduction:** NF-1 is one of the most common genetic mutations. Diagnosis is made by meeting the screening criteria. (1). Prior small studies have shown that bright patchy choroidal nodules are very specific for NF-1.(2) This large retrospective study was performed to further determine specificity and frequency of Choroidal nodules in OCT studies in NF-1 patients verses controls

**Methods:** 500 university and 2907 private practice consecutive optic nerve OCTs in patients 21 years of age or younger were serially evaluated and classified as confirmed NF-1 patients vs. other diagnosis. Those having any bright patchy choroidal nodules were identified and correlated with age and diagnosis of NF-1.

**Results:** 40 of 500 consecutive OCT patient studies in a university setting had NF-1 of which 35 had choroidal nodular lesions (87.5%). Of those without NF-1 (n=460), no study had such lesions. (0%).

33 of the 2907 consecutive OCT patients in private practice had NF-1 of which 23 had lesions (70%). None of those studies (n=2874) without NF-1 had such lesions (0%).

The average age of the OCT patients with NF-1 were 12 yo for the university setting and 14 yo for the private practice setting. Retrospective evaluation of the initial OCT study for the NF-1 patients with lesions in the private practice group,(prior to the consecutive series); noted lesions at an average of 6.8 yo, (4-19 yo)

**Conclusion/Relevance:** OCT bright patchy choroidal nodular lesions are very specific for NF-1 and should be part of NF-1 criteria for diagnosis

Study IRB # CHLA-22-00334

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Poster #B29  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Ophthalmic Features of Lamb-Shaffer Syndrome

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**Introduction:** Lamb-Shaffer syndrome (LSS) is a rare neurodevelopmental disorder due to heterozygous deletions of the SOX5 gene located on chromosome 12p12. Initially described only a decade ago, LSS has been genetically diagnosed in less than 100 individuals worldwide. The primary abnormalities in affected individuals are growth retardation, neurodevelopmental delay, dysmorphic features, cardiac defects, genitourinary defects, musculoskeletal and ophthalmic abnormalities. Herein we present a case series that describes the ophthalmic manifestations of LSS.

**Methods:** This is a case series of 6 patients genetically diagnosed with LSS. Ophthalmic exam data were collected from four different medical centers.

**Results:** Six subjects (5 females) were included in the series. The median age at presentation was 2.1 years (IQR 1.4-2.3), and the mean follow-up time was 5.0 years (SD = 4.9 years). Strabismus was present in 5/6 patients, and 4 of them underwent strabismus surgery, with exotropia being the most common deviation. In addition, all subjects had significant refractive errors, with 5/6 having astigmatism in the amblyogenic range. All patients had optic nerve abnormalities, including pallor (4/6), hypoplasia (2/6), or anomalous appearance (1/6). Other ophthalmic disorders detected were ptosis (1/6), nasolacrimal duct obstruction (1/6), and nystagmus (2/6). The median final BCVA observed was 20/45 (IQR 20/32-20/50).

**Conclusion/Relevance:** While LSS is a rare genetic disorder, it entails an array of ophthalmic manifestations, including optic nerve abnormalities, refractive errors, and strabismus, which the pediatric ophthalmologist should look for in these patients.

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## Chorioretinal Lesions in Chronic Granulomatous Disease

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**Introduction:** Chronic Granulomatous Disease (CGD) is a genetic disorder characterized by a severe immune deficiency, leading to the development of life-threatening bacterial and fungal infections. Ocular manifestations remain little-known and mainly consist of chorioretinal lesions considered 'typical' because of their uniform description in the few cases reported yet. The aim of this study is to describe chorioretinal lesions in CGD patients, and to provide a pathophysiological hypothesis regarding their development.

**Methods:** Fifty patients with genetically-confirmed CGD were examined between May 2018 and March 2021. Their files were examined retrospectively. Fundus lesions were considered 'typical' in case of atrophic yellowish punched-out scars, distributed along retinal vessels<sup>1</sup>.

**Results:** Among the 50 patients, 16 (32%) had chorioretinal lesions. Nine of them (56%) exhibited typical lesions. Ten of them (63%) presented 'atypical' lesions, less prominent or not previously described, alone or associated with typical ones, such as rod-cone dystrophy lesions, fundus autofluorescence isolated abnormalities, retinal fold or vasculitis lesions.

**Conclusion/Relevance:** Because of the high prevalence of chorioretinal lesions in CGD, a fundus examination should be systematically performed when CGD is diagnosed or suspected. Typical lesions are considered non-evolutive. Several clues suggest that these typical lesions represent the final stage of other lesions, described here as atypical. The changes we observed in one 'atypical' lesion and pathological data from the literature<sup>2</sup> helps formulate a hypothesis about their development: a focal infection would trigger a retinal pigmentary epithelium reaction, visible as a hyper-autofluorescence spot, followed by a focal fundus depigmentation and eventually an atrophic 'typical' scar.

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Poster #B31  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## The Role of Genetic Testing in Avoiding Diagnostic Delays in Inherited Retinal Disease

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**Introduction:** Inherited retinal diseases (IRDs) are a genetically and phenotypically heterogeneous group of conditions that represent a leading cause of visual impairment. Factors including variable expressivity, incomplete penetrance, vision abnormalities often manifesting with a normal appearing fundus, and overlapping clinical features among the different IRDs present significant diagnostic challenges when making a diagnosis based on clinical suspicion alone without incorporating genetic testing.

**Methods:** We analyzed 131 consecutive patients with suspected IRDs referred to an ophthalmic genetics specialty service. Provider referral patterns, diagnostic delay and yield of genetic testing were evaluated.

**Results:** Mean age in the cohort was 24 years. Of the patients that underwent genetic testing, the diagnostic yield was 69%. Genetic testing revealed 51% of patients had an incorrect initial referring clinical diagnosis. The average delay to reach a correct diagnosis was 15 years. Ophthalmologists represented the largest referral base at 80%, followed by neurologists representing 5% of referrals. Pediatric and retinal specialists were the largest referral of ophthalmic subspecialties at 44% and 35%, respectively.

**Conclusion/Relevance:** A significant number of patients experienced a prolonged delay in reaching a correct diagnosis largely due to a delay in initiating the genetic evaluation and testing process. Additionally, the initial suspected clinical diagnosis was incorrect in a significant number of cases, revealing that affected patients were potentially denied from appropriate recurrence risk counseling, relevant educational resources, specialty referrals in syndromic cases, and clinical trial eligibility in a timely manner. These findings warrant further investigation into the underlying challenges faced by patients with IRDs.

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Poster #B32  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Visual Performance in Children with Albinism during the Second Decade of Life

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**Introduction:** To determine if visual maturation continues through the second decade of life in children with albinism and whether this is related to the albinism sub-type or other clinical factor.

**Methods:** Retrospective study of children with clinical and genetic diagnosis of albinism examined during school years with at least 3 years of follow up. Type of albinism, genotype, B-BCVA (bilateral best corrected visual acuity), refractive error, strabismus, eye muscle surgery and presence of nystagmus were recorded on different visits (Visit1: ages 7-9; Visit2: ages: 10-12; Visit3: ages 13-16; Visit4: ages >16).

**Results:** Seventy-five children with clinical and confirmed genetic diagnosis of albinism were included in the study. Patients were divided into different groups according to the albinism type including OCA1A: 17; OCA1B: 28; OCA2: 26; HPS: 3; OCA4: 1. Follow-up ranged from 3- 13 years. Progressive visual acuity improvement was seen mainly in OCA1A and OCA2 groups. T-test paired samples showed a statistically significant improvement when comparing vision from Visit1 and Visit3 in both OCA1A and OCA2 groups. There was no correlation between visual improvement and refractive error, eye muscle surgery or nystagmus.

**Conclusion/Relevance:** In both OCA1A and OCA2 groups a mean visual improvement of 2 lines was registered at last follow up when compared to vision at age 7-9 years. The reason for this late improvement in vision is not clear but may be related to late maturation of macular area or improvement in nystagmus with time and worth taking into consideration when counseling parents of albino children.

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Poster #B33  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Expanding the Spectrum of Oculocutaneous Albinism: Does Isolated Foveal Hypoplasia Really Exist?

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**Introduction:** Albino patients can show a significant clinical variability: some individuals can present with only mild depigmentation and subtle ocular changes. We report the retrospective review of standardized clinical charts of patients firstly addressed for evaluation of foveal hypoplasia and slightly subnormal visual acuity, whose definition of albinism was achieved only after extensive phenotypic and genotypic characterization

**Methods:** Inclusion criteria were the presence of foveal hypoplasia (FH), optic pathways misrouting and BCVA better than 0.5 LogMAR Unit. All patients underwent spectral domain optical coherence tomography, pattern-onset VEPs and fundus photography. FH was evaluated and graded from 1 to 4 according to Thomas classification. WES analysis was performed for all patients

**Results:** Eight patients satisfied the inclusion criteria. The mean BCVA was 0.20 LogMAR. All patients showed a degree of FH ranging from 1 to 3 and misrouting of optic pathways. No patients presented nystagmus. Iris transillumination defects were absent in all patients. Molecular analysis showed point mutations in TYR in all patients and none of them presented sequence alterations or Copy Number Variants (CNVs) in PAX6, SLC38A8 or in other genes associated to foveal hypoplasia.

**Conclusion/Relevance:** Our report corroborates the pathogenicity of the two common TYR polymorphisms p.(Arg402Gln) and p.(Ser192Tyr) and aims to expand the phenotypic spectrum of albinism. Our data also suggest that isolated FH should be considered a clinical sign instead of a definitive diagnosis of an isolated clinical entity and we recommend deep phenotypic and molecular characterization in such patients to achieve a proper diagnosis.

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Poster #B34  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

### Cost Analysis Of Childhood Glaucoma Surgeries

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**Introduction:** To analyze and calculate the relative cost of various pediatric glaucoma surgical interventions per mm-Hg intraocular pressure (IOP) reduction (\$/mmHg) in the management of childhood glaucoma

**Methods:** A cost-analysis study including childhood glaucoma patients undergoing surgical intervention. Representative index studies were reviewed to quantitate the reduction of mean IOP and glaucoma medications for each surgical intervention in childhood glaucoma. A US perspective was adopted, using Medicare allowable costs were used to calculate cost/mmHg IOP reduction (\$/mmHg) at 1 year postoperatively.

**Results:** At one year postoperatively, the cost/mmHg IOP reduction was \$226/mmHg for microcatheter-assisted circumferential trabeculotomy, \$284/mmHg for cyclophotocoagulation, \$288/mmHg for conventional ab-externo trabeculotomy, \$338/mmHg for Ahmed glaucoma valve, \$350/mmHg for Baerveldt glaucoma implant, \$351/mmHg for goniotomy, and \$400/mmHg for trabeculectomy

**Conclusion/Relevance:** Microcatheter-assisted circumferential trabeculotomy was the most cost-efficient surgical method to lower IOP in childhood glaucoma while trabeculectomy was the least cost-efficient surgical method

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Poster #B35  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Demographics and Surgical Outcomes in Sturge-Weber Syndrome (SWS) Associated Glaucoma (SWS-glaucoma) in the Academy IRIS® Registry**

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**Introduction:** Data on demographics and surgical outcomes for SWS-glaucoma are limited. The IRIS® Registry (Intelligent Research in Sight) may provide insight into SWS-glaucoma patient characteristics and surgical procedures outcomes.

**Methods:** This retrospective cohort study included children and adults (<40 years) in the IRIS Registry with SWS-glaucoma (ICD-10 code 85.8 (SWS) and (ICD-10 codes Q15.0, P15.3, H42 (glaucoma)).

**Results:** 832 patients had SWS-glaucoma (51.3% female, 62.7% White). 97 patients (11.7%) underwent  $\geq 1$  surgical procedure (55 (56.7%): trabeculectomy/ tube shunt as first documented procedure, 30 (30.9%): goniotomy or trabeculotomy, and 16 (16.5%): cyclo-destructive procedure). Average age at first documented procedure was 15.5 (SD 12.4) years (trabeculectomy or tube shunt first 15.8 (12.2), goniotomy or trabeculotomy 3.7 (6.2), and cyclo-destructive procedure 20.9 (9.9)). The overall surgical failure rate (IOP > 21 mmHg on two consecutive visits or additional surgery) was 72.2% (71.6% in trabeculectomy or shunt, 73.3% in goniotomy or trabeculotomy, and 90.9% in cyclo-destructive). Of the 70 surgical failures, 50% (11) needed an additional procedure in those who underwent a cyclo-destructive procedure. Those who underwent trabeculectomy or shunt (55) exhibited the highest percentage of IOP greater than 21 mm Hg (37.3%), and cyclo-destructive procedure exhibited the highest percentage of vision-threatening complications (13.6%).

**Conclusion/Relevance:** In the large national clinical database, surgery was uncommon. Of those requiring surgery, on average, younger patients underwent goniotomy and trabeculotomy and older patients underwent cyclo-destructive procedures. Cyclo-destructive procedures had the highest surgical failure rate and the highest final IOP. SWS-glaucoma may require multiple surgical procedures to preserve vision.

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## Microcatheter-Assisted Circumferential Trabeculotomy in Primary Congenital Glaucoma: Long-Term Clinical Outcomes

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**Introduction:** The purpose of this study was to report the long-term efficacy and clinical outcomes of microcatheter-assisted circumferential trabeculotomy (MCT) in children with primary congenital glaucoma (PCG).

**Methods:** This is a single-center retrospective study including consecutive children with PCG who underwent MCT with > two years follow up. The primary outcome was surgical success, defined as intraocular pressure (IOP)  $\leq 21$  mmHg with or without medications. Secondary outcomes were visual acuity (VA), refraction, axial length (AXL), complications, reinterventions, and number of medications.

**Results:** Twelve eyes of ten patients were included. In eight children only one eye was affected. The mean  $\pm$  standard deviation (SD) age at surgery was  $6.3 \pm 4.1$  months. The mean postoperative follow-up was  $66 \pm 35$  months. The mean IOP was  $34.3 \pm 9.6$  mmHg preoperatively and  $14.6 \pm 2.3$  mmHg postoperatively at the last visit ( $p < 0.001$ ). Complete success was achieved at all time points in 10 out of 12 eyes, while 2 eyes had a qualified success. At three years of age, the mean VA of the operated eyes was  $0.25 \pm 0.12$  logMAR, the mean spherical equivalent was  $-0.78 \pm 1.43$  diopters, and the mean AXL was 23.78 mm. Transient hyphema was the only complication observed. None of the children required additional glaucoma surgery.

**Conclusion/Relevance:** Circumferential trabeculotomy for PCG effectively lowers the IOP at more than two years after surgery. Following this procedure, the prognosis for the visual function is good, and the refractive error is low. Postoperative complications were not significant.

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Poster #B37  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

### Long-Term Outcomes of Ahmed Valve Capsulectomies in Pediatric Glaucoma Patients

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**Introduction:** Bleb encapsulation is an established complication of glaucoma drainage device placement (1,2), leading to increased intraocular pressure (IOP) and valve failure. Pediatric valves are more likely to have fibrovascular encapsulation compared to those of adults (3), likely due to a more robust fibrous tissue response.

**Methods:** A retrospective chart review of pediatric glaucoma patients with FP7 Ahmed valve capsulectomies performed by two surgeons at a single institution was conducted. Surgical success was defined as post-capsulectomy IOP <21 mm Hg at most recent follow-up without additional procedures, regardless of topical medications. Qualified success was determined by IOP <21 mm Hg at most recent follow-up if subsequent procedures were cyclodestructive laser procedures or valve revisions, irrespective of topical medications.

**Results:** Review of 22 capsulectomies of 22 eyes of 18 patients aged 1-17 years was completed, with median post-capsulectomy follow-up of 5.8 years. Etiologies of glaucoma were primary congenital glaucoma (50%), anterior segment dysgenesis (31.8%), Sturge-Weber Syndrome (13.6%), and angle recession (4.6%). Pre-capsulectomy IOP was  $29.5 \pm 6.2$  mm Hg, with first post-operative IOP of  $15.2 \pm 8.0$  mm Hg. Surgical success was met for 5 capsulectomies (22.7%) with follow-up of 1.1-5.9 years. Qualified success was met for 6 capsulectomies (27.2%) with follow-up of 0.79-7.8 years. Post-capsulectomy complications included short-term hypotony (4.6%) and macular edema (4.6%).

**Conclusion/Relevance:** Among pediatric glaucoma patients with valve encapsulation, capsulectomy should be considered. Valve capsulectomy may serve as a temporizing measure before proceeding with further incisional surgical options.

**References:** 1) Razeghinejad MR, Kaffashan S, Nowroozzadeh MH. Results of Ahmed glaucoma valve implantation in primary congenital glaucoma. *J AAPOS*. 2014;18(6):590-595. doi:10.1016/j.jaapos.2014.08.008

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Poster #B38  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Outcomes of Ab-Externo Microshunt Implantation in the Management of Complex Paediatric Glaucoma

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**Introduction:** Glaucoma drainage devices are a mainstay of treatment for complex childhood glaucoma. Recently a microshunt device has been introduced which allows easier implantation and does not require a large conjunctival incision.<sup>1</sup> We present the results of this device in paediatric patients with complex glaucoma.

**Methods:** This is a retrospective single-center case series. Research ethics board approval was obtained. The medical notes of all patients with complex childhood glaucoma treated surgically with the microshunt device were reviewed.

**Results:** 5 eyes of 5 children (3 months to 17 years of age) were identified. All patients had congenital glaucoma and had undergone previous glaucoma surgeries. One patient had Peters anomaly and one had microcornea. The mean preoperative intraocular pressure was  $29.3 \pm 5.7$  mmHg. The mean number of topical medications required was  $3.0 \pm 0.6$  and 4 of 5 patients were on oral acetazolamide. Postoperatively the mean intraocular pressure dropped to  $11.3 \pm 6.6$  mmHg at 1 month (n= 5) and  $21.0 \pm 3.0$  mmHg at 6 months (n=2). During the follow-up period no patients required systemic medication and the mean number of topical medications was  $1.0 \pm 1.4$ . There were no complications and no eyes required additional surgery.

**Conclusion/Relevance:** These early data suggest that the microshunt device is safe and appears effective in complex cases of childhood glaucoma.

**References:** 1. Batlle et al. Three-Year Follow-up of a Novel Aqueous Humor MicroShunt. J Glaucoma. 2016 Feb;25(2):e58-65.

Poster #B39  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## The Outcomes of Glaucoma Drainage Devices in Childhood Glaucoma: A Meta-Analysis

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**Introduction:** To evaluate the outcomes and safety of Ahmed glaucoma valve (AGV) and Baerveldt glaucoma implant (BGI) in childhood glaucoma.

**Methods:** A systematic literature review was performed of publications from 1990-2022 in PubMed, EMBASE, ClinicalTrials.gov, Ovid MEDLINE, Cochrane CENTRAL, and google scholar for studies evaluating AGV and BGI in childhood glaucoma. Primary outcomes were intraocular pressure (IOP) reduction and glaucoma medications. The secondary outcomes were the survival rates and incidence of postoperative complications.

**Results:** Thirty-two studies met the inclusion criteria. Data for 1480 eyes (992 eyes in the AGV group and 488 eyes in the BGI group) were analyzed. The mean IOP reduction was 14.53 mmHg for AGV (95% CI:14.01-15.05,  $p < 0.00001$ ) and 13.65 mmHg for BGI group (95% CI:12.91-14.39,  $p < 0.00001$ ). The mean difference between pre-and post-operative glaucoma medications was 1.05 fewer medications (95% CI:0.98-1.11,  $p < 0.00001$ ) in the AGV group and 0.94 fewer medications (95% CI:0.73-1.15,  $p < 0.00001$ ) in the BGI group. Survival analysis showed lower survival in the AGV vs BGI groups at 6 months (88.2% vs 92%, respectively) and 1 year (86.3% vs 87.8%, respectively), however, the survival was slightly higher in the AGV (61% vs 56% in BGI) at 5 years postoperatively. The incidence of postoperative complications was comparable in AGV and BGI groups with complication rates of 28% and 27% respectively.

**Conclusion/Relevance:** The IOP and glaucoma medications reduction, survival, and incidence of postoperative complications were comparable in both groups. Most evidence is from low-quality retrospective studies including a heterogenous group of refractory childhood glaucoma. Further larger randomized controlled trials are needed.

**References:** Elhusseiny AM, VanderVeen DK. Outcomes of Glaucoma Drainage Devices in Childhood Glaucoma. *Semin Ophthalmol.* 2020;35(3):194-204. doi:10.1080/08820538.2020.1781906

Poster #B40  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Long-Term Outcomes of Aurolab Aqueous Drainage Implant (AADI) vs Ahmed Glaucoma Valve (AGV) in Pediatric Patients: A Retrospective Study

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**Introduction:** Whilst the Ahmed glaucoma valve is a popular choice in the Middle-East for refractory pediatric glaucoma, the Aurolab Aqueous Drainage Implant (AADI) is a non-valved glaucoma drainage device (GDD) that has the advantages of cost-effectiveness and possibly better glaucoma control. Here, we compared the outcomes of the AADI with the AGV in terms of relative efficacy and safety at 3 years of follow up, in a Middle-Eastern pediatric population with refractory glaucoma.

**Methods:** A comparative retrospective study of consecutive paediatric patients (age  $\leq$  18 years) who received the AADI vs AGV from 2014-2022. Data collected included demographics, type of glaucoma, intraocular pressure (IOP), number of anti-glaucoma medications (AGM) and any subsequent complications or further surgeries.

**Results:** A total of 126 tube surgeries (56 eyes in AADI and 70 eyes in AGV) were performed. The mean duration of follow-up was  $42.93 \pm 16.48$  and  $34.91 \pm 12.33$  months in AGV and AADI, respectively. Post-operative IOP readings had no significant difference between the two groups. However, AADI had a consistently lower mean number of AGMs after six months till last visit (0.8 compared to 1.6 in AGV). Significant complications were transient choroidal detachment in 16% of AADI and late encapsulation in 7.14% of AGV group. (Significance P-value  $< 0.05$ ).

**Conclusion/Relevance:** This is one of the few studies done outside India (Country of origin of AADI) that studied AADI in a paediatric population. The findings suggest an acceptable safety profile for the AADI in children, with a less need for glaucoma re-operation or glaucoma medication for 3 years of follow up.

**References:** Aljaloud, A., Alhilali, S., Edward, D. P., Ahmad, K., & Malik, R. (2022). Preliminary Surgical Outcomes of a Trimmed-Plate Aurolab Aqueous Drainage Implant (AADI) in Eyes at High Risk of Hypotony. *Clinical Ophthalmology* (Auckland, N.Z.), 16, 1487–1496. <https://doi.org/10.2147/OPHTH.S343378>

Khan, A. M., Ahmad, K., Alarfaj, M., Alotaibi, H., AlJaloud, A., & Malik, R. (2021). Surgical outcomes of the Aurolab aqueous drainage implant (AADI) versus the Ahmed glaucoma valve for refractory paediatric glaucoma in Middle Eastern children. *BMJ Open Ophthalmology*, 6(1), e000831. <https://doi.org/10.1136/bmjophth-2021-000831>

Poster #B41  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Long Term Follow-up of Pediatric Eversional Angle Closure with Headache (PEACH) Syndrome Following Laser PI**

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**Introduction:** Pediatric Eversional Angle Closure with Headache (PEACH) was first described at AAPOS in 2017. This childhood variant of intermittent angle closure glaucoma can produce severe headache and optic nerve compromise but is mitigated easily with laser PI.

**Methods:** Description of 99 eyes (53 patients aged 7-18 years) with PEACH, and that of the presenting author of this prospective update who suffered similarly prior to diagnosis and treatment. Assessment of examination findings before and following laser, symptom score using headache questionnaire (MFP), and visual field improvement using Frequency Doubling Perimetry (FDT). Patients were followed at yearly intervals through 48 months and compared to baseline.

**Results:** These patients presented with consistent findings: 1) recurrent, intermittent, severe unilateral or bilateral frontal headache, often precipitated by near work, 2) concentric peripheral iris folds (rings) with profound iris laxity, 3) gonioscopic iris concavity with distension on compression, 4) pigment anterior to TM, 4) visual field loss. Headache prevalence dropped from >93% to <20% after laser ( $p<0.0001$ ); severity decreased from mean 5.74 (MFP 'severe') to mean 0.70 (MFP 'no pain',  $p<0.0001$ ). Pre-laser FDT MD improved from baseline cohort deficit (range 7.15-7.75 with SEM range  $\pm 0.74$ -1.08) dB (moderate field loss), to  $-3.98 \pm 0.56$  (mild) at 12mo ( $p<10^{-5}$ ),  $-2.05 \pm 0.54$  (mild) at 24mo ( $p<10^{-8}$ ),  $-1.82 \pm 0.64$  (mild) at 36mo ( $p<10^{-6}$ ), and  $-0.93 \pm 0.71$  (normal) at 48mo ( $p<10^{-5}$ ).

**Conclusion/Relevance:** Pediatric patients with recurrent intermittent frontal headache should be evaluated for iris and gonioscopic findings of PEACH syndrome. Remarkable improvement in symptoms and visual field defects occurs following treatment.

**References:** Groth SL, Crosnoe K, Sponsel WE. 'Intermittent angle closure in pediatrics: identification and treatment.' Poster presentation: American Association for Pediatric Ophthalmology and Strabismus (AAPOS), Nashville, TN, April 3, 2017.

Poster #B42  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## The Use of Ologen Collagen Matrix in Combination with XEN Microstent for the Treatment of Glaucoma in Pediatrics: A Retrospective Case Series

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**Introduction:** Evaluate a series of pediatric glaucoma patients who received XEN Gel Stent implantation + Mitomycin C with the addition of Ologen Collagen Matrix.

**Methods:** Retrospective, interventional case series in which 13 eyes of 10 pediatric patients (age  $\leq$  16 years) were treated with XEN+MMC+Ologen with documented 12 months follow-up. Failure was defined as a need for additional intervention within 12-months.

**Results:** The mean age ( $\pm$  standard deviation) of patients at time of surgery was  $5.56 \pm 4.02$  years. The percent of eyes which did not require additional procedural intervention within 12 months was 61.53% (8/13). The mean IOP decreased from  $26.25 \pm 8.01$  mmHg to  $17.75 \pm 8.86$  mmHg at 12 months post-surgery for successful cases. The average percentage decrease in IOP at 12 months was  $29.92\% \pm 23.29$ . Only one case experienced an increase in IOP without an additional procedure at 12 months. Notably, 9/13 eyes experienced two consecutive visits with an IOP  $>21$  mmHg. By 12 months follow-up, 38.46% (5/13) required an additional procedure to control IOP. The median time to failure was 10 months (range: 2 to 11). Of the cases that did not require another procedure at 12-months follow-up, 7/13 had a persistent drop in IOP.

**Conclusion/Relevance:** The utility of the XEN Gel Stent+MMC+Ologen combination was safely demonstrated in this case series. Ologen may provide a benefit to prevent postoperative re-scarring in this glaucoma patient population.

**References:** Chang I, Caprioli J, Ou Y. Surgical Management of Pediatric Glaucoma. *Dev Ophthalmol.* 2017;59:165-178. doi:10.1159/000458495

Beck AD. Diagnosis and management of pediatric glaucoma. *Ophthalmol Clin North Am.* Sep 2001;14(3):501-12. doi:10.1016/s0896-1549(05)70248-0

Ghate D, Wang X. Surgical interventions for primary congenital glaucoma. *Cochrane Database Syst Rev.* Jan 30 2015;1:CD008213. doi:10.1002/14651858.CD008213.pub2



Poster #B43  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Retinal Findings in Pediatric Idiopathic Intracranial Hypertension

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**Introduction:** Pediatric and adult idiopathic intracranial hypertension (IIH) have distinct anthropomorphics and clinical manifestations.<sup>1</sup> Retinal manifestations associated with adult IIH are well-known and can limit visual function<sup>2</sup>, however data examining these manifestations in pediatric IIH are sparse. We aimed to identify the range and effects of retinal manifestations in pediatric IIH focusing on associated visual and structural outcomes.

**Methods:** This retrospective case series included IIH patients from an academic children's hospital between 2003-2022. Patients meeting full diagnostic criteria for IIH without other concomitant retinal disease of alternate etiology were included. We evaluated demographics, visual function, and structural correlates longitudinally to report on outcomes.

**Results:** Of the 321 patients with IIH meeting criteria, 27 (8.4%) had significant retinal manifestations, including peripapillary wrinkling (25 patients), retinal folds (21), macular exudates (19), subretinal fluid (12) and choroidal neovascular membrane (1). Initial logMAR visual acuity in the most severely affected eye was  $0.46 \pm 0.49$ . All patients were treated with acetazolamide, 3 with topiramate, and 3 with furosemide. 6 patients underwent shunting and 3 underwent optic nerve sheath fenestration surgery. Final visual acuity in the most affected eye at diagnosis was  $0.22 \pm 0.43$ . 4 patients had persistent photoreceptor disruption on OCT, 3 had lasting RPE changes, 2 had macular scarring, and 14 developed optic nerve atrophy or pallor.

**Conclusion/Relevance:** We found that retinal pathology is common in pediatric IIH patients. Retinal findings have lasting effects on visual acuity and retinal structure following resolution. Prospective study will reveal whether retinal pathology directly impacts the clinical course and prognosis.

**References:** 1. Gaier ED, Heidary G. Pediatric Idiopathic Intracranial Hypertension. *Semin Neurol.* 2019 Dec;39(6):704-710. doi: 10.1055/s-0039-1698743. Epub 2019 Dec 17. PMID: 31847041.

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Poster #B44  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Analysis of Pediatric Idiopathic Intracranial Hypertension at a Tertiary Care Hospital: Features and Management**

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**Introduction:** Pediatric idiopathic intracranial hypertension (IIH) can vary from adult IIH. The treatment is long and multidisciplinary. The goal here is to characterize the presentation and treatment of pediatric IIH.

**Methods:** A medical records review was conducted. Patients presenting at less than 18 years of age between April 2015 and April 2022 were included. Patients were excluded if there was diagnostic uncertainty, or if follow up totaled less than 6 months.

**Results:** Seventy-seven patients with mean age at presentation of 12.7 years (female 13.4, male 11.4) were evaluated. Mean body mass index was 31.0 for females, 27.0 for males. Mean presenting visual acuity was statistically significantly better for females (mean LogMar 0.08) than males (0.23) with p value: RE 0.082, LE: 0.027. The mean presenting optic nerve head edema was 1.6 (Frisen scale). Mean lumbar puncture opening pressure (mm H<sub>2</sub>O) was 362 for females, 330 for males. Presenting symptoms: headache 87%, transient visual obscurations 42%, visual acuity decrease 48%, pulsatile tinnitus 21%, nausea 30%, other neurologic symptoms 17%, including abducens palsy in 10% of cases. Findings of MRI brain/orbit found globe flattening in 27%, empty sella 9%, increased perioptic CSF 9%, transverse venous sinus stenosis 9%. MRV demonstrated transverse venous sinus stenosis in 33%. Medical therapy was initiated in 99% of cases; 14% required shunting, 3% stenting, and 4% optic nerve sheath fenestration.

**Conclusion/Relevance:** Pediatric IIH commonly presents with headaches and mild-moderate optic nerve swelling. Imaging findings are not seen in a majority of cases. Most can be managed medically.

**References:** 1. Rangwala LM, Liu GT. Pediatric idiopathic intracranial hypertension. *Surv Ophthalmol.* 2007 Nov-Dec;52(6):597-617. doi: 10.1016/j.survophthal.2007.08.018. PMID: 18029269.  
2. Gaier ED, Heidary G. Pediatric Idiopathic Intracranial Hypertension. *Semin Neurol.* 2019 Dec;39(6):704-710. doi: 10.1055/s-0039-1698743. Epub 2019 Dec 17. PMID: 31847041.

Poster #B45  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **An Analysis of Presenting Features and Visual Outcomes for Paediatric Patients with Idiopathic Intracranial Hypertension in a Single British Centre**

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Deepa Krishnakumar, Dr; Brinda Muthusamy, Miss

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**Introduction:** We reviewed the demographics, presenting features, treatment, and visual outcomes in a cohort attending a single British tertiary centre of children diagnosed with Idiopathic Intracranial Hypertension (IIH).

**Methods:** A retrospective review of all IIH cases attending from 2010 to 2021, fulfilling the Friedman criteria and aged 4 to 16 years were included (1).

**Results:** 62 Children met the inclusion criteria. Mean age 12.5years (range 5-16 years) and 71% were female. Presenting headaches occurred in 93.5% and 25% described visual obscurations. Papilloedema was found in 96.1% with Frisen grade 5 (4.1%), 4 (20.8%), 3 (22.9%), 2 (31.1%), and grade 1 (14.5%). Visual acuity was 6/9 or better in 88% at presentation. Visual field changes were found in 54% at presentation and recovered in 56% of these. Colour vision was affected in 29% and recovered completely in 82% of these with treatment. Treatment included combinations of acetazolamide 75.4% and/or topiramate 38.5%. One child required an emergency ventriculoperitoneal shunt. Significantly, children under 12 years old had a mean BMI of 25+/-8% (n=12) while those >12 had 28+/-5% (n=36). Graphpad prism was used for statistical analysis.

**Conclusion/Relevance:** This cohort has a majority presenting with headaches and papilloedema with visual field changes being the commonest visual deficit. They demonstrate recovery of colour vision with treatment but 46% with visual field defects were found to have persistent losses highlighting the time-critical nature of diagnosis and treatment. The contrast in BMI between children > or < 12 years old suggests a possible difference in underlying pathology in these groups.

**References:** 1. Friedman DI, Liu GT, Digre KB. Revised diagnostic criteria for the pseudotumor cerebri syndrome in adults and children. *Neurology*. 2013;81(13):1159-65.

Poster #B46  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Optical Coherence Tomography and Optical Coherence Tomography Angiography Findings in Optic Disc Hypoplasia

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**Introduction:** Optic disc hypoplasia (ONH) is congenital anomaly diagnosed based on funduscopic examination, but diagnosis could be enhanced by using imaging. Optical coherence tomography (OCT) and OCT-angiography (OCT-A) are broadly used diagnostic tool in clinical ophthalmology. We compared spectralis OCT (SD-OCT) and OCT-A results of ONH patients with age-matched healthy controls.

**Methods:** SD-OCT and OCT-A were obtained from 12 ONH patients, 17 eyes and age-matched 34 healthy controls, 34 eyes. Retinal nerve fiber layer (RNFL) (superior, temporal, inferior, nasal, supero-temporal, supero-nasal, infero-temporal, infero-nasal) thickness assessed using SD-OCT and the radial peripapillary capillary (RPC) segment (center, superior, inferior, temporal) vessel densities assessed using OCT-A were compared between groups. Also, correlation between visual acuity and RNFL, RPC measures were analyzed.

**Results:** Significant RNFL thinning was seen in all quadrants of ONH patients compared to healthy controls. (mean,  $p < 0.001$ ; superior,  $p < 0.001$ ; temporal,  $p = 0.045$ ; inferior,  $p = 0.002$ ; nasal,  $p < 0.001$ ; supero-nasal,  $p < 0.001$ ; infero-temporal,  $p = 0.037$ ; infero-nasal,  $p < 0.001$ ; supero-temporal,  $p < 0.001$ ) The RPC segment vessel densities were higher in ONH patients in center ( $p < 0.001$ ), and lower in superior ( $p = 0.027$ ), inferior ( $p = 0.014$ ). There was significant correlation between RNFL thickness and visual acuity in ONH patients (mean,  $r = 0.684$ ,  $p = 0.007$ ; inferior,  $r = 0.662$ ,  $p = 0.010$ ; superior,  $r = 0.630$ ,  $p = 0.016$ ; temporal,  $r = 0.573$ ,  $p = 0.032$ ; nasal,  $r = 0.595$ ,  $p = 0.025$ ; supero-temporal,  $r = 0.625$ ,  $p = 0.017$ ; supero-nasal,  $r = 0.574$ ,  $p = 0.032$ ; infero-temporal,  $r = 0.640$ ,  $p = 0.014$ ; infero-nasal,  $r = 0.631$ ,  $p = 0.016$ ), but no correlation was found between RPC density and visual acuity.

**Conclusion/Relevance:** In diagnosing ONH patients, OCT and OCT-A can be useful tool. Also we demonstrated that the RNFL thickness has correlation with visual acuity in ONH patients.

**References:** 1) Haruta M, Kodama R, Yamakawa R. Optical coherence tomography detection of characteristic retinal nerve fiber layer thinning in nasal hypoplasia of the optic disc. *Eye (Lond)* 2017;31:1685-8.  
2) Lee KM, Woo SJ, Hwang JM. Evaluation of congenital excavated optic disc anomalies with spectral-domain and swept-source optical coherence tomography. *Graefes Arch Clin Exp Ophthalmol* 2014;252:1853-60.

## Single-Line Macular Optic Coherence Tomography (OCT) to Diagnose Optic Neuropathies in Young, Awake Children

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**Introduction:** Handheld optical coherence tomography (HH-OCT) can image young awake children, but lacks integrated segmentation/analysis software. Eyes with optic neuropathies demonstrate ganglion cell layer (GCL) thinning, with a normal/thickened inner nuclear layer (INL) on OCT imaging. We measured the GCL/INL and GCC/INL ratios from HH-OCT macular scans of young, awake children with clinically-diagnosed optic neuropathies to compare against normative data.

**Methods:** Review of prospectively-obtained macular HH-OCT in the eyes of awake children with optic neuropathies, using Bioptigen(Leica Microsystems). The GCL, Ganglion Cell Complex (GCC), and INL were manually measured (ImageJ) from single-line macular scans at the thickest points nasal and temporal to the fovea, respectively, by two readers, and the GCL/INL and GCC/INL ratios were calculated and compared to normative pediatric data.

**Results:** HH-OCT images from 33 eyes with optic neuropathies (17 children, mean age  $4.3 \pm 2.9$  yrs) were analyzed. Mean nasal and temporal GCL/INL ratios for 15 children (23 eyes nasally and 20 eyes temporally) with optic neuropathies were  $0.48 \pm 0.33$  (min/max=0.10/1.42) and  $0.44 \pm 0.26$  (min/max=0.12/1.10), respectively. Corresponding normative GCL/INL ratios were  $1.24 \pm 0.18$  (min/max=0.92/1.75) and  $1.22 \pm 0.24$  (min/max=0.66/1.70, respectively ( $p < 0.0001$ ). Severe thinning precluded GCL measurements in 10 eyes nasally and 12 eyes temporally. Mean nasal and temporal GCC/INL ratios, available from 17 children (33 eyes nasally and 32 eyes temporally) were  $1.81 \pm 0.64$  (min/max=0.93/3.33) and  $1.76 \pm 0.47$  (min/max=1.06/2.58). Corresponding normative ratios were  $2.81 \pm 0.38$  (min/max=2.13/3.63) and  $2.78 \pm 0.38$  (min/max=2.14/3.69, respectively ( $p < 0.0001$ ).

**Conclusion/Relevance:** GCL/INL and GCC/INL ratios calculated from single-line macular HH-OCT scans may provide structural confirmation of optic neuropathies in awake young children.

**References:** Haynie ML, Alvarez-Falcon S, Tauscher R, Taleb EM, Glaser T, Freedman SF, El-Dairi MA. Pediatric Optical Coherence Tomography (OCT) made easy: Establishing normative retinal layer thickness ratios for interpretation of handheld macular OCT in clinic. American Academy of Pediatric Ophthalmology and Strabismus, 47th Annual Meeting. Scottsdale, Arizona. March 23-27, 2022. Poster presentation.

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Poster #B48  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Design and Implementation of a Screening Protocol to Improve Diagnosis of Visual Sequelae in Children with Primary Brain Tumors**

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**Introduction:** Tumors such as optic pathway gliomas have high rates of associated visual impairment and are often symptomatic. The potential visual sequelae associated with tumors in areas of the brain beyond the optic pathway, however, have received little attention to date (1). Previous publications have highlighted the importance of screening for such impairments, yet most institutions have no formal screening protocol. The purpose of this study was to assess the effects of the implementation of a screening protocol for visual sequelae in patients with primary brain tumors at our institution.

**Methods:** A protocol for referring patients with newly diagnosed brain tumors was initiated at our institution in December 2021. Charts were reviewed for oncologic and ophthalmologic data if an ophthalmic evaluation was performed after that date. These data were then compared to a pre-protocol cohort described previously (2).

**Results:** Forty patients were diagnosed with a primary brain tumor within the study period January - September 2022. Mean age at diagnosis was 9.7 years. An ophthalmology referral was sent for 31 of these patients (78%) and 29 were evaluated by an ophthalmologist (73%), compared to only 63% referral rate and 58% evaluation rate in the pre-protocol cohort. Seventeen patients had some form of visual impairment (59%), while only 10 (34%) were symptomatic. The most common ocular pathology was optic nerve abnormalities (41%).

**Conclusion/Relevance:** We have successfully instituted a formal ophthalmology referral and screening protocol at our institution with associated improvements in referrals and diagnoses. Areas for improvement include timeliness of clinic referrals and use of low vision services

**References:** 1. Liu Y, Abongwa C, Ashwal S, Deming DD, Winter TW. Referral for Ophthalmology Evaluation and Visual Sequelae in Children With Primary Brain Tumors. *JAMA Netw Open*. 2019;2(8):e198273. Published 2019 Aug 2. doi:10.1001/jamanetworkopen.2019.8273  
2. Smith CG, Mehner LC. Referral patterns and visual sequelae in children with newly diagnosed primary brain tumors. Poster Presentation, Association for Research in Vision and Ophthalmology Annual Meeting, Denver, Colorado, May 3, 2022.

Poster #B49  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Visual Acuity at 20% Contrast and its Correlation with Optic Nerve Atrophy in Children and Young People Diagnosed with Brain Tumours**

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**Introduction:** Standard visual acuity (VA) testing, at 100% contrast, may mask the functional implications of optic nerve fibre layer (NFL) loss secondary to brain tumours in children and young people. Patients with optic nerve atrophy are known to have reduced contrast sensitivity, which may not routinely be measured. We assessed the value of testing vision at 20% contrast on the Thomson LogMAR in patients with a range of different brain tumours.

**Methods:** 81 patients, aged 5 to 28 years (mean age 14) were retrospectively reviewed to correlate their visual acuity and OCT optic nerve head measurements.

**Results:** 72 of 81 patients had preserved visual acuity at 100% contrast, and a disproportionate drop in visual acuity when tested at 20% contrast LogMAR (30 patients initially LogMAR 0.0 or better, 12 0.00-0.10, 13 patients at 0.20-0.40 and 12 with more than 0.40). 125 eyes had reduced vision at 20% contrast, 111 of these (88.8%) were found to have significantly reduced NFL thickness on OCT.

**Conclusion/Relevance:** A reduced NFL thickness was consistent with reduced vision at 20% contrast. This suggests that reduced 20% contrast VA and NFL measurements help to identify visual loss that is not detected with formal VA testing at 100% contrast. Reduced contrast VA is an important factor to identify for functional vision, as such patients will struggle with educational activities and mobility in low light environments. This can have a profound impact on academic achievement and independence.

**References:** Peragallo J.H. Effects of Brain Tumours on Vision in Children. *Int Ophthalmol Clin.* 2018; 58 (4): 83-95

Poster #B50  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Clinical and Radiologic Findings in Patients with Morning Glory Disc Anomaly and associated Optic Pathway Enlargement**

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**Introduction:** Optic pathway enlargement (OPE) has recently been associated with morning glory disc anomaly (MGDA), though the literature is limited.[1,2] Herein, we report, to our knowledge, the largest cohort of patients of MGDA associated with OPE that includes both clinical and radiologic findings.

**Methods:** A retrospective single-center study in which all patients with a clinical diagnosis of MGDA and evidence of OPE on MRI imaging (T1, T2, GRE, and DWI) of the brain and orbit were included.

**Results:** Six patients (7 eyes) were included. One patient presented with bilateral MGDA; five patients presented with unilateral MGDA. Five patients were non-Hispanic white (83.3%). The median age at presentation was 1.32 years. The median follow-up time was 5.93 years. All patients had strabismus and amblyopia. OPE was seen in the following sections: intraorbital (7/7), intracanalicular (3/7), cisternal (6/7) chiasmatic (4/7), and retorchiasmatic (2/7). All cases showed homogeneous signals on T1 and T2-WI while 6/7 cases had some portion of T1-WI enhancement on post-contrast imaging. Additional MRI findings of the orbit included: uveoscleral discontinuity (7/7), abnormal tissue suggestive of glial tuft (7/7), and funnel-shaped excavation of the optic disc (6/7). Associated systemic abnormalities included intracranial vascular anomalies (4/6), developmental venous anomalies (2/6), hypoplasia of the cerebellar hemisphere (1/6), ectopic posterior pituitary (1/6), epicanthal folds (2/6), heterochromia (1/6), and eyelid hemangioma (1/6).

**Conclusion/Relevance:** In patients with MGDA, OPE may be a developmental abnormality rather than a pathologic entity, such as an optic nerve glioma.

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2. Poillon G, Henry A, Bergès O, Bourdeaut F, Chouklati K, Kuchcinski G, et al. Optic Pathways Enlargement on Magnetic Resonance Imaging in Patients with Morning Glory Disc Anomaly. *Ophthalmology.* 2021 Jan;128(1):172–4.



## Characteristics of Optic Papillitis in Pediatric Uveitis

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**Introduction:** The occurrence of optic papillitis in pediatric uveitis is not well defined in the literature. We aimed to better characterize it.

**Methods:** This was a retrospective chart review of pediatric patients with uveitis and concomitant papillitis at an academic children's hospital. Demographics, disease characteristics, ancillary testing results, treatment modalities and visual outcomes were collected.

**Results:** 30 patients (16 male, 14 female) with optic papillitis were identified. Average age at diagnosis was 9.8 +/- 4.5 years. The three most common underlying diagnoses were idiopathic (27%), juvenile idiopathic arthritis (23%) and tubulointerstitial nephritis and uveitis (23%). 20 patients (66.7%) had optic papillitis at presentation. 16 (53%) were bilateral initially and 4 (13%) became bilateral. 11 patients (37%) initially had decreased visual acuity in the affected eye(s) (range 20/30 to count finger) with eight eventually recovering vision to better than 20/30. 19 (63%) had anterior uveitis and 11 (37%) patients had panuveitis. 34 eyes had  $\geq 2+$  anterior chamber inflammation. 15 patients had MRIs and 9 had lumbar punctures that were unremarkable. None had neurological symptoms. The average time to resolution was 8.98 months. Optic papillitis resolved in all patients without consequences. 29 patients were treated with topical steroids; 16 patients with systemic steroids. Immunomodulatory treatment was needed to control uveitis in 76% of patients (Methotrexate (24), and biologic agents (14)).

**Conclusion/Relevance:** Optic papillitis associated with anterior or panuveitis does not require neuroimaging unless associated with neurological symptoms. 76% required immunomodulatory treatment. It resolved in all cases with no consequences.

- References:**
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  6. Kumar P, Gupta A, Bansal R, et al. Chronic Uveitis in Children. *Indian J Pediatr*. 2022;89(4):358-363. doi: 10.1007/s12098-021-03884-5.
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Poster #B52  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Peripapillary Hyperreflective Ovoid Mass-like Structures (PHOMS) in Children: Optical Coherence Tomography Measurements and Refractive Status**

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**Introduction:** Peripapillary hyperreflective ovoid mass-like structures (PHOMS) are a recently described entity (1). They are a common and non-specific cause of pseudopapilloedema. We aim to determine if there is a relationship between optical coherence tomography (OCT) measurements and refractive status on the presence of peripapillary hyperreflective ovoid mass like structures (PHOMS) on OCT.

**Methods:** Retrospective analysis of optic nerve head OCT scans from children seen in the suspected papilledema virtual clinic between August 2016 and March 2021 at University Hospital of Wales, Cardiff. Three assessors graded each scan for the presence of PHOMS. Numerical data on the disc morphology (disc area (DA (mm<sup>2</sup>)) and scleral canal diameter (SCD (µm)) was obtained from the OCT scans. Refractive data was obtained from the initial optometric referral where available. Logistic regression analysis was performed to assess the effect of age, sex, spherical equivalent, DA and SCD on the likelihood of the presence of PHOMS.

**Results:** The SCD was significantly larger in eyes with PHOMS (mean diameter 1771 µm) vs no PHOMS (mean diameter 1621 µm). Odds ratio 1.0042 (1.0016 to 1.0069). The other variables were not significantly associated, but there was a tendency towards a younger age, larger disc area and the presence of a refractive error if PHOMS were present.

**Conclusion/Relevance:** Anatomical and developmental differences in the size of the scleral canal and optic nerve may explain the presence of PHOMS in children. In contrast to other recently published studies (2), we show that a wider scleral canal diameter was significantly associated with the presence of PHOMS.

**References:** (1) The Optic Disc Drusen Studies Consortium Recommendations for Diagnosis of Optic Disc Drusen Using Optical Coherence Tomography Lasse Malmqvist, MD, Lulu Bursztyn, Msc, MD, Fiona Costello, MD, PhD, Kathleen Digre, MD, J. Alexander Fraser, MD, Clare Fraser, MMed, Bradley Katz, MD, PhD, Mitchell Lawlor, FRANZCO, PhD, Axel Petzold, MD, PhD, Patrick Sibony, MD, Judith Warner, MD, Marianne Wegener, MD, Sui Wong, MD, Steffen Hamann, MD, Ph. J Neuro-Ophthalmol 2017; 0: 1-9

(2) Peripapillary hyperreflective ovoid mass-like structures (PHOMS) in children. Ye Jin Ahn, Yoo Yeon Park, Sun Young Shin. Eye (2022) 36:533–539

Poster #B53  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Globe Stabilization in Acquired Nystagmus using a Titanium T-Plate**

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**Introduction:** Acquired nystagmus with oscillopsia and no null point is difficult to treat with current medical and surgical options. In 2017, Tse and colleagues reported a surgical technique to stabilize the globe and reduce nystagmus: a T-plate is anchored to the lateral orbital rim and cantilevered into the orbit; the inferior rectus muscle is then sutured to the T-plate. I will describe my early experience with this procedure.

**Methods:** A retrospective case series was performed between December 2021 and September 2022. Included patient underwent the globe stabilization procedure as described by Dr. Tse.

**Results:** A 3 patient case series (6 eyes) was collected. All patients had acquired nystagmus with debilitating oscillopsia and no discernible null point. Two patients had failed treatment with baclofen and gabapentin; the other patient was unwilling to try any medications due to their sedating effects. One patient failed to have a response to botulinum toxin injections into his rectus muscles, one patient had a vertical Kestenbaum that did not lead to improvement in symptoms, and one patient had no prior procedures. All 3 patients tolerated the surgery well without any significant complications. Five out of the six eyes had improved visual acuity following the surgery, and two out of the three patients noted significantly improved quality of life.

**Conclusion/Relevance:** Acquired nystagmus is a difficult entity to treat. Surgery in which a titanium T-plate is used as a platform for globe stabilization offers another option to help improve visual functioning and quality of life in these patients.

**References:** 1) Tse, Brian C. M.D.; McKeown, Craig A. M.D.; Tse, David T. M.D.. Titanium T-Plate as a Platform for Globe Stabilization in Acquired Nystagmus and Oscillopsia Without a Null Zone. *Ophthalmic Plastic and Reconstructive Surgery*: May/June 2017 - Volume 33 - Issue 3 - p e61-e63 doi: 10.1097/IOP.0000000000000750  
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Poster #B54  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Surgery for Acquired Nystagmus in Patients with Cerebellar Dysfunction

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**Introduction:** To report the association of downbeat nystagmus and chin-down head posture with cerebellar dysfunction and the results of treatment with bilateral superior rectus recession and bilateral inferior oblique anteriorization.

**Methods:** This is a retrospective review of cerebellar ataxia patients treated for downbeat nystagmus, oscillopsia and abnormal head posture with bilateral superior rectus recession and bilateral inferior oblique anteriorization between 2000-2022

**Results:** Four patients underwent the procedure. All 4 patients had systemic signs and symptoms of cerebellar ataxia, confirmed by a neurologist as well as MRI findings involving the cerebellum. All patients had oscillopsia, downbeat nystagmus with damping in up gaze, and chin-down head posture. All patients underwent bilateral superior rectus recession and bilateral inferior oblique anteriorization. Median follow up period was 3 years. Oscillopsia and abnormal head posture resolved in all patients.

**Conclusion/Relevance:** Bilateral superior rectus recession and bilateral inferior oblique anteriorization is an effective procedure for patients with downbeat nystagmus associated with cerebellar dysfunction

**References:** Lueder GT, Galli M. Oblique muscle surgery for treatment of nystagmus with head tilt. *J AAPOS*. 2012 Aug;16(4):322-6. doi: 10.1016/j.jaapos.2012.05.005. PMID: 22929446.  
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Poster #B55  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Chiasmal Misrouting in Infantile Nystagmus Syndrome(INS): Phenotypes in Patients with Molecular Diagnoses**

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**Introduction:** Chiasmal misrouting, once believed to be pathognomonic for albinism, has been reported in cases of INS, independent of melanin pathway disruption. The purpose of this study is to determine if there are clinical-electrophysiological parameters that correlate with particular genotypes in INS.

**Methods:** A retrospective chart review at Moorfields Eye Hospital identified 71 patients with a molecular diagnosis relating to INS. Visual acuity; presence of nystagmus, signs of albinism and OCT foveal hypoplasia grade were recorded alongside flash and pattern VEP (Visual Evoked Potential) amplitude and peak time. VEP asymmetry was assessed using the Pearson Correlation Coefficient(r).

**Results:** Pathological variants in 8 genes (TYR, OCA2, HPS6, HPS3, HPS1, GPR143, FRMD7, SLC38A8, OCA1) were seen. Mean BCVA per group ranged from 0.38-0.74LogMAR  $F(0.72,3.5)=2.8$ ;  $p=0.04$  one-way ANOVA. All genotypes demonstrated foveal hypoplasia (mode grade 4) except FRMD7(all grade 1). Clinical features of albinism were not seen in FRMD7 nor SLC38A8 patients. In this cohort, positive flash and pattern VEP amplitude/peak time asymmetry was correlated with clinical signs of albinism in all genotypes except SLC38A8 (flash VEP,  $r=0.22(0-6yrs)$ ; pattern VEP,  $r=0.17(6-65yrs)$ ). There was marked asymmetry in SLC38A8 patients, despite few clinical features of albinism ( $r = -0.85$  to  $-0.93$ ).

**Conclusion/Relevance:** This study provides a detailed genotype-phenotype correlation of VEP findings in a molecularly characterised INS cohort. Our findings suggest that cases incorporating INS, foveal hypoplasia and marked electrophysiological misrouting (but without pigmentary changes) are highly correlated with pathological SLC38A8 variants - useful in selecting clinically guided genetic testing and counselling patients.

**References:** Poulter JA, Al-Araimi M, Conte I, et al. Recessive mutations in SLC38A8 cause foveal hypoplasia and optic nerve misrouting without albinism. *Am J Hum Genet.* 2013;93(6):1143-1150. doi:10.1016/j.ajhg.2013.11.002

Poster #B56  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Global Prevalence and Epidemiological Characteristics of Infantile Nystagmus: A Systematic Review and Meta-Analysis**

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**Introduction:** Infantile nystagmus (IN) is a significant cause of vision impairment (1). The epidemiology of IN in the general population is poorly characterised. Reliable epidemiological estimates can inform policy and priority setting. This study aimed to estimate the global prevalence of IN.

**Methods:** A comprehensive parallel systematic review of Medline and EMBASE was conducted to identify population-based epidemiological studies on IN published from database inception to May 2022. We conducted a random-effects meta-analysis to obtain the pooled birth prevalence of IN and subtypes.

**Results:** 3199 studies were identified, of which 11 met the inclusion criteria. The studies involved 1,375,312 participants and identified 1533 IN cases. The pooled birth prevalence estimate was 8.09 (95% CI 4.67–14.02) per 10 000 people for IN. Idiopathic IN was the most common subtype, affecting 2.03 (95% CI 1.18–3.52) per 10 000 people, followed by albinism 1.27 (95% CI 0.51–3.16) per 10 000 people. Nystagmus associated with retinal disease and optic nerve pathologies affected 2.37 (95% CI 1.22–4.58) per 10 000 people. The odds ratio for developing IN in Caucasian children compared to Chinese children was 5.59 (95% CI 2.30 to 13.58).

**Conclusion/Relevance:** This review found that IN affects around 1 in 1236 people in the general population globally. The epidemiology of IN is less well studied in minority populations, with no study from the middle east and the southern hemisphere identified. The findings provide suggestions for further studies on the risk factors and pathogenesis of IN and highlight the need for further research into the understanding of this important cause of vision impairment.

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## Does Spasmus Nutans Really Exist?

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**Introduction:** Spasmus nutans (SN) is considered a benign self-limited disease, however, there are reports of rare, serious SN mimickers. The aim of this study was to identify patients clinically diagnosed with SN and determine if they had an underlying diagnosis.

**Methods:** IRB-approved, retrospective chart review from 1/1/2008 to 1/1/2021 ICD text-searched for SN. Charts without a formal eye exam, or without nystagmus, were excluded.

**Results:** 4,019 charts of patients with nystagmus were identified. The SN text search identified 63 charts; 47 met inclusion criteria. Thirty-one of 47 patients (66%) had a final alternate diagnosis including optic nerve disease (8/31), inherited retinal disease (7/31), systemic diseases (7/31), trisomy 21 (3/31), optic pathway glioma (2/31), neurological disease (2/31), congenital motor nystagmus (1/31), and multifactorial etiology (1/31). Of these patients with an alternate diagnosis, six (6/31, 19%) had improvement or resolution of nystagmus during the follow-up period, including 3 with optic nerve disorders, 2 with CSNB, and one with blue cone monochromacy. Sixteen (16/47) patients had partial or no workup, 9/47 were lost to follow-up, 4/47 were undergoing workup and 3/47 had improvement of nystagmus with no alternate diagnosis.

**Conclusion/Relevance:** Most patients presenting with SN-type nystagmus were found to have a pathologic cause after complete workup. Of patients with underlying disease, 19% had resolution of nystagmus, making resolution unreliable for diagnosis of SN. We propose that shimmering asymmetric nystagmus be renamed 'spasmus-nutans-like' and that patients must have a complete workup including eye examination, OCT, ERG, brain MRI, and genetic testing before receiving a diagnosis of SN.

**References:** Gottlob I, Wizov SS, Reinecke RD. Spasmus nutans. A long-term follow-up. *Invest Ophthalmol Vis Sci.* 1995;36(13):2768-2771.

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**Cutaneous Lower Eyelid Retractor Release (CLERR):  
A Simple Method to Avert Lower Lid Malposition After Inferior Rectus (IR) Muscle Recession**

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**Introduction:** The lower eyelid is anatomically coupled to the IR, so that IR recession alone causes lower lid retraction often symptomatic due to inferior scleral show and corneal exposure. Although procedures within the conjunctival incision reduce retraction slightly, release of the lower lid retractor muscles via cutaneous incision (CLERR) eliminates this problem.

**Methods:** We reviewed 65 consecutive IR recessions performed by one surgeon between September 2019 and August 2002, of which 50 included CLERR. CLERR was performed in 2-3 minutes by blunt dissection of the retractors from the inferior margin of the tarsus via a small skin incision over the lateral orbital rim, using Stevens scissors blades visualized through the intact inferior tarsal conjunctiva. Inferior scleral show was measured an average of 116 days post-operatively.

**Results:** Although mean IR recession was significantly greater at  $4.8 \pm 2.1$  mm (SD, range 2-8mm) with CLERR than  $3.4 \pm 1.2$ mm (range 2-6mm) without it ( $P=0.02$ ), inferior scleral show averaged less with CLERR at  $0.1 \pm 0.8$ mm than  $0.7 \pm 1.0$ mm without it ( $P=0.014$ ). Lower lid ecchymosis occurred in 22 cases with CLERR, but resolved within one week without patient complaints. The skin incision healed without visible scar in 5-7 days. There was one complication of severing an IR hangback suture that was repaired during suture adjustment.

**Conclusion/Relevance:** CLERR is a quick and simple procedure that virtually eliminates lower eyelid retraction following IR recession of any amount, avoiding inferior scleral show and new dry eye symptoms without additional conjunctival dissection. It is a quick oculoplastic procedure readily performed by any strabismus surgeon.

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Poster #B59  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Frontalis Flap Advancement versus Frontalis Sling in the Management of Congenital Blepharoptosis

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**Introduction:** Management of congenital ptosis is somewhat difficult, and its repair necessitates accurate preoperative assessment, careful operative plan, and meticulous surgical technique. The frontalis muscle is the main motor muscle in the correction of severe ptosis with poor levator function in children. It is well developed in infancy and can be used in young children. This study aimed to compare the results obtained by frontalis muscle flap advancement and frontalis sling operations.

**Methods:** 42 eyelids of 34 children with moderate to severe congenital ptosis with poor levator function were divided into two groups: Group A included 21 eyelids corrected with the frontalis muscle flap advancement technique, and group B included 21 eyelids corrected with the frontalis sling operation.

**Results:** Improvement in both MRD1 and VPFH were almost the same, but the stability of ptosis correction was better in the flap group. Cosmetic outcomes were better in the flap advancement group regarding eyelid contour (90.5% vs. 76.2%), eyelid crease (95.2% vs. 81.0%) and eyelid fold (95.2% vs. 81.0%). Gaze asymmetry was better in the sling group (81.0% vs. 33.3%). Hematoma, lash ptosis, pop eyelid and lagophthalmos were reported only in flap group (38.1%, 9.5%, 9.5%, and 4.8% respectively). Infection occurred only in the sling group (9.5%). Under correction was more frequent in the flap group (23.8% vs. 19.0%). Overcorrection was not recorded in either groups. Recurrence was less frequent in the flap group (15.3% vs. 23.8%). Parent's satisfaction rates were better in the flap group (90.5% vs. 76.2%).

**Conclusion/Relevance:** Frontalis muscle flap advancement could be a better surgical option and can be added to the current procedures for congenital ptosis correction.

**References:** Allen RC. Surgical Management of Ptosis and Brow Ptosis. American Academy of Ophthalmology. 2017; XXXV (5):7-13.

## Outcomes of Levator Resection for Congenital Ptosis with Poor Levator Function

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**Introduction:** In congenital ptosis with poor levator function, frontalis sling suspension is considered standard of care. However, frontalis suspension can be complicated by extrusion, infection, granulomas, poor cosmesis and need for re-operations. The use of levator resection as an alternative has been argued.<sup>1-3</sup>

**Methods:** Chart review of 123 patients who had levator resection for congenital ptosis at Boston Children's Hospital. Patients were divided into subgroups based on levator function - poor defined as  $\leq 5$ mm (n = 38), moderate as 6 – 10mm (n = 74), and excellent as  $\geq 11$ mm (n = 11).

**Results:** MRD1 increased from  $-0.33 \pm 0.87$  mm pre-op to  $1.81 \pm 1.52$  mm post-op in the poor group, from  $0.66 \pm 0.99$  mm to  $3.01 \pm 1.07$  mm in the moderate group, and  $0.73 \pm 0.83$  mm to  $3.38 \pm 0.87$  mm in the excellent group. There was no significant difference in the pre-op to post-op change in MRD1 when comparing the poor vs. moderate group (2.14 vs. 2.35mm; p = 0.51) or the poor vs. excellent group (2.14 vs. 2.65; p = 0.26). Of the 15 patients who needed re-operation, 8 had poor levator function vs. 7 with moderate function (p = 0.14), and vs. 0 with excellent function (p = 0.048).

**Conclusion/Relevance:** Patients with poor levator function did not have significantly worse outcomes than the moderate or excellent groups. Re-operation rates were similar between poor and moderate groups. It is reasonable to offer levator resection as a primary surgical option for congenital ptosis with poor levator function.

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Poster #B61  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Anisometropia in a Population-Based Cohort of Children with Nasolacrimal Duct Obstruction**

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**Introduction:** The purpose of this study was to evaluate the association between congenital nasolacrimal duct obstruction (CNLDO) and anisometropia among a population-based cohort of children diagnosed over a 10-year period.

**Methods:** The medical records of all children (<5 years old) diagnosed with CNLDO from January 1, 1995, through December 31, 2004, while residing in Olmsted County, Minnesota, were reviewed for their refractive error through August 2022. Anisometropia was defined as  $\geq 1$  diopter spherical equivalent between the 2 eyes.

**Results:** Among a cohort of 1950 children diagnosed with CNLDO during the 10-year period, 708 (36.3%) subsequently underwent one or more refractions at a mean age of 112 months (range, 0.3 months to 27.1 years). The 708 later-refracted children, compared to the 1242 without follow-up, were more commonly female (50.6% vs 46.1%,  $p = 0.066$ ), diagnosed with CNLDO at an older age (mean of 5.1 months vs 3.1 months,  $p < 0.001$ ), and were less likely to experience a spontaneous resolution (67.6% vs 96.0%,  $p < 0.001$ ). Seventy-seven (10.9%) of the 708 children who underwent a refraction were found to have a mean anisometropia of 1.72 diopters (range, 1.00 to 4.50 diopters), of which 33 (4.7%) were diagnosed with amblyopia.

**Conclusion/Relevance:** In this population-based cohort of infants diagnosed with CNLDO, anisometropia was observed in 1 in 9 children who had follow-up examinations. These elevated rates of anisometropia and amblyopia among infants with CNLDO, a common pediatric condition, may be a significant contributor to their incidence in the general population.

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Poster #B62  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Safety and Efficacy of Nasolacrimal Duct Stenting Outside of the Operating Room- Comparing Three Types of Stents**

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**Introduction:** Congenital nasolacrimal duct obstructions (NLDO) are a very common ophthalmic problem. While most resolve by one year of age, the remainder require surgical intervention by probing and/or stenting. This is usually accomplished under general anesthesia in an operating room setting. We are evaluating the safety and efficacy of intravenous sedation outside of the operating room comparing three types of stents.

**Methods:** Retrospective chart review of 60 patients (79 stents), 35 Monoka, 15 Masterka, and 29 Lacrijet. All procedures were performed by the same physician, under intravenous sedation provided by a pediatric sedation service team. Sedation complications and final outcomes were reviewed for each type of stent.

**Results:** Of the 60 patients 57% were male, 43% female, 83% white, mean age 23.9months, mean BMI 17.7. Sedation adverse effects were recorded in 17% of the Monoka patients, 13% of Masterka and none of the Lacrijet. They consisted of apnea/hypoxia, need for positioning, suctioning or bag mask ventilation, hypotension or laryngospasm. No complication resulted in harm to the patients or required hospitalization or intubation. The average sedation time was similar for all 3 types of stents. Recurrence was noticed in 14% of Monoka, 6% of Masterka and 6% of Lacrijet stents. A single factor ANOVA showed no statistically significant difference between the stents for recurrence, complication or resolution.

**Conclusion/Relevance:** Intravenous sedation is safe and effective for NLDO stenting procedures saving time and resources in the operating room and providing convenience for the families that can remain with the patient during the procedure and return home faster.

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Poster #B63  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Comparing Extrusion Rates and Post-Operative Emergency Visits between Tied and Untied Silicone Stents in Pediatric Lacrimal Surgery**

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**Introduction:** Bicanalicular intubation has been the gold standard for secondary treatment of congenital nasolacrimal duct obstruction refractory to probing.<sup>1</sup> A common post-operative complication is the lateral displacement of the silicone loop at the medial canthus causing a prolapsed stent.<sup>2-3</sup> Our study sought to compare rate of stent extrusion and emergency visits in tied and untied silicone stents for pediatric lacrimal surgery.

**Methods:** This retrospective chart review included 166 eyes of 129 patients from February 2018 to March 2022. All probe and stent surgeries performed by one surgeon utilizing silicone stents were included apart from those lost to follow-up, complicated by infection, anatomical abnormalities, neoplasms, or trauma.

**Results:** Of the 166 eyes, 97 had stents that were tied and 69 had stents that were left untied. The rate of success between untied and tied stents was not statistically significant. Untied stents prematurely prolapsed to a greater extent. (p-value<0.05) Untied stents also involved less earlier visits to the emergency room, clinic, and telemedicine. (p-value<0.05) Out of the 32 earlier visits required in the tied stent group, 15 of them included emergency room encounters. Out of the 9 earlier visits required in the untied stent group, none of them were to the emergency room. A 2-sample t-test or chi-squared test was used for all indicated statistical analyses.

**Conclusion/Relevance:** We propose leaving silicone stents untied for the standard nasolacrimal duct intubation given the similar rate of success between untied and tied stents and the decrease in burden on the healthcare system with less earlier visits required for prolapse.

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Poster #B64  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Demographic Barriers to Subspecialty Care in Patients with Juvenile Idiopathic Arthritis

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**Introduction:** Geographic distance to subspecialty care is a predictor of delayed referral to pediatric rheumatology in patients with juvenile idiopathic arthritis (JIA) in Germany.

**Methods:** Through retrospective chart review, we compared predictors of delayed referral to pediatric ophthalmology and rheumatology in 306 children with JIA over a 10-year period.

**Results:** Median time from symptom onset to first subspecialist visit was 14 weeks (range 0-557). Children with JIA traveled large distances to receive subspecialty care: median distance was 43.9 km (range 2.4-637 km). Patients from areas with low median incomes also lived farther away, while those from the most affluent areas lived closer to the eye center (ANOVA,  $p < 0.0001$ ). There was a trend for African American children to have longer intervals between symptom onset and first subspecialty visit, although this did not reach statistical significance ( $p = 0.08$ ). No other variable (income, race, ethnicity, presence of ocular inflammation, or geographic distance) was associated with delayed referral time to either, both, or between subspecialties, or to start of immune modifying therapy. Children with eye inflammation at their first ophthalmology visit were more likely to be  $< 7$  years old or have oligoarticular JIA (Chi-squared test,  $p = 0.02$  and  $p = 0.0002$ , respectively); ANA status was not significantly correlated.

**Conclusion/Relevance:** Clinicians should be aware their JIA patients often travel long distances for subspecialty care, with those traveling the farthest being from resource limited areas. Effort should be made to see younger children and those with oligoarticular JIA promptly, as they have the highest risk of ocular inflammation at diagnosis.

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Poster #B65  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Increasing Pediatric Eye Care Access in the United States: Pilot Results from the All Children See Program**

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**Introduction:** Many children in the United States have unmet vision care needs. Economic factors are a significant barrier to accessing eye care [1]. The All Children See (ACS) program was founded through the support of the Knights Templar Eye Foundation and the Children's Eye Foundation of AAPOS as an initiative to offer eye examinations to children in need of eye care.

**Methods:** ACS recruited nationally for pediatric ophthalmology volunteers. Children 0 to 18 years old qualify for ACS if they failed a vision screening or had an eye concern reported by a parent/guardian or provider and are uninsured. ACS was advertised as a resource to local pediatricians and school-based screening programs. Qualified children were referred to an ACS-affiliated provider in their area. We report preliminary program experience.

**Results:** In 2020, ACS launched a regional pilot in Maryland, Virginia, and the District of Columbia. By 2022, the program expanded to 5 additional states. Nationally, 180 pediatric ophthalmologists volunteered for ACS; 23.9% (n=43) are in the pilot region, with the remaining 76.1% (n=137) in states where ACS has or is soon to launch. Patient recruitment efforts began in October 2020; however, it was significantly impacted by the pandemic. To date, 43 children received eye exams, and over 30% (n=16) were prescribed eyeglasses.

**Conclusion/Relevance:** ACS demonstrated success at establishing a program to address disparities in accessing quality eye exams. Providing timely connections to specialized eye care can reduce the burden of visual impairment in the pediatric population. ACS's impact will continue to grow as the program expands.

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## Cost Analysis of a School-Based Vision Program in an Urban, High-Poverty School District

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**Introduction:** School-based vision programs (SBVPs) deliver care directly in schools. They are one approach to address pediatric eye care disparities, especially in disadvantaged communities with high vision screening failure rates and limited access to care.[1] While the impact of SBVPs on vision and academics has been reported,[2,3] little is known about program operating costs. This study reports the costs associated with operating a SBVP in an urban, high-poverty school district.

**Methods:** Students in pre-Kindergarten- 8th grade from Baltimore City Public Schools were screened during 2016-2019; students who failed vision screening were offered eye examinations and eyeglasses, when indicated. Expenses related to screenings (Baltimore City Health Department) and examinations (Vision To Learn) were collected, along with the number of days screening and examinations were conducted. Eyeglasses were donated to the program, however for analysis purposes, the cost was estimated at \$10 each.

**Results:** Over a three-year period, implementing Baltimore's SBVP in 136 schools cost \$1,821,691, including \$1,364,758 for personnel, \$297,223 for program administration, and \$159,710 in estimated eyeglasses costs. For all 55,305 children screened, the total cost of screening was \$847,345; the cost per child screened was \$15.32. For the 9,880 children examined, the total cost of examination and glasses was \$974,346; the cost per child examined was \$98.62. Total program costs were \$32.94/child and \$13,394/school served.

**Conclusion/Relevance:** Understanding the costs related to operating SBVP aids in program planning. Future studies should also include the cost-benefit of SBVPs, especially as it relates to quality of life and learning impact for underserved populations.

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## Protective Eyewear in Children with an Impaired Monocular Vision: Compliance and Trends

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**Introduction:** To evaluate compliance, trends, and frequency of safety glasses worn in children with impaired monocular vision.

**Methods:** We conducted telephone interviews with 81 parents of pediatric patients who met the inclusion criteria of recommendation to use protective glasses due to monocular decreased vision ( $\leq 20/100$ ) or a deteriorating visual condition. The survey included questions regarding awareness of safety glasses and compliance in general and during sports activity.

**Results:** Seventy parents participated in our telephone survey. The average age was 8.85 years ( $\pm 4.51$ ). A documented recommendation was found in the files of 44 (64.71%) of the cases; 51 (73.91%) of the parents approved being aware of the recommendation, while 18 (25.7%) did not. 21 (36.8%) used safety glasses all the time, 26 (45.6%) wear safety glasses for less than 8 hours a day. The main reasons to avoid protective glasses were: appearance (12.50%), discomfort (37.93%), the frame being too broad (8.62%), and interference with visual acuity (5.26%). Sixteen parents (28.07%) stated that wearing safety glasses has prevented traumatic injury to a healthy eye. There was no correlation between compliance and age, time since the recommendation was first given, type of injury, visual acuity, and refractive error in the impaired eye.

Compliance correlates with the need for a refractive correction in the good eye ( $P=0.05$ ). There was a correlation between sports practice and poor compliance ( $P=0.001$ ).

**Conclusion/Relevance:** Compliance with protective glasses is not sufficient. Educational efforts should be improved, emphasizing the actual risk for the healthy eye, especially during childhood and sports activities.

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Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Protective Eyewear Reduces Retinal Damage in Sports Trauma

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**Introduction:** Sports-related ocular injury is common in the pediatric population and can lead to life-long vision deficits if severe enough. Soccer is the most popular game in the world, but eye protection is rarely utilized. The purpose of this study was to quantify the reduction in retinal stress that eye protection provides, as well as compare efficacy of different materials.

**Methods:** A finite element (FE) computer simulation was used to model a pediatric eye, soccer ball, and protective glasses composed of acrylic or polycarbonate.

**Results:** Eye protection significantly reduced peak average retinal stress by absorbing energy and transferring it to the orbit instead of the globe. Polycarbonate performed better (61% reduction) than acrylic (40% reduction).

**Conclusion/Relevance:** Protective eyewear has the potential to greatly reduce the incidence and severity of sports-related eye injuries. Polycarbonate is more effective in reducing retinal stress than acrylic, however other factors should be considered in designing eye protection, such as cost and accessibility. Regardless of the material, the authors suggest that community leaders and physicians working with pediatric populations recommend use of eye protection when playing soccer to prevent potentially life-long vision loss.

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Poster #B69  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Use of the World Health Organization Primary Eye Care Protocol to Investigate the Ocular Health Status of School Children in Rwanda

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**Introduction:** Eye health services are not equitably delivered worldwide.<sup>1</sup> Eye care services in sub-Saharan Africa continue to suffer from bottlenecks,<sup>2</sup> with limited data on vision screening programs.<sup>3</sup> This study sought to assess the ocular health of schoolchildren in Rwanda and explore the use of the World Health Organization primary eye care (WHO PEC) screening protocol.

**Methods:** This was a cross-sectional population-based study across 19 schools in Rwanda. Screening was completed using the WHO PEC screening protocol whereby visual acuity was measured using a 2-line tumbling E Snellen chart (6/60 and 6/12). Other abnormal features were identified using a flashlight and history against a checklist. Those with abnormal screening were referred to an onsite clinic for full examination. Those who could not be treated were referred to a hospital for specialist care.

**Results:** 24,892 children underwent ocular health screening. 1,865 (7.5%) failed the primary screening. Of those, 658 (35.3%) were false positives, leaving 1,207 students (4.8% of total) who truly failed the vision screening. The most frequently observed ocular diagnoses were allergic conjunctivitis (3.11% of total screened) and strabismus (0.26%). Refractive error was very rare (0.18%).

**Conclusion/Relevance:** The WHO PEC curriculum provides an option for school vision screening by utilizing a standardized checklist and low-cost resources while empowering existing health personnel. There was a remarkably low frequency of refractive errors, and the overwhelming majority of ocular problems were visible in nature. In this setting, teachers may be equally effective as screeners in detecting children visibly needing ophthalmic care.

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Poster #B70  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Parental Attitudes Toward Myopia Management

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**Introduction:** Myopia is a disease and public health threat where the incidence and prevalence outpaces genetic contributions alone. Myopia management (MM) strategies minimize the risk of future vision-threatening complications. Our objective was to assess parental attitudes toward MM in an effort to inform eye care professionals and industry.

**Methods:** 87 parents whose children under 18 years old have myopia were recruited via social media to complete a 10-item questionnaire evaluating their perspectives about myopia as well as current treatment options.

**Results:** Of 87 parental respondents, 95% had myopia and 72% had a partner with myopia. 56% believe their child's myopia had gotten worse in the past year and 52% were educated on MM treatments. While atropine (A), ortho-k (OK), and soft contact lenses (SCL) were most discussed, the top 3 prescribed were A, OK, and undercorrection. 49% had never heard of MM before. The top 3 motivating factors to start MM earlier were: rapid progression, threat to child's overall well-being, and FDA-approved treatments with long-term data. Parents with myopia worse than -6.00 had a 5.84 [1.56-21.80] increased odds of being worried or extremely worried about myopia ( $p=0.009$ ).

**Conclusion/Relevance:** Our study indicates almost half of parents were not educated about myopia management treatment options at the time of their child's visit. Outreach should follow a two armed approach: 1) Encourage ophthalmologists and optometrists to uphold MM standard of care 2) Educate parents directly about MM strategies so that they can be proactive in their children's eye care.

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Poster #B71  
Saturday, April 1, 2023  
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## Ophthalmic Outcomes in Children with In-Utero Drug Exposure

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**Introduction:** We sought to identify the incidence of ocular pathology among children experiencing in utero drug exposure (IUDE) and/or Neonatal Abstinence Syndrome (NAS).

**Methods:** Retrospective cohort study of children seen at Children's Hospital of Philadelphia over a 12-year period who had been exposed to one or more illicit drugs during gestation. Children with fetal alcohol syndrome were excluded. Primary outcomes were the rates and types of ophthalmologic abnormalities. The types and numbers of drug exposures, and severity of postnatal withdrawal symptoms requiring pharmacologic treatment, were evaluated as modifying factors. Reason for eye exam was considered to reduce the effect of referral bias on the prevalence estimates.

**Results:** 382 patients with IUDE were studied. Mean age at initial ophthalmology exam was 2.2 years (SD 2.3), with average follow up length 3.8 years (SD 3.3), and average number of exams per patient 4.8 (SD 5.2). Strabismus was the most common outcome (48%, 20% adjusted) followed by amblyopia (25%, 11% adjusted) and nystagmus (12%). Rates of eye disease were higher if children required treatment for withdrawal symptoms: strabismus 55% ( $p < 0.005$ ), amblyopia 31% ( $p < 0.001$ ) and nystagmus 15% ( $p = 0.05$ ). Polysubstance did not increase risk of eye disease. Refractive error distribution was as expected for young children.

**Conclusion/Relevance:** Children with IUDE appeared at increased risk of strabismus, amblyopia and nystagmus. NAS requiring pharmacologic treatment further increased the risk of developing these outcomes.

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Poster #B72  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Role of Prenatal Imaging in the Identification of Congenital Ocular Anomalies: A Systematic Review**

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**Introduction:** Early diagnosis of congenital ocular disease is paramount in optimal postnatal management. However, standards of care regarding the clinical utility of fetal ultrasound (fUS) and magnetic resonance imaging (fMRI) in identifying ocular anomalies during the prenatal period are lacking<sup>1</sup>. This systematic review aims to evaluate the evidence regarding prenatal imaging in identifying ocular and orbital abnormalities.

**Methods:** Database searches in Embase, MEDLINE, and Cochrane for keywords and database-specific terminology (e.g., MeSH) were performed without date restrictions. Case reports, case series, conference abstracts, and full-length articles describing identification of ocular or orbital anomalies using fUS and/or fMRI were included. Literature reviews and non-English articles were excluded.

**Results:** The literature search identified 2,239 records of which 142 articles (314 subjects) comprising case reports/series (n=132) and retrospective (n=9) and prospective (n=1) cohort studies were included. Microphthalmia and congenital cataracts were identified in the highest number of cases (n=121 and 118, respectively). Other anomalies included anophthalmia, cryptophthalmia, coloboma, retinal dysplasia, orbital tumors/masses, corneal opacity, persistent fetal vasculature, and glaucoma. Most cases (98.7%) were identified during the second or third trimester. Fetal ultrasound alone was utilized to identify ocular anomalies in 85% of studies. Multimodal imaging (fMRI/fUS) was used most frequently for posterior segment anomalies. Imaging findings informed postnatal surgical and medical treatment in 26 cases (8%).

**Conclusion/Relevance:** A broad spectrum of ocular and orbital anomalies in fetuses have been identified using fetal imaging. Prospective, multi-institutional studies are needed to develop clinical standards for prenatal ocular assessment.

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Poster #B73  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Association of Refractive Error with Bruch's Membrane Opening and Gamma & Delta Parapapillary Zone among Progressive High Myopic School-aged Children

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**Introduction:** Circular gamma-zone[absence of Bruch's-membrane(BM) and delta-zone(elongated and thinned peripapillary scleral flange)] may develop due to enlargement of Bruch's-membrane opening(BMO) in high-myopia. The objective of this study is to evaluate and correlate the change in myopic refractive error with change in size of BMO and of gamma and delta-zone.

**Methods:** Optical-coherence-tomography(OCT) was performed on 20 eyes of high myopic children using SPECTRALIS OCT(Heidelberg engineering, Germany) at baseline and 6-month visit. BMO assessed using preset analysis software showing a transverse section on the BM. Gamma and delta-zone were measured selecting the desired layers and adapting the analysing slabs to the region of interest. Cycloplegic refractive error was measured using autorefractometer.

**Results:** The mean age of children were  $10.8 \pm 2.7$  years. The difference in mean myopic spherical-equivalent refractive-error between baseline/first-visit( $-11.3 \pm 3.8$  D) and 6-month visit( $-11.9 \pm 4.1$ ) is statistically significant( $P < 0.001$ ). The change in mean BMO was significant between first( $303 \pm 54 \mu$ ) and 6-month( $342 \pm 72 \mu$ ) visit( $P: 0.023$ ). The gamma-zone increased significantly from  $112 \pm 32 \mu$  (baseline) to  $131 \pm 33 \mu$  in 6 month( $P: 0.001$ ), similarly delta-zone is increased from  $54 \pm 13 \mu$  to  $66 \pm 15 \mu$  in 6 months( $P: 0.04$ ). The change in BMO is significantly correlated with change in myopic refractive-error ( $r: 0.59; P: 0.042$ ). However, no correlation was observed between BMO and myopia at first( $r: 0.21; P: 0.17$ ) and 6-month visit( $r: 0.14; P: 0.09$ ). The correlation of myopia progression is significant with change in gamma-zone ( $r: 0.54; P: 0.044$ ); but not significant with change in delta-zone( $r: 0.25; P: 0.08$ ).

**Conclusion/Relevance:** The BMO and gamma-zone is progressively increased in correlation with increase in myopia among high-myopic children. The BMO enlargement cause compression and thinning of choroid at posterior-pole. The large gamma-zone could explain the central-scotoma developed in high-myopia unaccompanied by maculopathy.

**References:** 1. Wang YX, Panda-Jonas S, Jonas JB. Optic nerve head anatomy in myopia and glaucoma, including parapapillary zones alpha, beta, gamma and delta: Histology and clinical features. *Prog Retin Eye Res.* 2021;83:100933.  
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Poster #B74  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

### **Prevalence of Pediatric Astigmatism in the Navajo Nation**

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**Introduction:** Our outreach branch has partnered with Navajo Health Services to provide ophthalmologic care to children since 2013. During this time, a high prevalence of astigmatism has been identified. Uncorrected astigmatism is negatively correlated with academic success in pediatric populations (1).

**Methods:** In 2021, the Navajo Nation IRB approved a formal study of pediatric vision care records collected since 2013. The prevalence and trends of astigmatism were analyzed from 681 pediatric charts with refraction information.

**Results:** A total of 681 patients ages 5-17 were included in preliminary data analysis. The prevalence of astigmatism greater than two diopters was 30.84% (210/681). Right eyes had a mean cylinder of 1.89 D, and SE of -0.30 D. Left eyes had a mean cylinder of 1.95 D, and SE of -0.20 D. Without correction, 35.55% (166/467) of patients had a visual acuity worse than 20/40.

**Conclusion/Relevance:** This is the first epidemiological study examining the ophthalmologic health in pediatric populations in the Navajo Nation in Utah and Arizona. Preliminary data suggests higher prevalence of astigmatism in this population relative to the US average (2,3). The refractive error SE data may suggest some potential for self-correction of astigmatism. Uncorrected astigmatism can lead to worse outcomes in primary education. Further exploration of potential causes of this higher prevalence is warranted. Routine visual screenings in high-risk pediatric populations can ensure lower rates of untreated refractive error, thus increasing quality of life and educational outcomes.

**References:** 1. Garber JM. High corneal astigmatism in Navajo school children and its effect on classroom performance. *J Am Optom Assoc.* 1981;52(7):583-586.  
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Poster #B75  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Longitudinal Development of Ocular Biometric Components and Refractive Error in Children with Infantile ET vs Late-Onset Accommodative ET**

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**Introduction:** Previously we reported that children with infantile ET maintained a stable level of hyperopia until 7 years of age, at which point it begins to decrease. Unlike infantile ET, children with late-onset accommodative ET had little change in hyperopia up to age 12.[1, 2] However, little is known about how optical components develop in these two types of patients. We hypothesize that optical components develop differently in these two groups. Here, we report the development of optical components in these two groups.

**Methods:** This prospective longitudinal study included children with infantile ET (n=35) and with late-onset accommodative ET (n=78). Axial length (AL), anterior chamber depth (ACD), lens thickness (LT), and keratometry (K1, K2) were obtained with a LenStar LS 900. Participants had cycloplegic refraction within 6 months of the LenStar measurements and spherical equivalent (SEQ) was derived. The follow-up duration ranged from 1.5 to 5.1 years (average 4 years). A linear mixed-effect model was used to estimate the rate of individual development for each ocular component and SEQ, and to compare the two groups.

**Results:** The rates of change with age (slopes) of SEQ and AL were significantly different between the infantile and late-onset groups (SEQ: -0.20 vs -0.15D/year,  $P<0.05$ ; AL: 0.17 vs 0.15 mm/year,  $P<0.05$ ). The rates of change in ACD, LT, K1, and K2 did not differ for the two groups.

**Conclusion/Relevance:** Changes in axial length are slower in late-onset accommodative ET than infantile ET, consistent with less change in spherical equivalent with age.

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Poster #B76  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Outcome of Ocular Toxoplasmosis in Children and Adolescents

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**Introduction:** Toxoplasmosis is the most common cause of infectious uveitis of the posterior segment. In this study, we focused on localization of the retinal infiltration and visual outcome in children and adolescents.

**Methods:** Single-center, retrospective study, study period 2012 to 2021. Patients  $\leq 18$  years of age at first presentation with active ocular toxoplasmosis were included. Age, visual acuity (VA, Snellen) at first and last examination, and location of infiltrate were extracted from electronic medical charts. Fundus imaging and optical coherence tomography were reviewed. The cohort was divided into three subgroups depending on foveal involvement. The primary outcome was VA improvement. Local ethics committee approved study.

**Results:** A total of 144 pediatric uveitis cases were identified, thereof 21 (14.5%) presented with active ocular toxoplasmosis. All but one patient agreed study inclusion. Mean age was 14.4 years. All patients were treated with oral antibiotics and prednisone. Mean follow up period was 276 days. Overall VA improved was from mean 20/40 to mean 20/28 ( $p=0.001$ ). In cases with fovea inflammation with foveal infiltrate mean VA improved significantly from 20/500 to 20/66 ( $p=0.028$ ). In cases with foveal inflammation but extrafoveal infiltrate VA improved from 20/32 to 20/22 ( $p=0.078$ ). In cases with no foveal involvement VA improved from 20/25 to 20/21 ( $p=0.066$ ).

**Conclusion/Relevance:** VA improvement was noticed after treatment especially in fovea involving cases. All groups demonstrated a favorable outcome, however foveal infiltrates predicted a reduced visual recovery.

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Poster #B77  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Characterizing Myelinated Retinal Nerve Fibers in Patients With and Without Myopia and Amblyopia

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**Introduction:** Myelinated retinal nerve fibers (MRNF) are present in 0.57-1% of the population [1]. For most patients, MRNF are benign. Patients with Straatsma syndrome, however, present with axial myopia and amblyopia in the eye with MRNF [2]. No study has quantitatively compared MRNF characteristics in asymptomatic MRNF to Straatsma.

**Methods:** Charts were reviewed for all patients with MRNF examined at one tertiary center between 2010 and 2022. Straatsma syndrome was defined as spherical equivalent (SE) refractive error  $\leq -3.0$  D and amblyopia with Snellen best corrected visual acuity (BCVA)  $<20/60$  in the eye with MRNF.

**Results:** A total of 158 patients with MRNF were identified, of whom 19 met criteria for Straatsma syndrome. For Straatsma patients, median Snellen BCVA was 20/500 and SE was -7.75 in the affected eye. Fundus photographs were available for 10 Straatsma-affected eyes and 107 non-Straatsma eyes with MRNF. Straatsma eyes had a median of 12 clock-hours [interquartile range (IQR) 10.5-12] of MRNF involvement relative to the optic nerve, while non-Straatsma eyes had 5 (IQR 2-8.5) ( $p = 0.002$ ). Straatsma patients were significantly more likely to have MRNF extending along the superior ( $p < 0.001$ ) and/or inferior arcades ( $p = 0.04$ ). All Straatsma eyes had MRNF extending temporal to the fovea along one or both arcades, compared to only 5 non-Straatsma eyes.

**Conclusion/Relevance:** The pathophysiology of MRNF and underlying differences between patients with Straatsma and benign MRNF remain incompletely understood. Our findings support a quantitative difference in extent of MRNF involvement between symptomatic and asymptomatic patients and identify imaging markers for potential myopia and amblyopia.

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2. Tarabishy AB, Alexandrou TJ, Traboulsi EI. Syndrome of myelinated retinal nerve fibers, myopia, and amblyopia: a review. *Surv Ophthalmol.* 2007;52(6):588-96.

Poster #B78  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## A Phase I Study of Episcleral Topotecan Plaque for Retinoblastoma

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**Introduction:** Treatment of eyes with advanced intraocular retinoblastoma remains a challenge. The current standard therapies used in the treatment of intraocular retinoblastoma, systemic chemotherapy, enucleation, and EBRT, are all associated with significant morbidity. Intra-arterial chemotherapy has become the widely used modality for recurrent retinoblastoma but has side effects and requires technical proficiency of an interventionist.

**Methods:** This Phase I study (ClinicalTrials.gov Identifier: NCT04156347) will evaluate the feasibility and toxicity of topotecan delivered directly to the eye using a novel Episcleral Reservoir. The episcleral device is secured to the episclera by tissue adhesive for 6 weeks. This is a dose escalation study involving 3 dose levels.

**Results:** 10 eyes of 10 patients with recurrent retinoblastoma following systemic chemotherapy and/or intra-arterial chemotherapy were enrolled in the 3 dose levels. Three patients had only tumor recurrence, 2 had only subretinal seed recurrence, 3 had tumor and vitreous seed recurrence and 1 had tumor and subretinal seed recurrence. Complete tumor response was seen in all 10 patients after a mean follow of 155 days with no need for additional treatment. One patient underwent enucleation for non-tumor related complication. The most common side effect was discomfort caused by self-limiting scleritis.

**Conclusion/Relevance:** In a limited Phase I study, episcleral topotecan shows good tumor control for recurrent retinoblastoma. Further Phase II studies are required to characterize tumor response and complications.

**References:** 1. Carcaboso AM, Chiappetta DA, Opezzo JAW, et al. Episcleral Reservoirs for topotecan delivery to the posterior segment of the eye. *Invest. Ophthalmol. Vis. Sci.* 2010;51(4):2126-2134.

## Long Term Efficacy of Intravitreal Melphalan Chemotherapy for Vitreous Seeding in Retinoblastoma

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**Introduction:** To evaluate the efficacy of intravitreal Melphalan chemotherapy for vitreous seeding in retinoblastoma.

**Methods:** A tertiary eye center conducted a retrospective one-arm cohort study. Between 2013 and 2021, 27 vitreous retinoblastoma seed patients who received intravitreal melphalan in one eye were included. The data involved demographic factors, stage of diagnosis, clinical findings, treatment modalities, side effects, time of follow-up, and saved eyes. A survival estimate was performed to assess saved eyes in Melphalan received group and compared with the standard treatment group in bilateral cases.

**Results:** Patients were followed up for 65 (34-83) months. 17 (63%) patients had bilateral disease. The median number of injections per eye was 2 (1-3). The main indication for intravitreal Melphalan injection was the persistence of vitreous seeds after systemic chemotherapy (89%). The first response to treatment was observed after the first injection in 25 patients (93%). 16 (59%) eyes were salvaged. Survival estimate (saved eyes) for eyes receiving Melphalan was 80% at 24.8 months (95% CI: 11.2-45.2). After 42.5 months, the survival estimate dropped to 75% (95% CI: 14.2-48.9) months. The main cause of enucleation in our patients was tumor recurrence (36%). Retinal toxicity was observed in 11 eyes. Vitreous hemorrhage, presented in 5 eyes, showed a 13.14-fold increase in enucleation rates. Saved eyes in the Melphalan-received eye group were significantly higher than the standard treatment group.

**Conclusion/Relevance:** Intravitreal Melphalan is an effective treatment option for vitreous seeds, especially in the short term. Vitreous hemorrhage is a significant risk factor for enucleation in patients with retinoblastoma

**References:** 1. González ME, Gaviria ML, López M, Escudero PA, Bravo A, Vargas SA. Eye Salvage with Intra-Arterial and Intra-Vitreous Chemotherapy in Patients with Retinoblastoma: 8-Year Single-Institution Experience in Colombia. *Ocul Oncol Pathol.* 2021;7(3):215-223. doi:10.1159/000511980  
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Poster #B80  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Direct Medical Costs of Globe Preservation in Patients with Group C-E Retinoblastoma

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**Introduction:** Intra-arterial chemotherapy (IAC) has increasingly been used in the treatment of retinoblastoma [1]. The cost of IAC can be justified when saving an eye; however, in cases of advanced tumor and poor vision potential, the cost and risk of a prolonged treatment course needs to be considered and better understood.

**Methods:** Retrospective review of 74 eyes of 70 patients diagnosed with International Classification Group C-E retinoblastoma: 5 in Group C, 29 in Group D, and 40 in Group E. Patients who were transferred or initially diagnosed elsewhere were excluded. Direct medical costs pertaining to examinations under anesthesia, clinic visits, and treatment modalities were calculated.

**Results:** 55 eyes underwent primary enucleation, 12 eyes failed globe-preserving treatment and were ultimately enucleated, and 7 eyes avoided enucleation. Out of 11 eyes treated with primary IAC, 7 were eventually enucleated. In the first year of treatment, the average cost of primary enucleation was \$94,364, the cost of IAC was \$322,073, and the cost of enucleation after failed treatment was \$242,777. Patients who underwent primary enucleation had significantly lower treatment costs compared to patients who underwent IAC ( $p < 0.001$ ). There was no significant difference in cost between patients who failed initial treatment and were ultimately enucleated compared to patients whose eye was saved.

**Conclusion/Relevance:** Primary enucleation was significantly less costly than all other treatment modalities, and IAC was the most expensive ( $p < 0.001$ ). Incurring additional costs may save the eye in advanced cases, but it should be disclosed that enucleation may eventually be necessary.

**References:** 1. Abramson DH, Shields CL, Munier FL, Chantada GL. Treatment of Retinoblastoma in 2015: Agreement and Disagreement. *JAMA Ophthalmol.* 2015;133(11):1341-1347. doi:10.1001/jamaophthalmol.2015.3108  
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Poster #B81  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Persistent Retinopathies of Prematurity after 40 Weeks Corrected Age**

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**Introduction:** To describe the evolution of retinopathy of prematurity (ROP) still visualizable in patients of more than 40 weeks of gestational age (GA)

**Methods:** We collected data from patients with persistent retinopathy of prematurity still visualizable after 40 weeks of GA. All patients underwent screening and follow-up by wide field digital retinal imaging at Rothschild's Foundation Hospital between May 2021 and April 2022. Information such as term, weight at birth, number of fundoscopy before and after 40 weeks of GA, retinopathy's characteristics and evolution were analyzed

**Results:** 37 patients with persistent retinopathy of prematurity after 40 weeks of were included. Among them, 6 patients (16,2%) required a treatment by laser. 31 patients (83,8%) did not require any treatment because of spontaneous resolution for the majority (26 patients). The two groups did not differ in their birth characteristics ( $p>0,05$ ) neither in their fundus evolution. The worst stage was always observed before 40 GA with no worsening after. Laser was performed around 45 SA. The fundoscopic exams were numerous (mean of 3 after 40 weeks of GA ; total of 82 for patients with spontaneous resolution of the retinopathy).

**Conclusion/Relevance:** Among the patients with persistent retinopathy after 40 GA, 83,8% did not require any treatment. We could not predict the need for a treatment by laser with birth characteristics as they were not statistically different in both groups, neither by ophthalmological fundus evolution. This made us consider the interest of a study focused on the post-natal history of these premature infants. We realized that retinal photographs were numerous for a clear majority of spontaneous resolution, and absolutely no worsening of the ROP after 40 GA. We could propose to space out the fundus exams after 40 GA, in order to perform laser on an older infant who will better tolerate general anesthesia.

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Poster #B82  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

### **Association between Treatment for Retinopathy of Prematurity and Blood Monocyte Counts**

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**Introduction:** To investigate the blood monocyte counts as a risk factor for retinopathy of prematurity (ROP) treatment.

**Methods:** This was retrospective cohort study. Infants who underwent ROP screening at Shiga University of Medical Science Hospital between January 2011 and July 2021 were included in this study. Screening criteria were a gestational age (GA) <32 weeks or birth weight (BW) <1500 g. The week with the largest monocyte counts difference between the ROP treatment and non-treatment groups was determined based on the effect size. Multivariate logistic regression analysis was applied to investigate whether the monocyte counts constituted an independent risk factor for ROP treatment. The objective variable was ROP treatment, and the explanatory variables were GA, BW, infants' infection, and monocyte counts in the week with the largest monocyte counts difference between the ROP treatment and non-treatment groups.

**Results:** In total, 231 infants met the inclusion criteria. The monocyte counts in the fourth week after birth (4w MONO) exhibited the largest difference between infants with and without ROP treatment. The analysis was performed on 198 infants, excluding 33 infants without 4w MONO data. Thirty-one infants received treatment for ROP, whereas 167 infants had no ROP treatment. BW and 4w MONO were significantly associated with ROP treatment (odds ratio: 0.52 and 4.0,  $P < .001$  and  $.004$ , respectively).

**Conclusion/Relevance:** The 4w MONO was an independent risk factor for ROP treatment and may be useful to follow up infants with ROP.

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Poster #B83  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **A Comparison of Efficacy Between Intravitreal Bevacizumab versus Ranibizumab for Type 1 Retinopathy of Prematurity**

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**Introduction:** The use of intravitreal anti-vascular endothelial growth factors (anti-VEGF) for treatment of retinopathy of prematurity has grown. Questions remain about which medication and dose are ideal. Ranibizumab may offer a better safety profile as its effect on systemic VEGF is shorter than bevacizumab's.

**Methods:** We compared short-term retinal detachment rates following treatment of Type 1 ROP with bevacizumab or ranibizumab. The primary outcome was rate of retinal detachment (ROP stage 4A, 4B, or 5) within 8 weeks of initial treatment. Secondary outcomes included rates of retreatment, recurrence of Stage 2 or higher, vitreous hemorrhage, and death, all within 8 weeks after initial treatment. Fisher's exact tests were used to compare groups.

**Results:** 84 eyes met inclusion criteria. There was no difference in short-term retinal detachment between eyes treated with bevacizumab (0/62) and ranibizumab (0/22) ( $p=1$ ). Rates of vitreous hemorrhage (12/62 vs. 3/22) ( $p=0.7490$ ) and death (2/31 patients vs. 0/11 patients) ( $p=1$ ) also did not vary significantly between groups. 14/62 eyes receiving bevacizumab were retreated compared to 4/22 eyes receiving ranibizumab ( $p=0.7699$ ). 12/62 of the bevacizumab and 4/22 of the ranibizumab eyes recurred with Stage 2 or higher ( $p=1$ ).

**Conclusion/Relevance:** Eyes with Type 1 ROP treated with bevacizumab and ranibizumab both demonstrated excellent short-term structural outcomes. Similarly, we did not demonstrate a short-term difference in retreatment, complications, or recurrence rates between medications within 8 weeks. Treatment of ROP with ranibizumab was as safe and efficacious in the short-term as bevacizumab and may have less effect on systemic VEGF.

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Poster #B84

Saturday, April 1, 2023

9:50 AM – 10:50 AM

## **Use of anti-Vascular Endothelial Growth Factor (antiVEGF) in the Treatment of Retinopathy of Prematurity (ROP), A Systematic Review and Meta-Analysis**

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**Introduction:** Retinopathy of prematurity (ROP) is one of the leading causes of blindness in children worldwide. The management of ROP has been revolutionised with the introduction of intravitreal anti-vascular endothelial growth factor(antiVEGF) agents. This review evaluates the safety and efficacy of intravitreal antiVEGF agents when used either as monotherapy, or in combination with laser/cryo in type 1 ROP.

**Methods:** A comprehensive literature search was conducted from 2000 to April 2022 using the following databases PubMed, EMBASE and CINHALL. Total of 12 randomised controlled studies (RCTs) and 7 comparative studies were selected after critical appraisal. RCTs were included in the meta-analysis.

**Results:** There were 4628 eyes of 2571 infants with type 1 ROP were identified from the included studies. A meta analysis showed no statistically significant difference in retinal detachment, ROP recurrence, mortality and cerebral palsy between standard treatment (laser/cryo) and antiVEGF mono therapy. AntiVEGF mono therapy may reduce the risk of refractive errors in childhood compared to standard therapy. No significant risk of acute and long-term systemic complications noted with antiVEGF therapy.

**Conclusion/Relevance:** AntiVEGF agents, as monotherapy is non inferior to standard therapy after evaluating for risk of retinal detachment and recurrence of ROP in infants with type 1 ROP. The data is not sufficient to make strong conclusions favouring routine use anti-VEGF agents as monotherapy in all types of type 1 ROP. Hence, further large scale RCTs with longer follow up period are necessary to evaluate the safety and efficacy of antiVEGF agents for type 1 ROP.

**References:** 1. Mintz-Hittner HA, Kennedy KA, Chuang AZ. Efficacy of Intravitreal Bevacizumab for Stage 3+ Retinopathy of Prematurity. N Engl J Med. 2011 Feb 17;364(7):603-15

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Poster #B85  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Atypical Reactivation of Retinopathy of Prematurity Six Years after Bevacizumab Intravitreal Injection**

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**Introduction:** we report a case of very late reactivation of retinopathy of prematurity (ROP) after bevacizumab monotherapy.

**Methods:** An asymptomatic 6-year-old girl presented for a pre-school regular eye exam. She was born at 24 weeks of gestational age weighing 485 grams. Her retinal exam at 38 weeks postmenstrual age showed bilateral ROP stage 3 in anterior zone 2 with tortuous retinal vessels (type 1 ROP), she underwent bilateral intravitreal 0.625 mg bevacizumab injection. The ROP regressed and vascularization extended normally to zone 3. The patient was followed until 2 years of age and then lost to follow-up.

**Results:** On presentation, fundus examination revealed peripheral neovascularization from 9 to 11 o'clock in the right eye (OD) and peripheral vascular retina (PAR) in the left eye (OS). The best corrected visual acuity was 20/20 in each eye with a +1.00 correction. The ophthalmic exam was otherwise unremarkable. Laser photocoagulation was performed on the OD avascular retina and prophylactically to the PAR OS. The ROP history and absence of familial ophthalmic history made Familial Exudative Vitreoretinopathy and other diagnoses less likely alternatives. On follow-up at 2 months, the retinal neovascularization had significantly regressed.

**Conclusion/Relevance:** Although there are few cases of late ROP reactivation, to our knowledge this is the first report of an incidental very late ROP reactivation in almost near complete retinal vascularization. This underscores the importance of continued surveillance of all ROP patients and opens the discussion about laser treatment after intravitreal injection.

**References:** 1. Snyder LL, Garcia-Gonzalez JM, Shapiro MJ, Blair MP. Very Late Reactivation of Retinopathy of Prematurity After Monotherapy With Intravitreal Bevacizumab. *Ophthalmic Surg Lasers Imaging Retina*. 2016;47(3):280-283. doi:10.3928/23258160-20160229-12  
2. Taylor K, Ghergherehchi L, Rao P, Harper CA 3rd, Chang E. Very late-onset reactivation of retinopathy of prematurity post anti-VEGF bevacizumab treatment for type 1 ROP: a case report. *J AAPOS*. 2021;25(3):180-184. doi:10.1016/j.jaapos.2021.02.004

## Refractive Outcomes of ROP Treated with Laser Photocoagulation, Bevacizumab, and Combination Therapy

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**Introduction:** Patients with ROP are at increased risk for refractive error.<sup>1</sup> This study aimed to identify variables associated with refractive outcomes among patients treated for ROP.

**Methods:** Retrospective single-center analysis of 136 patients. Cycloplegic refraction was used to calculate continuous and categorical<sup>2</sup> outcomes. Univariable and multivariable analyses determined clinical variables associated with refractive outcomes at last follow-up.

**Results:** 136 infants met inclusion criteria. Patients were born at a mean gestational age of 25.0±10.9 weeks and followed until a mean postnatal age at last follow-up of 3.0±2.2 years. 68/136 (50%) patients were treated with only laser, 18/136 (13.2%) with only bevacizumab, and 50/136 (36.8%) with both. At the last follow-up, 30/136 (22.1%) patients had myopia and 80/136 (58.8%) had hyperopia.

By multivariable analysis, spherical equivalent was predicted by stage of ROP ( $\beta$  -1.45, 95%CI -2.79;-0.10,  $p=0.036$ ) and number of treatments ( $\beta$  -0.99, 95%CI -1.74;-0.25,  $p=0.01$ ). Myopia was associated with lower gestational age (OR 1.09, 95%CI 1.02;1.16,  $p=0.011$ ) and lower corrected-for-age birthweight z-score<sup>3</sup> (OR 1.99, 95%CI 1.09;3.65,  $p=0.026$ ). Among patients treated with laser and bevacizumab, hyperopia was associated with laser treatment first (OR 14.2, 95%CI 1.04;193,  $p=0.046$ ) or at the same time as bevacizumab (OR 28.2, 95%CI 1.19;669,  $p=0.039$ ), and anisometropia was associated with fewer days between treatments (OR 1.10, 95%CI 1.00;1.19,  $p=0.04$ ) and higher number of treatments (OR 23.2, 95%CI 1.07;504,  $p=0.045$ ).

**Conclusion/Relevance:** Among infants treated for ROP, a majority had hyperopia at follow-up. Lower anthropometric measurements were associated with myopia, whereas choice of treatment modality and sequencing were associated with hyperopia and anisometropia.

**References:** 1. Abri Aghdam K, Khadamy J, Falavarjani KG, Tsui I. Refractive outcomes following the treatment of retinopathy of prematurity in the anti-VEGF era: a literature review. *J AAPOS Off Publ Am Assoc Pediatr Ophthalmol Strabismus*. 2016;20(6):539-540.e3. doi:10.1016/j.jaapos.2016.09.013  
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## Maternal and Neonatal Factors Associated with More Severe Retinopathy Of Prematurity

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**Introduction:** As the survival rates for premature births continue to improve with advancements in neonatal care, the number of premature infants at risk for developing retinopathy of prematurity (ROP) rises, and the screening demand on pediatric ophthalmologists heightens. The ability to more accurately risk stratify neonates who will potentially require treatment becomes even more critical. The objective of this study is to identify maternal and/or neonatal factors that may increase the patient's risk for a more severe stage of ROP and thus inform the ophthalmologist which infants necessitate closer monitoring.

**Methods:** A chart review of 488 newborns diagnosed with ROP was performed. Patient disease characteristics, including worst zone, worst stage, and plus (PLS), were analyzed against the patient demographics, gestational age, birth weight, single vs. multiple birth status, maternal diabetes and smoking status, neonatal insulin and caffeine requirement. A statistical analysis of our collected de-identified data was performed using SAS 9.4.

**Results:** Smoking was associated with PLS, with 10.5% of current smokers having infants with ROP PLS compared to 2.0% of non-smokers ( $p=0.0153$ ). Neonatal insulin use was associated with the stage of ROP. Insulin recipients were more likely to have higher ROP stages compared to non-recipients ( $p=0.0011$ ).

**Conclusion/Relevance:** These results better inform ophthalmologists and neonatologists of identifiable risk factors that may give rise to a higher likelihood for treatment requiring ROP. As the number of infants requiring screening increases, these findings aid in determining more optimal follow up strategies.

**References:** 1. Chiang MF, Quinn GE, Fielder AR, et al. International classification of retinopathy of prematurity, third edition. *Ophthalmology*. 2021;128(10):e51-e68. doi: S0161-6420(21)00416-4 [pii].  
2. Hudalla H, Bruckner T, Pöschl J, Strowitzki T, Kuon R. Maternal smoking as an independent risk factor for the development of severe retinopathy of prematurity in very preterm infants. *Eye*. 2021;35(3):799-804. <https://doi.org/10.1038/s41433-020-0963-4>. doi: 10.1038/s41433-020-0963-4.  
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Poster #B88  
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### **Changing Fields of View: Perceived Plus Disease Severity Using The New ICROP3 Definition**

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**Introduction:** The recent third International Classification of ROP (ICROP3) expanded the area for assessing plus-disease-related vascular change from peripapillary to all of zone I. We determined whether this expanded area for defining plus affected perceived severity of vascular change.

**Methods:** Secondary analysis of multi-center e-ROP Study2 Retcam images. All serial posterior-pole images ranging from 'no plus' through 'plus' of eyes that eventually developed "plus" were included. For each photograph, a full zone-I image (ICROP3 plus definition) was compared to a cropped peripapillary image (ICROP2 plus definition). A single examiner judged whether using full zone I made vascular change (dilation/tortuosity) look better, unchanged, or worse compared to the peripapillary image. A subset was judged by a second examiner, showing grading consistency. Stratified analysis by e-ROP Study ophthalmologist's clinical diagnosis of plus (ICROP2 definition for plus) was performed.

**Results:** Among 516 image pairs (from 139 eyes of 83 infants at mean postmenstrual age 35.8 weeks (SD 2.3)), 114 were clinically diagnosed as plus, 161 pre-plus, 214 no-plus. Compared to the peripapillary view, the zone-I view made plus-like change look better/unchanged/worse 1%/53%/45% of the time among plus eyes, 6%/52%/42% among pre-plus eyes, and 4%/75%/21% among no-plus eyes, respectively ( $p < 0.0001$ ).

**Conclusion/Relevance:** Expanding the area of assessment for plus disease to all of zone I frequently results in more severe-appearing vascular change, particularly among eyes with pre-plus or plus, when almost half of eyes look worse. This effect may lead to earlier treatment with clinical use of the new ICROP3 plus-disease definition.

**References:** 1. Fielder AR, Quinn GE, Paul Chan RV, Holmström GE, Chiang MF; ICROP 3 Classification Committee. Retinopathy of prematurity classification updates: possible implications for treatment. *J AAPOS*. 2022 Jun;26(3):109-112.  
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## **Objective Assessment of Control Compared with Clinical Triple Office Control Score in Children with Intermittent Exotropia**

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**Introduction:** Exodeviation control varies over a day, and during a clinic visit, in children with intermittent exotropia (IXT). A triple office control score that rates control of the exodeviation on a standardized 6-point scale (1) is a good approximation to the mean of multiple measurements on the same or next day.(2) While this validates the use of the triple office control score as a summary of overall control, it does not link the clinical measurement of control to objective assessment of vergence variability. Here we compare triple control score with objective eye movement recordings of vergence instability.

**Methods:** 31 children (4-11y) with IXT and normal VA were enrolled (3). Triple office control scores were determined by the referring pediatric ophthalmologist. Fixation instability was recorded during binocular fixation of a 0.3 deg dot for three 20 s intervals using an EyeLink binocular eye tracker (115 cm viewing distance). The bivariate contour ellipse area (BCEA) was calculated for vergence instability (left eye position - right eye position).

**Results:** Triple office control score was moderately correlated with vergence instability (BCEA);  $r=0.52$ ;  $CI_{95\%}$ : 0.20-0.74;  $p=.003$  and Distance Randot stereoacuity;  $r=0.44$ ;  $CI_{95\%}$ : 0.15-0.66;  $p=.005$ . Additionally, triple office control score was correlated with the percentage of time IXT was manifest during EyeLink recording;  $r=0.39$ ;  $CI_{95\%}$ : 0.03-0.66;  $p=.04$ .

**Conclusion/Relevance:** Larger triple office control scores for IXT provide a meaningful description of larger vergence variability, supporting its use in clinical decision making and as an eligibility or outcome measure in clinical trials.

### **References:**

1. Mohny BG, Holmes JM. An office-based scale for assessing control in intermittent exotropia. *Strabismus* 2006;14(3):147-50.
2. Hatt SR, Liebermann L, Leske DA, et al. Improved assessment of control in intermittent exotropia using multiple measures. *Am J Ophthalmol* 2011;152(5):872-6. doi: 10.1016/j.ajo.2011.05.007
3. These children were enrolled as part of an ongoing clinical trial NCT04199871

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## Assessment and Management of Intermittent Exotropia in France: An AFSOP Study

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**Introduction:** The purpose of this study is to give an overview on how intermittent exotropia (IXT) is assessed and managed in France, through the results of a questionnaire.

**Methods:** An online questionnaire in French about the assessment and the management of IXT was submitted to French speaking ophthalmologists and orthoptists. The questions addressed the professional profile of the participants, their habits concerning the assessment of IXT (7 items), its medical management (6 items), and its surgical treatments (9 items). For almost all the items, there were 4 modalities of answer (always/often/rarely/never). The majority of the participating ophthalmologists (n=43) and orthoptists (n= 97) were members of the Association Française de Strabologie et d'Ophtalmologie pédiatrique (AFSOP).

**Results:** Concerning the assessment of IXT, the occlusion test and a prism adaptation test was (always or often) performed by 60% and 56% of the participants respectively. Concerning the medical treatments, patching (in the absence of amblyopia), prisms and myopic overcorrection were (rarely or never) proposed by 80, 81 and 90 % of the participants respectively, whereas 41% often proposed orthoptic exercises. Concerning the surgical treatments, the median minimum age for surgery was 5 years (2-8), and the most usual procedure was unilateral (70%), bilateral (15%) or equally uni- or bilateral (15%).

**Conclusion/Relevance:** The assessment and the management of IXT, as performed in France, seems to differ from other countries. The results of this study reflects the lack of evidence-based guidelines, and sometimes even does not seem to follow the usual recommendations found in most strabismus textbooks.

**References:** Hatt SR, Gnanaraj L. Interventions for intermittent exotropia. Cochrane Database Syst Rev. 2013;(5):CD003737.



## Refractive and Sensorimotor Outcomes of Intermittent Exotropia Managed with Overminus Glasses

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**Introduction:** Overminus (OM) glasses have become a more utilized treatment for intermittent exotropia (IXT), but recent studies show contradictory results regarding whether OM glasses lead to myopic progression.<sup>1,2</sup>

**Methods:** The medical records of 720 patients diagnosed with IXT and prescribed glasses between May 2015 – May 2022 were retrospectively reviewed. Patients were included if they had >1 year follow-up data, and were without sensory exotropia, history of strabismus surgery, or amblyopia. Patients were divided into OM (-1.00D to -2.50D over cycloplegic refraction) and non-OM cohorts. Refractive error, motor alignment in primary gaze at distance and near fixation, stereoacuity, and visual acuity were noted at 6-month $\pm$ 1 month, 1-year $\pm$ 1 month, and final recorded visits.

**Results:** Of the 54 patients included, 33 wore OM glasses. The average age at initiation of glasses treatment was 3.84 $\pm$ 1.61 years, with no difference between cohorts ( $p=0.48$ ). The OM cohort had higher near deviation at baseline (26.4 $\pm$ 10.4PD) compared to the non-OM cohort (20.3 $\pm$ 8.2PD) ( $p=0.025$ ). The median follow-up time was 3.27 years. The OM cohort was significantly less myopic than the non-OM cohort at baseline visit, with cycloplegic refraction of (-0.076 $\pm$ 0.79D) compared to (-1.24 $\pm$ 1.3D) ( $p=0.0001$ ). There were no differences in final stereoacuity ( $p=0.521$ ), change in alignment at near ( $p=0.749$ ), or change in alignment at distance ( $p=0.542$ ) between the groups. There was no difference in change in SE by last visit between the non-OM (-1.43 $\pm$ 1.84D) and OM groups (-0.81 $\pm$ 1.38D) ( $p=0.16$ ).

**Conclusion/Relevance:** OM glasses did not appear to worsen myopia in our patient population; however, a range of OM was used. Sensorimotor outcomes were comparable.

**References:** 1. Chen, A. M. et al. Overminus lens therapy for children 3 to 10 years of age with intermittent exotropia. *JAMA Ophthalmology* 139, 464 (2021).  
2. Ale Magar JB, Shah SP, Webber A, Sleep MG, Dai SH. Optimised minus lens overcorrection for paediatric intermittent exotropia: A randomised clinical trial. *Clin Exp Ophthalmol* 50, 4 (2022)

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## Clinical Features and Analysis of Spontaneous Consecutive Exotropia in Children with Refractive Accommodative Esotropia

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**Introduction:** Consecutive exotropia in patients with refractive accommodative esotropia is rare and the mechanism of the change is not known. This study aimed to evaluate the clinical features and risk factors for development of spontaneous consecutive exotropia among patients with refractive accommodative esotropia.

**Methods:** Medical records of 19 patients diagnosed with spontaneous change from refractive accommodative esotropia to exotropia were retrospectively reviewed. 31 patients with refractive accommodative esotropia who maintained successful optical alignment for at least 5 years were included as the control group. The ophthalmologic examination findings of the study group and the control group were compared.

**Results:** In the study group, 15 (78.9%) were female, 4 (21.1%) were male and the mean age at diagnosis was 22.68 months ( $\pm 12.91$ ). In the control group, 16 (51.6%) were female, 15 (48.4%) were male and the mean age at diagnosis was 25.09 months ( $\pm 15.47$ ). There was no statistical difference between the two groups ( $p=0.55$ ), when the mean age at diagnosis was compared.

Cycloplegic refraction values performed at the first visit showed that the study group had higher hyperopic values in the right ( $p=0.01$ ) and left ( $p=0.04$ ) eyes as compared to the control group. Inferior oblique overaction was more common in the study group ( $p=0.03$ ).

There were no significant differences between the two groups with regard to the amblyopia, anisometropia, and angle of deviation at the first visit ( $p>0.05$ ).

**Conclusion/Relevance:** Long-term follow-up should be conducted in patients with high hypermetropic refraction because of the possibility of consecutive exotropia.

**References:** 1. Shin DH, Choi CY, Han SY. Risk factors for spontaneous consecutive exotropia in children with refractive and nonrefractive accommodative esotropia. *Jpn J Ophthalmol.* 2020;64(3):292-297.  
2. Weir C R, Cleary M, Dutton G N. Spontaneous consecutive exotropia in children with motor fusion. *Br J Ophthalmol.* 2001; 85: 242-243

Poster #B93  
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## Restoration of Binocular Vision with Liquid Crystal Glasses

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Association of Pediatric Eye Clinics "Yasnyi Vzor"

**Introduction:** Recovery of binocular functions is the most important step in strabismus treatment.

**Purpose:** to determine the optimal parameters for alternating programming of liquid crystal glasses for sensory fusion and binocular vision recovery.

Study included 46 patients in the main group, who wear liquid crystal glasses and 52 patients from control group who undertake treatment on synoptophore. All patients were with concomitant convergent strabismus with orthotropy with no sensory fusion after surgical treatment of strabismus.

**Methods:** Patients were  $5.1 \pm 1.0$  years old (from 3 to 11 years). Spherical equivalent refraction was  $2.74 \pm 0.94$  diopters (0.88-4.50 diopters). The objective residual angle after the surgery was  $3.5 \pm 1.0$  (0-9) degrees.

The task of video oculography was to determine the time that was needed for fixation movement - it consisted of the duration of fixation movement itself and the duration of latent period.

The duration of fixation movement for each eye was entered into the glasses program for alternating occlusion.

Patients wearing glasses for 6-8 hours a day. Treatment on synoptophore was carried out in clinic for 10 days 4 times in a year.

**Results:** Recovery of binocular function (binocular vision and sensory fusion), occurred more often when using liquid crystal glasses ( $P < 0.000$ ): in 11 patients (21%) from the control group and in 32 patients (69.5%) from the main group. Sensory fusion in the control group was restored on average in  $5.82 \pm 3.85$  months, and in the main group in  $5 \pm 2.1$  months.

**Conclusion/Relevance:** The proposed alternating technique provides effective use of liquid crystal glasses to restore sensory fusion in children after surgery for concomitant convergent strabismus.

**References:** 1. Erbagci I., Okumus S., Oner V., Coskun E., Celik O., Oren B. Using liquid crystal glasses to treat amblyopia in children. J. AAPOS. 2015;19(3): 257-259.

2. Herbison N., MacKeith D., Vivian A. et al. Randomised controlled trial of video clips and interactive games to improve vision in children with amblyopia using the I-BiT system / N. Herbison, D. MacKeith, A. Vivian et al. // British Journal of Ophthalmology. – 2016. – Vol. 100. P. 1511-1516.

Poster #B94  
Saturday, April 1, 2023  
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## **A Chip Off the Old Block - Slab-Off Prism for Symptomatic, Vertical Heterophoria in the Reading Position.**

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**Introduction:** Slab-off prism has historically been used to treat diplopia associated with vertical prism imbalance induced when patients with anisometropic refractive error view through their bifocal segments. Less well-known is the concept that slab-off or reverse slab-off prism can also be used to successfully resolve diplopia associated with incomitant vertical heterophoria in downgaze or reading position, unrelated to anisometropia.

### **Purpose:**

To describe uncommon techniques utilizing slab-off or reverse slab-off spectacle prism to treat symptomatic incomitant vertical strabismus in adults with diplopia only in the reading position.

### **Study Design:**

Retrospective chart review of consecutive patients in an urban, tertiary care hospital.

**Methods:** This study was reviewed by the Johns Hopkins Institutional Review Board and determined to be exempt. Five consecutive patients with a chief complaint of diplopia in the reading position were treated with slab-off prism correction. Data collected for this study included visual acuity, spectacle correction, sensorimotor examination data including stereoacuity, Worth 4-dot, prism and alternate cover testing, and final prismatic prescription. Success of the slab-off spectacle prism correction was determined by resolution of diplopia when reading.

**Results:** Five adult patients ranged in age from 55 to 75 years (mean age 65.6 years). All 5 complained of vertical diplopia at near during reading. The near vertical deviation ranged from 2-6 PD (mean deviation 3.8 PD). Mean slab-off prism prescribed was 2.5 PD (range 2-3 PD). Follow-up ranged from 1 month to 18 months. Symptoms resolved with slab-off prism in all 5 patients.

**Conclusion/Relevance:** Slab-off spectacle prism in non-digitally manufactured multifocal lens prescriptions is an effective non-surgical treatment option for vertical diplopia related to small-angle vertical strabismus in the reading position.

### **References:**

1. Cotter SA. Clinical uses of prisms: a spectrum of applications. St. Louis (MO): Mosby; 1995. p. 284-291.
2. Christoff A, Guyton DL. How to measure slab-off and reverse slab prism in spectacle lenses. J AAPOS. 2007 Aug;11(4):414-415.

Poster #B95  
Saturday, April 1, 2023  
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## **Strabismus Outcomes in Children Post-Hemispheric Surgery: A Systematic Review**

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**Introduction:** Pediatric patients undergoing hemispheric surgery are susceptible to visual complications including strabismus. We aimed to identify visual compensatory mechanisms and risk factors for strabismus and evaluate clinical implications for ophthalmological and neurosurgical care.

**Methods:** A systematic search of MEDLINE, EMBASE, Cochrane, PsychINFO and Web of Science databases was performed from database inception to May 2022.

**Results:** Of 41 articles identified, 10 studies consisting of 384 pediatric participants (48% females) were included. The age of study participants at time of hemispheric surgery ranged from 6 months to 16 years. There was significant heterogeneity in seizure etiology; however, the most common cause was hemimegalencephaly. Among studies reviewed, preoperative strabismus rates ranged between 38 - 56%, while post-operative rates ranged between 38 - 100%. With respect to the site of hemispheric surgery, contralateral exodeviation (16 - 67%) was reported by 7 articles, ipsilateral exodeviation (16% - 56%) by 2 studies, and ipsilateral esodeviation (4 - 9%) by 3 articles. Anomalous head posturing (33 - 75%) was commonly reported as a visual compensatory mechanism.

**Conclusion/Relevance:** Contralateral exotropia, and to a lower degree, ipsilateral esotropia may be a physiologic adaptation to expand the visual field and compensate for cortical deficits in the visual processing pathway. Understanding the potential visual complications post-hemispheric surgery is essential to guide parents regarding the risks and benefits of hemispheric surgery, role for strabismus surgery, and manage patient expectations of visual outcomes. While parents may have concerns regarding cosmesis, these should be balanced with the risk of visual field reduction by strabismus surgery.

**References:** Bronstad P, Peli E, Liu R, Doherty A, Fulton A. High prevalence of strabismic visual field expansion in pediatric homonymous hemianopia. *PLoS One*. 2018;13(12):e0209213. doi:10.1371/journal.pone.0209213  
Handley S, Vargha-Khadem F, Bowman R, Liasis A. Visual Function 20 Years After Childhood Hemispherectomy for Intractable Epilepsy. *Am J Ophthalmol*. 2017;177:81-89. doi:10.1016/j.ajo.2017.02.014  
Meer E, Chen M, Jones M, Mathern G, Pineles S. Long-Term Patient-Reported Outcomes of Visual Field Defects and Compensatory Mechanisms in Patients After Cerebral Hemispherectomy. *Journal of Neuro-Ophthalmology*. 2020;41(2):147-153. doi:10.1097/wno.0000000000000998

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## Changes in Strabismus Pattern in Cranial Nerve 3 Palsies

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**Introduction:** Cranial nerve 3 (CN3) palsies are difficult strabismus problems for surgeons to manage. A CN3 palsy is also likely to be incomplete and have variable amount of recovery as well as aberrant regeneration, all of which alter the strabismus pattern.

**Methods:** Consecutive patients with diagnosis of CN3 palsy were monitored over one year period and sensorimotor exams were obtained and collected at each visit. All CN3 palsy patients were included, regardless of time of onset or etiology, and if surgical treatment was performed, the last sensorimotor measurements prior to strabismus surgery was included in the study.

**Results:** A total of 14 patients were identified. There were two major groups of changes in strabismus pattern, attributed to either spontaneous recovery of CN3 function or aberrant regeneration. Aberrant regeneration was the most common reason for strabismus pattern changes. Spontaneous improvement resulted in improvement in the adduction deficits has the best surgical outcome in terms of resolution of diplopia for patients. The duration of the CN3 palsy was not significantly associated with the change in strabismus pattern.

**Conclusion/Relevance:** Discussion: For CN3 palsy resulting from the aberrant regeneration, one can associate eyelid changes with improvement in adduction. In CN3 palsy from microvascular cases, identifying amount of recovery of the adduction deficit can help formulate plan for surgery and anticipate outcome.  
Conclusion: Satisfactory alignment and relief of diplopia for patients with CN3 palsy remain challenging. Understanding and anticipating changes in strabismus pattern can assist with surgical planning and improve surgical outcomes for strabismus surgeons.

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Poster #B97  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Hierarchically Structured Hydrogels as Synthetic Muscles for the Treatment of Strabismus and Amblyopia

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**Introduction:** Treatment of cranial nerve palsies and extraocular muscles (EOM) trauma is limited, consisting mainly of transposition procedures that create passive balancing of the eye position, with limited ocular rotations for peripheral gaze. Recent development in polymer science have allowed the creation of hydrogels with muscle-like hierarchical architecture, high strength and toughness and a high fatigue resistance with preserved elasticity to allow stretching. This material may be a useful adjunct to create aligning forces but with some elasticity to allow contralateral movement.

**Methods:** Combining ice-templating and salting-out methods, a hierarchically-structured anisotropic polyvinyl alcohol (PVA) hydrogel material was fabricated to mimic the stress-strain behaviors of human EOMs. This material was tested in vitro to evaluate mechanical properties and similarity to EOMs as well as for fibrotic response incited in co-cultured fibroblasts. The hydrogel was implanted into a rabbit orbit as a replacement abducting force after lateral rectus (LR) extirpation.

**Results:** The preliminary result showed the 10% PVA hydrogel presented the best resemblance of the EOM master curve. Tensile stress testing of the hydrogels after culture with fibroblast cells demonstrated preserved mechanical properties and minimal stimulation of fibrotic reaction. After implantation between the orbital wall and the LR insertion (after LR extirpation) in a rabbit, the ocular alignment improved from esotropia to exotropia and some adduction was still possible.

**Conclusion/Relevance:** Construction of an EOM substitute with similar properties to EOM that preserves force but also relaxes to allow for contralateral movement, it could be useful for patients with paralytic strabismus.

**References:** 1 Velez FG, Isobe J, Zeale D, Judy JW, Edgerton VR, Patnode S, Lee H, Hahn BT. Toward an implantable functional electrical stimulation device to correct strabismus. *J AAPOS*. 2009;13(3):229-35 e1. Epub 2009/04/21. PubMed PMID: 19375369.

2 Hua M, Wu S, Ma Y, Zhao Y, Chen Z, Frenkel I, Strzalka J, Zhou H, Zhu X, He X. Strong tough hydrogels via the synergy of freeze-casting and salting out. *Nature*. 2021;590(7847):594-9. Epub 2021/02/26. PubMed PMID: 33627812.

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Poster #B98

Saturday, April 1, 2023

9:50 AM – 10:50 AM

## **Comprehensive High-Fidelity 3D Modelling of the EOM at the Fibre Bundle-Aponeurosis Level as In Situ: A Pilot Anatomical Study**

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**Introduction:** Imbalance of the extraocular muscles (EOM) due to changes in muscle morphology have been reported as possible factors in pathologies including strabismus<sup>1</sup>. Knowledge of muscle architecture, the spatial arrangements of the fibre bundles, tendons, and aponeuroses within the muscle volume, can provide a comprehensive understanding of EOM function, building on previous imaging studies. Technological advances have enabled volumetric reconstruction of muscles in 3D space using dissection, digitization, and 3D modelling at the fibre bundle-aponeurosis level<sup>2</sup>. The purpose of this study was to explore the feasibility of using this technique to characterize the EOM.

**Methods:** This protocol has been used to model the musculoaponeurotic architecture of other skeletal muscles<sup>3</sup>. The fibre bundles, aponeuroses, and tendons of EOM of a formalin embalmed specimen were serially dissected and digitized (Microscribe® G2X) to obtain cartesian coordinate data that was modeled in 3D using Autodesk® Maya® with plug ins. The specimen was laser scanned throughout this process to enable reconstruction of the EOM as in situ in the orbit. Morphological analysis was conducted.

**Results:** A volumetric model of the musculotendinous architecture of the superior oblique, inferior oblique, superior rectus, inferior rectus, lateral rectus, medial rectus, and levator palpebrae superioris muscles as in situ in the orbit was constructed. The morphology, fibre bundle length, tendonous attachments, and physiological cross-sectional area differed across functional EOM pairs.

**Conclusion/Relevance:** This technique is a feasible state of the art methodology for constructing comprehensive high-fidelity models of the EOM as in situ, enabling comparison of the musculotendinous morphology to elucidate normal functional parameters.

**References:** 1. Lee J-Y, Bae K, Park K-A, Lyu IJ, Oh SY. Correlation between extraocular muscle size measured by computed tomography and the vertical angle of deviation in Thyroid Eye Disease. PLOS ONE. 2016;11(1).  
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### Effect of Plasma Enriched with Platelet Growth Factors in Human Tenon's Capsule Fibroblast

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**Introduction:** Human plasma enriched with platelet-derived growth factors (PRGF) is currently used to promote regeneration in ocular surface diseases. Tumor Growth Factor Beta-1 (TGF- $\beta$ 1) is a cytokine in the PRGF that induces fibroblast differentiation into myofibroblasts. Our purpose was to evaluate the effect of PRGF and TGF- $\beta$ 1 on fibroblast derived from Tenon's capsule.

**Methods:** Primary Tenon's-derived fibroblasts were cultured using 10% fetal bovine serum (FBS). Fibroblasts were then exposed to PRGF 10%, 50% and 100%, and TGF- $\beta$ 1 (10 ng/ml). Morphological cellular changes and expression of fibrosis markers alpha-smooth muscle actin ( $\alpha$ -sma), fibronectin and collagen, were evaluated using immunofluorescence.

**Results:** Morphological changes were observed in fibroblasts exposed to 50% and 100% PRGF. Expression of fibrosis biomarkers  $\alpha$ -sma and fibronectin was similar in fibroblasts exposed PRGF and TGF- $\beta$ 1, and higher for both when compared to the control FBS 10%. Collagen expression, although increased in cells exposed to PRGF and TGF- $\beta$ 1, showed less differences when compared to the increase induced in  $\alpha$ -sma and fibronectin.

**Conclusion/Relevance:** Fibroblasts derived from Tenon's capsule exposed in-vitro to PRGFs, especially at higher concentrations, resulted in myofibroblast differentiation and expression of fibrotic markers like cells exposed to TGF- $\beta$ 1. In-vitro, PRGF appears to have a profibrotic effect on Tenon's capsule fibroblasts, which contrasts with the antifibrotic effect reported on ocular surface fibroblasts. Regulating TGF- $\beta$ 1 may decrease the profibrotic effect of PRGF on Tenon's capsule fibroblast which may be useful as an adjuvant in preventing scar tissue formation after complex strabismus or orbital procedures.

**References:** 1. Soifer M, Tovar A, Wang M, Mousa HM, Yennam S, Sabater AL, Pflugfelder SC, Perez VL. A multicenter report of the use of plasma rich in growth factors (PRGF) for the treatment of patients with ocular surface diseases in North America. *Ocul Surf.* 2022 Jul;25:40-48.

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Poster #B100  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Factors Associated with the Change of Horizontal Deviation after Inferior Oblique Weakening Surgery

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**Introduction:** To identify the factors affecting horizontal deviation in patients who underwent inferior oblique (IO) weakening surgery due to inferior oblique overaction (IOOA).

**Methods:** The medical records of patients who underwent IO weakening surgery from February 2010 to September 2021, with a minimum follow-up period of 6 months, were retrospectively reviewed. The following characteristics were analyzed: age at surgery, type of IOOA, grade of IOOA, concurrent strabismus, preoperative horizontal and vertical deviation, surgical methods, and postoperative deviation. Patients were divided into two groups according to the amount of postoperative six months shift in horizontal deviation: the eso-shift group and non-eso-shift group.

**Results:** A total of 84 patients underwent isolated IO weakening surgery. The patients ranged in age from 1 to 62 years, with a mean age at surgery  $11.97 \pm 16.06$ . Of the 84 patients, 55 patients (64.3%) showed changes in horizontal deviation: 39 (46.4%) eso-shift, 15 (17.9%) exo-shift. No change in alignment was observed in 30 patients. In the eso-shift group, the mean change of deviation was  $6.28 \pm 3.17$  prism diopter (PD), and 23 patients showed significant esodrift, ranging from 5 to 12PD. The eso-shift group showed significantly greater preoperative hypertropia than the non-eso-shift group at the primary position ( $P < 0.001$ ), ipsilateral gaze ( $P < 0.001$ ), and ipsilateral head tilt ( $P = 0.002$ ).

**Conclusion/Relevance:** The patients whose angle of preoperative vertical deviation was greater showed eso-shift after isolated IO weakening surgery. These results suggest that secondary change in rectus muscle related to oblique muscle dysfunction may affect the postoperative horizontal deviation.

**References:** 1. Stager DR, Parks MM. Inferior oblique weakening procedures. Effect on primary position horizontal alignment. *Arch Ophthalmol.* Jul 1973;90(1):15-6. doi:10.1001/archophth.1973.010000500170032. Taylan Sekeroglu H, Dikmetas O, Sanac AS, Sener EC, Arslan U. Inferior oblique muscle weakening: is it possible to quantify its effects on horizontal deviations? *J Ophthalmol.* 2012;2012:813085. doi:10.1155/2012/813085

## Effect of Inferior Oblique Weakening Procedures on Horizontal Alignment in Patients Treated Surgically for Exotropia

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**Introduction:** The tertiary action of the inferior oblique (IO) is abduction of the eye, therefore, combining IO weakening with bilateral lateral rectus recession (BLRc) may lead to overcorrection of exotropia.[1] Prior studies demonstrated conflicting results, although most identified minimal to no difference in postoperative deviation and success rates.[2,3] Our study compared outcomes between patients who underwent BLRc alone versus BLRc combined with IO weakening surgery.

**Methods:** A retrospective analysis of 232 patients without prior eye muscle surgery; 195 underwent BLRc alone and 37 underwent BLRc combined with an IO weakening procedure. Of the IO weakening surgeries, 28 were bilateral and 9 were unilateral. Unpaired t-tests compared mean postoperative deviation at distance. Negative values represented exodeviation. Pearson's chi-square tests compared success, reoperation, and overcorrection rates.

**Results:** There was no significant difference in postoperative outcomes. Outcomes for the BLRc alone versus BLRc with IO weakening were as follows: success rates 32.0% and 39.4% ( $p=0.408$ , 1 week), 74.7% and 83.9% ( $p=0.273$ , 6-10 weeks), 67.6% and 75.0% ( $p=0.553$ , 6-9 months); overcorrection rates 59.4% and 48.5% ( $p=0.243$ , 1 week), 8.4% and 3.2% ( $p=0.316$ , 6-10 weeks), 16.2% and 6.3% ( $p=0.298$ , 6-9 months); mean postoperative deviation  $10.65\pm 14.63$  and  $7.75\pm 2.62$  ( $p=0.301$ , 1 week),  $-2.46\pm 12.81$  and  $-3.30\pm 9.53$  ( $p=0.748$ , 6-10 weeks),  $-0.44\pm 11.22$  and  $-4.07\pm 8.32$  ( $p=0.251$ , 6-9 months); and reoperation rates of 14.4% and 5.4% ( $p=0.137$ ).

**Conclusion/Relevance:** IO weakening surgery did not have a significant effect on postoperative deviation in patients who underwent BLRc for exotropia. Both groups experienced greater esodeviation within the first postoperative week which improved over time.

**References:** 1. Stager D, Dao L, Felius J. Uses of the inferior oblique muscle in strabismus surgery. *Middle East Afr J Ophthalmol.* 2015;22(3):292. doi:10.4103/0974-9233.159723  
2. Bae SH, Kim J, Kim AY, et al. Effect of combining inferior oblique muscle weakening procedures with exotropia surgery on the surgical correction of exotropia. *PLoS One.* 2018;13(5):e0198002. doi:10.1371/journal.pone.0198002  
3. Scelfo C, Elhusseiny AM, Alkharashi M. Effect of inferior oblique myectomy on primary position when combined with lateral rectus recession for intermittent exotropia. *Eur J Ophthalmol.* 2022;32(1):559-562. doi:10.1177/11206721211002706

Poster #B102  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Outcomes of Inferior Oblique Myectomy Versus Recession Combined with Lateral Rectus Recession in V-Pattern Exotropias

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**Introduction:** There is debate whether bilateral inferior oblique (BIO) myectomy and recessions are equally effective when combined with bilateral lateral rectus (BLR) recessions in correcting V-pattern exotropias.

**Methods:** Retrospective chart review of children (<18 years old) who underwent BLR recessions with BIO myectomy vs. recession (10 mm) between 12/2020 and 05/2022 for V-pattern exotropias and with at least 1 month of follow-up. Children with ocular diagnoses other than strabismus, amblyopia, and refractive error were excluded. Outcomes included horizontal and vertical alignment, BIO action, and stereopsis.

**Results:** Sixty-nine patients underwent BLR recession with BIO myectomy (n=35) or recession (n=34). There was no difference in age, gender, ethnicity, or follow-up length between the two groups. Preoperatively, there were no differences in stereopsis, distance or near horizontal or vertical deviations, strabismus control, or inferior oblique overaction (IOOA). The BIO recession group showed a greater preoperative V-pattern ( $17.8 \pm 6.8$  vs.  $14.9 \pm 8.4$  Diopters,  $p=0.02$ ). There was no difference in amount of BLR recession. At final follow-up ( $153 \pm 134$  days), the two groups had no difference in visual acuity or stereopsis. Both showed significant decrease in horizontal distance and near deviations. There was no difference between BIO myectomy vs. recession in horizontal or vertical deviations at distance ( $p=0.50$ ) or near ( $p=0.09$ ). The myectomy group showed better control of residual strabismus ( $p=0.03$ ) and less post-operative V-pattern ( $p=0.02$ ) and IO overaction ( $p<0.0001$ ).

**Conclusion/Relevance:** BIO myectomy or recession in combination with BLR recession decreases horizontal and vertical deviations. BIO myectomy has a greater effect on control of residual strabismus and decreasing V pattern and BIO overaction.

**References:** Elhusseiny AM, Gore C, Ali A Sadiq M, Dagi LR, Kazlas M, Hunter DG. Self-grading effect of inferior oblique myectomy and recession. *J AAPOS*. 2020;24(4):218.e1-218.e6. doi:10.1016/j.jaapos.2020.04.014

Poster #B103  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Surgical Management of Exotropia in Superior Oblique Palsy**

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**Introduction:** Some patients with superior oblique palsy (SOP) have a coexisting exotropia; determining whether to address it surgically is challenging.

**Methods:** Retrospective review of patients with SOP who underwent inferior oblique (IO) weakening procedure.

**Results:** Records of 151 patients with SOP were reviewed. Mean age was 26.1 +/- 22 years (34m-78y). 27 patients had exotropia and were unable to fuse in free space with the vertical deviation offset with prism. In these patients, pre-operative vertical deviation was 15.2 +/- 7.5 PD (4-30), and exodeviation was 17 ± 5.5 PD (10-35). IO recession was performed in 21/27, 3 underwent IO myectomy, and 3 underwent anterior transposition. For the exotropia, 25/27 underwent unilateral lateral rectus recession and two underwent bilateral lateral rectus recessions. Mean follow up interval was 3 +/- 3.8 months (2w-17m). At final follow-up, vertical alignment was 3.0 +/- 5.9 and horizontal alignment was 3.4 +/- 5.2 PD, (ET 7 - XT 12) (p<0.0001). Nineteen of twenty-seven patients (70%) had a successful result (SPCT <10 PD horizontal deviation and = 4PD vertical deviation without overcorrection, no diplopia). One patient had residual XT>10 PD. Two had vertical overcorrection of 3-4 PD. Six had residual vertical deviation of = 4PD (5-20PD), of whom two underwent additional surgery. None had secondary ET>10 PD. 25/27 patients (92.6%) met success criteria for horizontal correction.

**Conclusion/Relevance:** Patients with SOP who have a concomitant exotropia and cannot fuse when the vertical deviation is offset with prism can undergo lateral rectus weakening with a high likelihood of success.

**References:** Lee JY, Kim SH, Yi ST, Lee TE, Cho YA. Contemplation of the surgical normogram of lateral rectus recession for exotropia associated with superior oblique palsy. Korean journal of ophthalmology. 2012;26(3):195-198. doi:10.3341/kjo.2012.26.3.195

Davis GT. Vertical deviations associated with exodeviations. In: Manley DR, editor. Symposium on horizontal ocular deviations. St. Louis: C. V. Mosby; 1971. p. 149-56.

Poster #B104  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Outcomes of Inferior Oblique Muscle Myectomy with and without Tucking into Tenon's Capsule, A Cohort Prospective Study**

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**Introduction:** Reattachment of the Inferior Oblique muscle (IO) to the globe after myectomy has led some authors to suggest tucking the proximal end into Tenon's capsule. This study aims to study the outcome of IO myectomy with and without tucking.

**Methods:** A cohort prospective study. 26 patients with primary or secondary Inferior Oblique Overaction (IOOA) were included. Subjects were divided into two groups randomly; a group with and without tucking. Tucking was performed by placing 2-3 interrupted 0.8 polyglactin sutures. All patients with previous strabismus surgery, thyroid eye disease, myasthenia gravis, Duane syndrome, or craniofacial anomalies were excluded. Patients had four visits; a baseline visit, 2 weeks, 3, and 6 months after the surgery. IOOA were graded on a scale from +4 to -4. The success rate was defined as an IOOA grade  $\leq +1$ .

**Results:** A total of 46 eyes of 26 patients were included ( 17 bilateral, 9 unilateral, and 6 had superior oblique palsy). Each group had 13 patients. 7 patients had a head tilt and 13 had a V-pattern pre-operatively. Preoperative grading of IOOA; 2 eyes were graded as +1, 16 eyes were +2, 21 eyes were +3, and 4 eyes were +4. At the third follow-up, 23 were graded as 0, 2 patients were graded as -1 from the first group and 1 was graded as -2 from the second group. Post-operatively V-pattern and head tilt resolved in both groups. There were no post-op complications

**Conclusion/Relevance:** Both surgical techniques are effective with no significant clinical differences.

**References:** 1. Lueder GT. Tucking the inferior oblique muscle into Tenon's capsule following myectomy. *J Pediatr Ophthalmol Strabismus*. 1998;35:277–80.  
2. Kelkar J, Kanade A, Agashe S, Kelkar A, Khandekar R. Outcomes of Asymmetric Primary Inferior Oblique Muscle Overaction Managed by Bilateral Myectomy and Tucking of Proximal Muscle End: A Cohort Study. *Middle East Afr J Ophthalmol*. 2015;22(4):457461.

Poster #B105  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Can Inferior Oblique Myectomy Alone Correct the Downgaze Deviation in Superior Oblique Palsy?

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**Introduction:** Myectomy alone was recommended by Knapp for class 1 and 2 superior oblique palsies (SOP) where the deviation is greatest in upgaze and contralateral gaze. For those whose deviation is greatest in downgaze (Class 3 and 4), he recommended an additional ipsilateral superior oblique tuck or recession of the contralateral inferior rectus. Recognizing the self-titrating effect of inferior oblique myectomy (IOM), we assessed the outcome of IOM alone for patients with SOP class 1-4 to determine if further surgery was indicated.

**Methods:** We reviewed the charts of all adult patients who underwent unilateral IOM for unilateral SOP between 2008-2021. Thirty-three patients were included. All patients had pre- and post-operative orthoptic testing with measurements in 9 cardinal gaze positions and were followed up for at least 6-months. Primary outcome measures included post-operative alignments in primary position, contralateral horizontal position, contralateral downgaze and downgaze.

**Results:** Twenty-nine patients were Knapp class 3 or 4. Pre-operative deviation range was 2-35PD in primary position and 1-35PD in downgaze. In 26 patients (78%) the vertical deviation in primary position was reduced to  $\leq 3$ PD. Thirty patients (91%) had resolution of diplopia in primary position, and 70% were orthotropic in contralateral downgaze and downgaze. Three patients (9%) required additional surgery due to residual deviation.

**Conclusion/Relevance:** IOM alone corrects vertical deviation from SOP in most patients. This is effective even for patients with deviations which increase in downgaze and we recommend this procedure alone for all but the largest preoperative deviations. Additional surgery can be reserved for those with significant residual deviation.

**References:** Knapp P. Classification and Treatment of Superior Oblique Palsy. American Orthoptic Journal. 1974;24(1):18-22.

## Clinical Outcomes of Inferior Oblique Myectomy in Patients with Unilateral Superior Oblique Palsy

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**Introduction:** Unilateral superior oblique palsy is the most common isolated cranial nerve palsy, and can result in diplopia, abnormal head posture and asthenopia<sup>1</sup>. Symptomatic patients can be treated with Inferior oblique myectomy, a safe and simple procedure<sup>2</sup>. This report looks at the results of this surgery on a large series of patients followed over a long period.

**Methods:** A retrospective chart review of patients who underwent a standardized inferior oblique myectomy for unilateral superior oblique palsy in the last 24 years, at the Department of Ophthalmology and Visual Sciences, Halifax, Nova Scotia, Canada. Primary outcomes were distance hypertropia and torsion in primary position, and inferior oblique overaction.

**Results:** A total of 70 patients with unilateral superior oblique palsy with sensory fusion who underwent inferior oblique myectomy by one surgeon were analyzed. The average follow-up was 350±393 days. The mean preoperative distance hypertropia was 15.9±6.2 Prism Diopters (range 4-30PD), the mean preoperative inferior oblique overaction was +2.1±0.7 (range 0-3.5) and the mean preoperative excyclotorsion was +5.7±3.6° (range 0-12°). The mean postoperative distance hypertropia was 2.5±2.3PD[(-1)-8PD], the mean postoperative inferior oblique overaction was 0[(-2)-3] and the mean postoperative torsion was +1.3±2.8°[(-5)-10].

**Conclusion/Relevance:** Inferior oblique myectomy results in a 13PD reduction of the distance hypertropia, and 4° reduction of torsion in primary position, with an effective reduction of inferior oblique overaction. While these results are comparable to the results of other surgical methods reported in the literature, they underline an efficacy without the risks of complications such as anti-elevation syndrome and macular harm<sup>1,3</sup>.

- References:**
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Poster #B107  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Effect of Conversion from Traditional Transposition to Anterior and Nasal Transposition of the Inferior Oblique Muscle**

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**Introduction:** The inferior oblique anterior and nasal transposition (IOANT) is a method utilized in cases with fourth nerve palsy with large angle vertical deviation, large inferior oblique muscle overaction (IOOA), and/or large head tilt (1). The IO is transferred nasally to the inferior rectus muscle (IR) in contrast to the traditional transposition of the IO to the temporal aspect of the IR (IOTEMP). The aim of the present study was to evaluate the effect on vertical deviation and IOOA of IOANT in patients previously treated with IOTEMP.

**Methods:** We reviewed charts of all 619 patients undergoing inferior oblique transposition at one ophthalmology department from January 2018, to October, 2022.

**Results:** We performed transposition of the inferior oblique muscle in 619 patients in the study period. Of these, 66 underwent IOANT from a naïve IO, and only six had IOTEMP converted to IOANT and were included in the present study. We placed short tag noose adjustable sutures in five cases, of which none required adjustment. Median vertical deviation decreased from 10 PD to -1 PD with a mean effect of 10PD (range 2-17PD), and median IOOA decreased from 1 to 0 with a median effect of 1. Excyclorotation was reduced with mean 7 degrees (range -2-16).

**Conclusion/Relevance:** IOANT is a useful procedure for treating fourth nerve palsy in patients who have previously undergone IOTEMP with residual vertical deviation, IOOA, head tilt, or excyclorotation.

**References:** 1. Stager D JR et al: Anterior and nasal transposition of the inferior oblique muscles. J AAPOS. 2003 Jun;7(3):167-73.

Poster #B108  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

### **Unilateral Superior Oblique Palsies: Fixation Preference and its Effect on Misdiagnosis, Surgical Outcomes, and Clinical Characteristics**

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**Introduction:** Although many children with superior oblique palsies (SOP) have compensatory head positions, diagnosis and subsequent management may be challenging due to cooperation and fixation preference.

**Methods:** Charts of 315 pediatric patients (07/2010-09/2022) with diagnosis of superior oblique palsy (SOP), monocular elevation deficit/double elevator palsy, or Browns syndrome were reviewed. Examination findings including visual acuity/preference, sensorimotor exam, and head position, and surgical details were collected.

**Results:** One hundred twenty-six of the 315 patients (40%) were diagnosed with a SOP at an average age of  $8.3 \pm 11.08$  years. Eighteen patients (14%) predominantly fixated with the palsied eye. Compensatory abnormal head positions were exhibited in 72% and 67% in patients who fixated with the non-palsied vs. the palsied eye, respectively. Four patients, all of whom had an abnormal head position, were initially misdiagnosed at  $1.5 \pm 0.2$  years with Brown syndrome (2), monocular elevation deficiency (1), or Duane's Retraction Syndrome (1). No patient who fixated with the non-palsied eye was initially misdiagnosed. Fifty-seven patients underwent surgery including inferior oblique recession (39) or myectomy (2), superior oblique tuck (6), contralateral inferior rectus recession (4), or a combination of procedures (6). Of the 54 patients who had comprehensive pre- and post-operative sensorimotor exams, half showed improvement in fusion and/or stereoacuity.

**Conclusion/Relevance:** Unilateral SOPs in children often present with a compensatory abnormal head position, but still may be misdiagnosed, especially if predominantly fixating with the palsied eye.

**References:** Cha et al., Clinical features of excyclotorsion in the non-paretic eye of patients with congenital unilateral superior oblique palsy, *BMC Ophthalmology*, 2022; 22:126

von Norden GK et al., Superior Oblique Paralysis, *Archives of Ophthalmology*, December 1986 Vol 104

Poster #B109  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Anteriorization of the Inferior Oblique Muscle versus Anteriorization and Resection for Asymmetrical Dissociated Vertical Deviation**

Ghada Osama; Hala Elhilali; Magda Salah EIDin; Heba Fouad

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Cairo, Egypt

**Introduction:** To compare the efficacy of bilateral symmetric anteriorization of the inferior oblique muscle versus combined resection and anteriorization of the inferior oblique for bilateral asymmetric dissociated vertical deviation (DVD) with inferior oblique overaction.

**Methods:** The study is a randomized, comparative clinical study. It includes fifty-four patients presenting with bilateral manifest asymmetric DVD and inferior oblique overaction (IOOA). Twenty-seven patients underwent bilateral symmetric anteriorization of the IO muscle (Group I) and twenty-seven patients underwent anteriorization of the IO in one eye and anteriorization with IO resection in the eye with the larger deviation (Group II). According to the difference in measured DVD between the two eyes whether less, or more than 5 PD; a 3 or 5 mm resection was done, respectively.

**Results:** In Group I, the mean preoperative DVD was reduced from  $11.00 \pm 6.06$  PD and  $10.56 \pm 5.92$  PD to  $1.81 \pm 4.25$  PD and  $1.78 \pm 3.77$  PD after surgery in the right and left eye respectively with a mean reduction of  $9.19 \pm 3.40$  PD and  $8.78 \pm 4.17$  PD (P-value 0.0002). In Group II, the mean pre-operative DVD was reduced from  $11.48 \pm 3.90$  PD and  $8.96 \pm 4.33$  PD to  $0.67 \pm 1.64$  PD and  $0.11 \pm 2.38$  PD in the right and left eye respectively with a mean reduction of  $10.81 \pm 3.79$  and  $9.07 \pm 4.15$  PD (P-value 0.0003). IOOA was significantly reduced in both groups. There was no statistically significant difference in improvement in the mean post-operative DVD and IOOA between the two groups (P-value 0.265) and (P-value 0.804) respectively.

**Conclusion/Relevance:** Both surgical modalities are effective in asymmetric dissociated vertical deviation with IOOA.

**References:** Quinn AG, Kraft SP, Day C, Taylor RS, Levin AV. A prospective evaluation of anterior transposition of the inferior oblique muscle, with and without resection, in the treatment of dissociated vertical deviation. *J AAPOS*. 2000;4(6):348-353.

Snir M, Axer-Siegel R, Cotlear D, Sherf I, Yassur Y. Combined Resection and Anterior Transposition of the Inferior Oblique Muscle for Asymmetric Double Dissociated Vertical Deviation. *Ophthalmology* 1999; 106:2372-2376.

Farvardin M, Attarzadeh A. Combined resection and anterior transposition of the inferior oblique muscle for the treatment of moderate to large dissociated vertical deviation associated with inferior oblique muscle overaction. *J Pediatr Ophthalmol Strabismus*. 2002; 39(5):268-272.

Poster #B110  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Comparative Evaluation of the Effect of Inferior Rectus Plication Versus Superior Rectus Recession in Cases of Dissociated Vertical Deviation**

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Dr Rajendra Prasad Centre for Ophthalmic Sciences, AIIMS  
New Delhi, India

**Introduction:** To compare Inferior Rectus (IR) Plication Vs various Superior Rectus (SR) Recession procedures (SR Recession, SR Recession with Posterior tenectomy of Superior Oblique (PTSO) and SR Recession with Y-split) for correction of Dissociated Vertical Deviation (DVD) in primary position.

**Methods:** This prospective study included patients aged >6 years, with pre-op hypertropia >8PD (with or without associated horizontal deviation) measured via Prism Bar Undercover Test, from January-2019 to January-2021. 21 Patients (29 eyes) were included, randomly divided into two groups.

**Results:** IR Plication group(n=16) and SR Recession group(n=13), (4 in SR Recession, 4 in SR Recession with PTSO and 5 in SR Recession with Y-split) were analyzed. Mean age and pre-op deviation in the two groups were 19.23years and 15.6years ( $p=1.00$ ) and  $18.25 \pm 7.22$ PD and  $21 \pm 9.81$ PD ( $p=0.61$ ) respectively. Post-op deviation at 3 months was  $3.56 \pm 2.06$ PD and  $3.54 \pm 1.56$ PD ( $p=0.77$ ) respectively, ( $4 \pm 1.83$ PD,  $4.25 \pm 1.71$ PD and  $2.6 \pm 0.89$ PD ( $p=0.19$ ) for the 3 SR Recession procedures). The mean amount of plication/recession done during surgery in the two groups was  $4.84 \pm 0.60$ mm and  $5.92 \pm 1.08$ mm and consecutively the amount of correction achieved per mm was  $3.11 \pm 1.62$ PD and  $2.83 \pm 1.26$ PD ( $p=0.24$ ) respectively ( $2.33 \pm 1.01$ PD,  $2.89 \pm 0.70$ PD and  $3.89 \pm 1.80$ PD ( $p=1.00$ ) within the SR Recession subgroup). 1 case in each group required secondary correction for residual deviation.

**Conclusion/Relevance:** Both surgeries had similar outcomes, hence IR-plication can be considered an effective option for DVD correction, due to its surgical ease and easy reversibility.

**References:** Diab, M., 2013. Inferior rectus tucking versus combined superior rectus recession with posterior fixation suture (faden) for the treatment of dissociated vertical deviation without inferior oblique overaction. Journal of the Egyptian Ophthalmological Society, 106(4), p.239.

Poster #B111  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

### Vertical Rectus Muscle Recession for Non-Restrictive Strabismus

Melanie Kazlas, MD; Abdelrahman M. Elhousseiny, MD; Charlotte Gore, MD; Mohammad Ali A. Sadiq, MD;  
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**Introduction:** There are few studies which examine the dose-response of vertical rectus (VR) recession. Pratt-Johnson suggested a 3 PD/mm correction for VR recession with greater effect in the field of action of the operated muscle. This study examines the outcomes of single vertical rectus muscle recession in non-restrictive vertical strabismus.

**Methods:** Retrospective chart review to determine outcomes of patients who underwent unilateral superior rectus (SR) or inferior rectus (IR) recession for non-restrictive vertical strabismus performed between 2005-2019, with a minimum postoperative follow up of 8 weeks. Success was defined as orthotropia in primary gaze distance in patients with a preoperative deviation of < 5 PD and success defined as  $\leq 3$  PD vertical strabismus in patients with a preoperative deviation  $\geq 5$  PD, without need for reoperation.

**Results:** A total of 100 patients were included (53 had SR recession and 47 had IR recession), with a median age at surgery of 57.5 years. The median postoperative follow-up was 2.7 months. At the 2-month follow-up visit, success was achieved in 77.4% undergoing SR recession and 78.7% undergoing IR recession. The response to vertical rectus muscle recession in PD/mm increased with increasing amounts of surgery, from 1.7 PD/mm for small deviations to 4 PD/mm for large deviations.

**Conclusion/Relevance:** The surgical dosage for single VR recession should be adjusted in a non-linear fashion for non-restrictive vertical strabismus. We propose a surgical dosage table analogous to that used for horizontal rectus muscle surgery to help surgeons account for this nonlinearity.

**References:** 1. Pratt-Johnson JA, Tillson G, eds. Management of Strabismus and Amblyopia: A Practical Guide, 2nd ed, 2001. 2. Bratton E, Hoehn ME, Yoo W, Cox KF, Kerr NC. Postoperative shift in ocular alignment following single vertical rectus recession on adjustable suture in adults without thyroid eye disease. J AAPOS 2015;19(3):247-251. 3. Bergamin O, Wirth MG, Landau K. Binocular vertical rectus muscle recession for comitant vertical strabismus. J Neuro-Ophthalmol 2008;28(4):296-301.

Poster #B112  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## Dose-Response Relationship in Mini-Plication Surgery for Small-Angle Deviations

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**Introduction:** Partial tendon tenotomies/recessions for small-angle vertical deviations are not applicable in all circumstances. An alternative procedure originally described by Leenheer and Wright, mini-plication involves passing suture through the central 3-5 mm of the muscle belly and securing it anterior to the insertion. However, published case series are few and offer little guidance for titrating the procedure.

**Methods:** Medical record review was conducted to identify all mini-plications performed by the senior author from 8/2012 to 2/2022 – 23 mini-plications in 21 patients. Outcomes were assessed based on the first scheduled post-operative visit.

**Results:** Most mini-plications (83%) were for vertical deviations. The median pre-operative deviation at distance was 4PD [range 0-12PD]. At follow-up, 13/21 patients had orthophoria in primary gaze and 17/21 had  $\leq 1$ PD of residual deviation in the relevant plane. The amount of muscle plicated was a weak predictor of the amount of correction (partial correlation coefficient  $r = 0.43$ ), whereas pre-operative deviation was a strong predictor ( $r = 0.85$ ). In linear regression models, the amount plicated provided little additional explanatory power beyond pre-operative deviation alone ( $R^2 = 0.76$  in single regression,  $R^2 = 0.78$  in multiple regression).

**Conclusion/Relevance:** Mini-plication is a useful alternative to address small deviations. There is not a strong relationship between amount plicated and surgical response, but pre-operative deviation is a strong independent predictor of the amount of correction.

**References:** Leenheer RS, Wright KW. Mini-plication to treat small-angle strabismus: A minimally invasive procedure. J AAPOS. 2012;16:327-30.

## Superior Oblique Anterior Fibers Plication Utilizing Adjustable Noose for Extorsion

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**Introduction:** We report a novel surgical technique, consisting of a superior oblique anterior fibers plication (SOAFP) with a uniquely anterior knot, allowing for accessible adjustable noose suture if needed, to correct extorsion in the setting of superior oblique palsy.

**Methods:** We conducted a retrospective interventional case series. Thirteen patients, aged 21 to 82 years, underwent SOAFP (15 eyes, 9 adjustable). SOAFP was the only procedure performed in 9 eyes whereas 6 were in conjunction with either superior rectus recession or horizontal rectus recession and/or plication. Ocular alignment was assessed with alternate prism cover and Maddox rod tests; preoperatively, at initial and final (closest to 3 months) postoperative visits.

**Results:** Preoperative torsion ranged from 4 to 22 degrees of extorsion (mean 7.5 +/- 4.5). A SOAFP of 3.0 to 10.0 mm (mean 6.0 +/- 1.9) was performed. At the initial postoperative appointment, mean extorsion correction was 7.7 +/- 4.3 degrees, accounting for a 1.3 +/- 0.7 degrees of correction per millimetre of plication. Three eyes were adjusted after the initial visit to a target of 5 degrees intorsion. At the final visit, 68 +/- 31 days postoperatively, mean extorsion was 1.3 +/- 3.1 degrees, ranging from 6 of extorsion to 5 of intorsion. Mean final extorsion correction was 6.2 +/- 4.8 degrees, accounting for a 0.9 +/- 0.7 degrees of correction per millimetre of plication. Twelve out of 13 patients had an improvement of their diplopia.

**Conclusion/Relevance:** SOAFP allows for a targeted and easily adjustable correction of extorsion.

**References:** 1. Bata BM, Leske DA, Holmes JM. Adjustable Bilateral Superior Oblique Tendon Advancement for Bilateral Fourth Nerve Palsy. *Am J Ophthalmol.* 2017;178:115-121. doi:10.1016/j.ajo.2017.03.028  
2. Harada M, Ito Y. Surgical correction of cyclotropia. *Jpn J Ophthalmol.* 1964;8:88-96.  
3. Fells P. Management of paralytic strabismus. *Br J Ophthalmol.* 1974;58(3):255-265.

Poster #B114  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

### **Socioeconomic and Racial Variations in Childhood Vision Care Access and Utilization**

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**Introduction:** To evaluate socioeconomic and racial disparities in vision care access and utilization across five years in a large pediatric cohort in the United States.

**Methods:** Results from the 2016-2020 National Survey of Children's Health (NSCH) were analyzed. Race and ethnicity categories were defined as Hispanic, non-Hispanic Black, non-Hispanic White [reference group], non-Hispanic Asian, or non-Hispanic Other. Outcome variables were vision screening, unmet vision need, specialist utilization (i.e., ophthalmologist and optometrist), and vision impairment. We performed logistic regression models with race constructs as independent variables adjusting for confounding (i.e., sex, age, insurance status, household income, and State of residence).

**Results:** National-level estimates for the combined NSCH sample size was 73,222,987 children (CI: 71,516,484-74,929,490) with mean (SD) age of 8.64 (5.15). The racial and ethnic groups studied varied widely in socioeconomic status and in all four outcome measures. In logistic regression models, we found that odds of screening were significantly higher for non-Hispanic Blacks in comparison to non-Hispanic Whites (OR [95% CI], 1.12 [1.03- 1.21]). Despite having greater odds of screening, unmet need was highest for non-Hispanic Blacks (OR, 1.96 [1.28- 2.98]). The odds of specialist utilization were highest among non-Hispanic Asians (OR, 1.22 [1.09- 1.37]). Hispanic children were significantly more likely to have blindness or trouble seeing in comparison to non-Hispanic Whites (OR, 1.56 [1.24 - 1.95]).

**Conclusion/Relevance:** Despite having higher rates of vision screening, non-Hispanic Black children have the highest proportion of unmet needs, suggesting that screening may not be translating to follow-up vision care to address underlying needs in this population.

**References:** Adomfeh J, Jastrzembski BG, Oke I. Association of Race, Ethnicity, and Socioeconomic Status With Visual Impairment in Adolescent Children in the US. *JAMA Ophthalmol.* 2022. Epub 20220915. doi: 10.1001/jamaophthalmol.2022.3627. PubMed PMID: 36107437.  
Varma R, Tarczy-Hornoch K, Jiang X. Visual Impairment in Preschool Children in the United States: Demographic and Geographic Variations From 2015 to 2060. *JAMA Ophthalmol.* 2017;135(6):610-6. doi: 10.1001/jamaophthalmol.2017.1021. PubMed PMID: 28472231; PubMed Central PMCID: PMC5710267.



Poster #B115  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Improving Access to Visual Screening in 4-5 Year Old Children in Deprived Areas of London Through School Nurse Led Assessment**

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Maria Theodorou, FRCOphth

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London, United Kingdom

**Introduction:** Public Health England advocates visual screening for all 4-5 year old children. Moorfields sees a high number of paediatric ophthalmic referrals presenting late from children not screened in deprived boroughs of West London. We implemented a vision screening pathway delivered by (Moorfields Orthoptist-trained) School Nurses to increase access to eyecare for vulnerable children in a cost-effective model under Ophthalmologists' supervision.

**Methods:** West London's vision screening outcomes (years 2019 - 2021) were evaluated against outcomes from South London's Orthoptist-delivered visual screening pathway (years 2015-2016).

**Results:** Overall, 2914 children were screened with only 1.9% recording visual acuity worse than 0.2 logMAR and referred to local Optometrists for further assessment. Of these, 69% had refractive error, 28% were referred to Ophthalmology and 5.5% were already be under Ophthalmology. The positive predictive value of this model was 84% with a sensitivity of 96.2%.

Children with learning disabilities were not captured in this pathway therefore we collaborated with a UK charity, 'SeeAbility', to screen these children in their schools by specially-trained Optometrists. Moorfields previously audited that the average paediatric consultation utilised 98 minutes of clinic time costing £70 per child. Children with learning disabilities often take double the length of time costing up to £140 per child. The combined model is a cost-effective approach to visual screening all children.

**Conclusion/Relevance:** The effectiveness of school nurse-led vision screening was comparable to Orthoptist-led programmes and inclusive of all children, with high parent satisfaction, faster access to eyecare and appropriate onward referral. Proven effectiveness of the programme has secured ongoing funding from UK Clinical Commissioning Groups.

**References:** 1. Public Health England. Child vision screening. GOV.UK.  
<https://www.gov.uk/government/publications/child-vision-screening>. Published April 24, 2019. Accessed October 10, 2022.

Poster #B116  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## The Association of Vision Concerns with the Physical and Mental Health of Adolescents in the United States

Sean C. Teebagy; Benjamin G. Jastrzembski, MD; Isdin Oke, MD

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**Introduction:** The purpose of this study is to describe the prevalence of vision concerns among US adolescents and the association of time spent worrying about eyesight with physical and mental health.

**Methods:** This cross-sectional study used data from the 2005-2008 National Health and Nutrition Examination Survey. We included adolescent children 12 to  $\leq 18$  years old with completed visual function questionnaires and eye examinations. Children with vision concerns were identified by self-report of any time spent worrying about eyesight. Recent poor physical and mental health were defined as at least one day of impaired health within the last month. Survey-weighted multivariable logistic regression was performed adjusting for participant demographics and refractive correction.

**Results:** This analysis included 3100 survey participants (median age, 15.5 years; 49% [n=1545] female). Vision concerns were expressed by 24% (n=865) of adolescents. Vision concerns were more prevalent among female (29% vs. 19%;  $p < .001$ ), low-income (30% vs. 23%;  $p < .001$ ), and uninsured (31% vs. 22%;  $p = .006$ ) adolescents. Participants worried about their eyesight were more likely to have undercorrected refractive error (OR, 2.07; 95% CI, 1.43-2.98). Poor recent mental health (OR, 1.30; 95%CI, 1.01-1.67), but not physical health (OR, 1.00; 95%CI, 0.69-1.45) was more likely to be reported by adolescents with vision concerns.

**Conclusion/Relevance:** Adolescents who report spending time worrying about their eyesight often have undercorrected refractive error. The potential association between vision concerns and mental health in adolescents deserves further investigation.

**References:** Zhang X, Bullard KM, Cotch MF, et al. Association between depression and functional vision loss in persons 20 years of age or older in the United States, NHANES 2005-2008. *JAMA Ophthalmol.* 2013;131(5):573-581. doi:10.1001/jamaophthalmol.2013.2597

Poster #B117  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Feasibility of a High School Student Assisted Elementary School Vision Screening Community Service Project.**

Mitchell Strominger; Sydney Strominger; Brianne Thoreson

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**Introduction:** Elementary school vision screening is mandatory in many states and usually performed by school nurses. However this does not pertain to private schools that often do not have nurses. In addition, many high schools now require community service hours for graduation. We instituted a trial program whereby high school students were trained on vision screening, and then performed exams in elementary schools as part of their required community service hours.

**Methods:** Interested students attended two 1 hour symposiums. Topics included eye structure, acuity, and binocularity. Students were then trained on the Lea symbol critical line 20/32 flip chart and 3-D testing using the PASS 3 smile. Vision screening was then performed on kindergarten and first grade students under supervision.

**Results:** Sixteen high school students participated in the program. Each was assigned to one of 4 tasks; escort/recorder, occluder glasses, flip card, and stereo. A total of 181 children were screened at three elementary schools. 19 failed for a failure rate of 10.5%. The total time to test one school was approximately one hour. A child was therefore screened every 2 minutes.

**Conclusion/Relevance:** A high School student assisted elementary school vision screening community service project is easily implemented. The high school students were extremely efficient, enjoyed interacting with the elementary school students, felt the project was worthwhile, and obtained community service hours. In areas with limited school resources this program fulfills a significant need. We would like to see similar programs established throughout the country and be recognized by AAPOS / AAP.

**References:** Atowa UC, Wajuihian SO, Hansraj R. A review of paediatric vision screening protocols and guidelines. *Int J Ophthalmol* 2019; 12(7):1194-01

Poster #B118  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

## **Pediatric Vision Screening Guidelines and Practices in Florida**

Meghan Sharma, BA; Eleonore Savatovsky, MD, PhD; Alana Grajewski, MD

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**Introduction:** In Florida, mandated school vision screenings begin in kindergarten.<sup>1</sup> However, a joint statement of the AAO and AAPOS recommends that primary care providers, including pediatricians, screen for eye and vision symptoms starting at birth.<sup>2</sup> This study aims to understand current vision screening practices of pediatricians in Florida.

**Methods:** A survey with 36 questions regarding screening procedures was sent to pediatricians through digital newsletters to members of the Florida Chapter of the American Academy of Pediatrics and pediatric departments at Florida universities.

**Results:** 46 responses were collected. 78% of the 46 respondents reported that they perform vision screenings in their pediatric clinics. However, 50% of respondents reported receiving no previous training on performing vision screenings. Only half of respondents reported feeling “somewhat comfortable” or “extremely comfortable” with performing vision screenings. Of respondents who reported performing vision screenings, 70% stated that they perform vision screenings starting at ages 0-2, while 24% start at ages 3-5 and 6% start at ages 6-8. 94% of pediatricians surveyed who screen for eye and vision symptoms examine for a red reflex, 76% use a visual acuity chart, and 68% use an automatic vision screening device.

**Conclusion/Relevance:** While most pediatricians surveyed perform vision screenings for children before kindergarten, many report that they have never received training on performing the exam or do not feel comfortable performing them in their practice. Increased training on vision screenings may help improve comfort levels and awareness regarding vision screenings.

**References:** 1 'Preventive Health Screenings in ES-Vision - Florida: State Policy Database.' Preventive Health Screenings in ES-Vision - Florida | State Policy Database, <https://statepolicies.nasbe.org/health/categories/health-services/preventive-health-screenings-in-es-vision/florida>.

2 'Vision Screening for Infants and Children - 2022.' American Academy of Ophthalmology, 6 Oct. 2022, <https://www.aao.org/clinical-statement/vision-screening-infants-children-2022>.

Poster #B119  
Saturday, April 1, 2023  
9:50 AM – 10:50 AM

### Primary Care Vision Screening during 3- to 5-Year-old Well Child Visits at an Academic Health System

Olivia J. Killeen, MD, MS; Amani Mubeen; Francine Moriguchi; Joshua R. Ehrlich, MD, MPH;  
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**Introduction:** Professional organizations recommend vision screening in the primary care setting at ages 3-5. Studies published 15 years ago found low rates of primary care vision screening, but contemporary data are lacking. We assessed determinants of primary care vision screening at an academic health system.

**Methods:** We reviewed 850 charts from 3- to 5-year-old well child visits with pediatricians and family physicians at 17 clinics in one health system. Data collected included child age, gender, race, ethnicity, physician specialty, and whether vision screening (defined as photoscreening or visual acuity testing) was performed. Logistic regression was used to analyze the association between age, gender, race, ethnicity, specialty, and vision screening.

**Results:** Mean patient age was  $3.9 \pm 0.8$  years, 64.1% were White, 52.5% were male, 53.0% were seen by pediatricians, and 45.5% received vision screening. Rates of screening by clinic ranged from 4.0-90.0%. The only clinic to use a photoscreener had the highest screening rate. Holding all other variables constant, the odds ratio (OR) for receiving vision screening was 1.87 for White compared to Black children (95% CI 1.6-5.0) and 1.86 for those seen by pediatricians compared to family physicians (95% CI 1.9-4.2). The odds of screening increased with age (OR 4.54, 95% CI 4.4-7.0).

**Conclusion/Relevance:** Rates of vision screening vary widely between clinics. Patient, provider and clinic level factors may be important determinants of vision screening and could be investigated using multilevel modeling and qualitative inquiry with primary care providers. Implementation strategies are needed to improve vision screening in the primary care setting.

**References:** American Association for Pediatric Ophthalmology and Strabismus. Vision Screening Recommendations. Accessed Oct 2022. Available from: <https://aapos.org/members/vision-screening-guidelines>

Committee on Practice and Ambulatory Medicine, Bright Futures Periodicity Schedule Workgroup. 2021 Recommendations for Preventive Pediatric Health Care. *Pediatrics*. 2021 Mar;147(3):e2020049776.

Kemper AR, Clark SJ. Preschool vision screening in pediatric practices. *Clin Pediatr (Phila)*. 2006 Apr;45(3):263-6.

## Clinical Findings in Children Referred for an Abnormal Red Reflex

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**Introduction:** Pediatricians conduct red reflex testing to identify vision and life-threatening ocular conditions. We sought to determine the type and prevalence of examination findings in children referred to an academic pediatric ophthalmology practice following an abnormal red reflex test.

**Methods:** A chart review was conducted for children less than 8 years old who were referred by a primary care physician for an abnormal red reflex, leukocoria, cataract, or retinoblastoma between January 2016 and March 2020. Children referred for genetic conditions or for a second opinion were excluded.

**Results:** Out of 89 referred patients, 41 (46%) had normal examinations (95% confidence Interval: 36-56%). The positivity rate in this cohort was 54% (95% confidence interval: 44-64%). The most common abnormal findings were cataracts (22 children, 24.7%), refractive error requiring spectacles (n=8, 8.9%), and anterior segment dysgenesis (n=6, 6.7%). Only 3 children (3.4%) had retinoblastoma.

**Conclusion/Relevance:** Over half of children referred by primary care physicians for an abnormal red reflex test had an abnormal finding, although rates of retinoblastoma were low.

**References:** 1. Lin SY, Yen KG, Zhu H, Moisiuc A, Chilakapati M. Abnormal Red Reflex: Etiologies in a Pediatric Ophthalmology Population. *Clin Pediatr (Phila)*. 2020 Jul;59(8):760-765.  
2. Eventov-Friedman S, Leiba H, Flidel-Rimon O, Juster-Reicher A, Shinwell ES. The red reflex examination in neonates: an efficient tool for early diagnosis of congenital ocular diseases. *Isr Med Assoc J*. 2010 May;12(5):259-61.  
3. Cagini C, Tosi G, Stracci F, Rinaldi VE, Verrotti A. Red reflex examination in neonates: evaluation of 3 years of screening. *Int Ophthalmol*. 2017 Oct;37(5):1199-1204.

Workshop #1  
Wednesday, March 29, 2023  
8:00 AM – 4:00 PM

## **Growing Your Practices' Economic Potential: From Basics to Advanced Concepts**

Eric Packwood, MD; Traci Fritz, AAPOS Socioeconomic Committee

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Fort Worth, Texas

**Purpose/Relevance:** In the shadow of the COVID-19 rebound, significant surgical reimbursement cuts and a declining supply of pediatric ophthalmologists, current pediatric ophthalmology practices face increasing challenges to their efforts to thrive and expand to meet the increasing patient needs.

**Target Audience:** Presentations target all those involved in pediatric ophthalmology practice operations including pediatric ophthalmologists and practice administrators.

**Current Practice:** Pediatric ophthalmology practices face increasing challenges to their ability to care for patients while balancing and maximizing socioeconomic factors. To thrive, physicians and administrators must lead themselves and their team and maximize all controllable variables in the function of their practices.

**Best Practice:** Experienced pediatric ophthalmologists, administrators and highly regarded consultants address the detail and nuances of practice leadership, practice efficiency, utilizing physician extenders, pursuing ancillary income, maintaining healthy practice finances and embracing healthy personal financial practices.

**Expected Outcomes:** Attendees should receive knowledge and tools that increase their ability to improve practice operations in these specific areas.

**Format:** The all day meeting will include didactic lectures, panel discussions and a period of time for questions and answers.

**Summary:** Pediatric ophthalmology practices face increasing challenges to their ability to not only meet the needs of their communities but also to thrive and expand to meet the increasing patient needs. The panel discussions, didactic lectures and question and answer sessions will address specific topics that drive socioeconomic well being. Speakers include experienced pediatric ophthalmologists, administrators and highly regarded consultants.

**References:** Bernstein, BK; Nelson, LB. Workforce Issues in Pediatric Ophthalmology. J Pediatr Ophthalmol Strabismus. 2020 Jan 1;57(1):9-11.

Workshop #2  
Wednesday, March 29, 2023  
4:15 PM – 5:15 PM

### **OMIC's Strabismus Claims--New Concerns**

Robert S. Gold, MD; Robert E. Wiggins, MD

Ophthalmic Mutual Insurance Corporation  
San Francisco, CA

**Purpose/Relevance:** Claims related to strabismus are the most common filed against pediatric ophthalmologist and strabismus specialists. In this course we'll review OMIC's history of claims related to strabismus and discuss 4 strabismus-related cases. We'll highlight risk management recommendations related to this condition to help reduce the likelihood that a claim will be filed and improve the defensibility of a claim if one is filed.

**Target Audience:** Pediatric ophthalmologists

**Current Practice:** To be presented

**Best Practice:** Clinical situations to be presented

**Expected Outcomes:** Highlight risk management recommendations related to strabismus to help reduce the likelihood that a claim will be filed and improve the defensibility of a claim if one is filed.

**Format:** Lecture with case presentations followed by open question and answer forum

**Summary:** Refer to abstract--repeated below--

Claims related to strabismus are the most common filed against pediatric ophthalmologist and strabismus specialists. In this course we'll review OMIC's history of claims related to strabismus and discuss 4 strabismus-related cases. We'll highlight risk management recommendations related to this condition to help reduce the likelihood that a claim will be filed and improve the defensibility of a claim if one is filed.

**References:** Twenty-five years of professional liability in pediatric ophthalmology and strabismus: The OMIC experience. Wiggins RE, Gold RS, Menke AM; JAAPOS 2015;19:535-540



Workshop #3  
Thursday, March 30, 2023  
2:15 PM – 3:15 PM

## **Implications of Socioeconomic Factors On the Future of Pediatric Ophthalmology and its Impact on Access to Care: The Next Generation Project**

Charlotte Gore, MD; Karen E. Lee, MD, MS; Leonard B. Nelson, MD; Eric Packwood, MD

**Purpose/Relevance:** Identify the socioeconomic factors of pediatric ophthalmologists in practice with relevance to the current landscape in post-COVID-19 era. Identify and address issues that influence our ability to attract future pediatric ophthalmologists from an economic perspective.

**Target Audience:** Pediatric ophthalmologists, current and future, including potential future pediatric ophthalmologists such as residents and medical students.

**Current Practice:** Pediatric ophthalmology is facing a critical issue of shortage of future pediatric ophthalmologists. This situation has been exacerbated by ongoing reimbursement cuts, the COVID-19 pandemic post-mitigation, change in practice patterns, and overall disillusionment within the field, which have also contributed to a crisis in access to eye care. Additionally, residents and program directors of residency programs misunderstand the earning potential of pediatric ophthalmologists. Many view pediatric ophthalmologists unfavorably in terms of financial security.

**Best Practice:** We need to understand our workforce issues and deterrent factors in order to suggest any policy changes or economic incentives to mitigate the shortage of pediatric ophthalmologists. In this workshop, we will present data to show the changing landscape of reimbursement in pediatric ophthalmology. We will also present data on job satisfaction from pediatric ophthalmologists. Lastly, we will share residents' and program directors' perspectives on pediatric ophthalmology.

**Expected Outcomes:** Recognize that there is a shift in the practice of pediatric ophthalmologists, creating an even dire situation for the future of our field. Develop a better understanding of residents' perspective on pediatric ophthalmology. Incorporate these findings to propose strategies for economic turnaround and areas of improvement, such as potential loan forgiveness, augmented financial reimbursements.

**Format:** Didactic lecture, followed by open question and answer forum.

**Summary:** Identify factors that deter residents from pursuing pediatric ophthalmology.  
Assess economic status and practice patterns of current pediatric ophthalmologists.  
Propose solutions and strategies to mitigate the shortage of pediatric ophthalmologists.

**References:** Simon JW, Bradfield Y, Smith J, Ahn E, France TD. Recruitment and manpower in pediatric ophthalmology and strabismus. *J AAPOS*. 2007 Aug;11(4):336-40. doi: 10.1016/j.jaapos.2007.04.004.PMID: 17689824  
Thuma TBT, Sussberg JA, Nelson LB, Schnall BM. Economic Impact of the COVID-19 Pandemic Post-Mitigation on Pediatric Ophthalmologists. *J Pediatr Ophthalmol Strabismus*. 2022 Sep-Oct;59(5):291-295. doi: 10.3928/01913913-20220623-01. Epub 2022 Sep 1. PMID: 36149924.  
Lee KE, Sussberg JA, Nelson LB, Thuma T. The Economic Factors Impacting the Viability of Pediatric Ophthalmology. *J Pediatr Ophthalmol Strabismus*. 2022;(In press).

Workshop #4  
Thursday, March 30, 2023  
3:30 PM – 5:00 PM

## **Building Blocks of Documentation and Coding in the Pediatric Ophthalmology Practice**

Heather Dunn, COA, OCS, OCSR; Traci Fritz, COE; Eric A. Packwood, MD; Maria P. Patterson, MD;  
Michael X. Repka, MD, MBA

American Academy of Ophthalmology  
San Francisco, CA

**Purpose/Relevance:** Pediatric ophthalmology may be more fun, but it also demands the fundamentals of ophthalmic coding. Proper documentation and claim coding that can withstand scrutiny begins with a solid coding knowledge foundation. The best pediatric ophthalmology team members:

- Understand applicable coding rules by identifying the payer and their policies.
- Recognize documentation requirements and code options for office based and inpatient examinations.
- Apply strong fundamental knowledge to pediatric coding scenarios.
- Stay informed of changes and areas under investigation.

**Target Audience:** Pediatric ophthalmologists, administrators, billers, coders, orthoptists, technicians, and scribes.

**Current Practice:** Struggles with documentation and/or application of correct level of office visit. Erroneously applies one payer's rules to all payers; each payer can/does have their own documentation requirements.

**Best Practice:** Best practices are aware of the 2023 documentation and coding updates as well as rules unique to each payer.

**Expected Outcomes:** Best practices are aware of the 2023 documentation and coding updates as well as rules unique to each payer.

**Format:** Lecture, panel discussion, audience polling

- Summary:**
1. Test participant's knowledge of E/M and Eye visit code documentation guidelines both in and outside the office.
  2. Demonstrate strong knowledge of when to submit an Eye visit code vs. E/M code by payer.
  3. Review answers to the top pediatric coding scenarios.
  4. Share coding changes and how knowledge is disseminated across the practice.

**References:** CPT 2022 vs CPT 2023  
Academy's Health Policy Committee

Workshop #5  
Friday, March 31, 2023  
7:00 AM – 8:15 AM

## **Cortical/Cerebral Visual Impairment 2023 Update: What You Need to Know**

Melinda Chang; Sharon Lehman; Richard Legge; Veeral Shah

Children's Hospital Los Angeles, University of Southern California  
Los Angeles, CA

**Purpose/Relevance:** Cortical/Cerebral Visual Impairment (CVI) is the most common cause of visual impairment in children in developed countries. Lack of standardized methods for evaluation, diagnosis and providing recommendations for children with CVI creates challenges for the pediatric ophthalmologist. This workshop will provide practical information to close those existing gaps. A review of recent literature and research will be included.

**Target Audience:** Pediatric ophthalmologists, orthoptists

**Current Practice:** Lack of understanding of pediatric ophthalmologists concerning the care of patients with CVI limits the effectiveness of the team in caring for patients.

**Best Practice:** A pediatric ophthalmologist familiar with the latest information about CVI evaluation and management will improve the effectiveness of the pediatric ophthalmologist as a part of the team caring for a child with CVI and ultimately provide the best care for the patient.

**Expected Outcomes:** Participation in this AAPOS Low Vision Committee-sponsored workshop will allow the pediatric ophthalmologist to have practical tools (questionnaires and templates) that will allow for easier diagnosis, evaluation, management, and communication of recommendations to the child's team. Additionally, participants will be able to generate an appropriate differential diagnosis, identify features of ocular vs. cerebral visual impairment, recommend ancillary diagnostic testing, and determine when strabismus surgery and refractive correction are indicated.

**Format:** Case presentation, didactic lecture, question and answer

**Summary:** Lack of standardized methods for evaluation, diagnosis and providing recommendations for children with CVI creates challenges for the care team. Education of pediatric ophthalmologists about appropriate workup, management, and communication strategies will provide practical ways to approach this problem.

**References:** Lueck AH, Dutton GN, editors.. Vision and the Brain: Understanding Cerebral Visual Impairment in Children. New York, NY: AFB Press; 2015

Roman-Lantzy C. Cortical Visual Impairment: An Approach to Assessment and Intervention. New York, NY: AFB Press; 2007

Chang MY, Borchert MS. Advances in the evaluation and management of cortical/cerebral visual impairment in children. Surv Ophthalmol. 2020 Nov-Dec;65(6):708-724. doi: 10.1016/j.survophthal.2020.03.001. Epub 2020 Mar 19. PMID: 32199940.

Workshop #6  
Friday, March 31, 2023  
7:00 AM – 8:15 AM

## **Advanced and Innovative Techniques Managing Strabismus from Orbital Trauma**

Linda R. Dagi, MD; Seyhan B. Özkan, MD; Eric D. Gaier, MD, PhD; Federico G. Velez, MD; Hilda Capo, MD

Boston Children's Hospital, Harvard Medical School; Private Eye Clinic, Aydin Turkey; Jules Stein Eye Institute, UCLA and Duke Eye Center; Bascom Palmer Eye Institute, University of Miami Medical School; Boston, Massachusetts; Aydin, Turkey; Los Angeles, California; Durham, North Carolina; Miami, Florida

**Purpose/Relevance:** Discussing advanced and innovative techniques for managing strabismus secondary to orbital trauma

**Target Audience:** Strabismus surgeons

**Current Practice:** Strabismus surgeons encountering orbital trauma may not be familiar with techniques to reduce risk of anterior segment ischemia and operative time, and all surgical treatment options.

**Best Practice:** Utilizing 3D imaging, screening for anterior segment ischemia and novel surgical approaches to improve outcomes.

**Expected Outcomes:** Knowing how and when to use ancillary testing, and which procedures may improve strabismus outcomes.

**Format:** Case presentations

**Summary:** Through the use of illustrative examples, our panel will introduce new concepts and refine old ones.

Role of botulinum toxin before transposition: An acute ram horn injury severing the superior rectus muscle and superior oblique tendon will be used to illustrate use of botox ahead of transposition procedures. We will cover use in fat adherence and lost muscle cases as well.

Transposition after transection and nerve damage to the inferior rectus: Repairing the muscle proved insufficient and transposition was performed instead.

How 3 D reconstruction can help you shorten operative time: Contrasting two strikingly similar cases of traumatic avulsion of the inferior and medial rectus muscles, MRI-based 3D modeling of the EOMs reduced surgical time by 30%.

Burn injury to the medial rectus: A unique case of penetrating orbital trauma from a hot metal marshmallow skewer focuses on mechanism of injury, partial recovery, and post-traumatic psychological impact.

Iris Angiography: When to worry about anterior segment ischemia and how to assess the risk.

Torsional strabismus and the Inferior oblique: Clues suggesting inferior oblique trauma in 'typical' blow-out fractures, and how to resolve the associated diplopia.

Exotropia following endoscopic intranasal sinus surgery: Medial rectus injury from endoscopic intranasal surgery and strabismus treatment alternatives.

Strabismus after dental implant: Extra-ocular muscle trauma during dental implant surgery and strabismus surgical treatment options.

### **References:**

- (1) Tiedemann LM, Lefebvre DR, Wan MJ, and Dagi LR. J AAPOS 18(5): 511-14. 2014.
- (2) Pineles, SL, Chang MY, Oltra EL, Pihlblad MS, Davila-Gonzalez JP, Sauer TC and Velez FG. Eye (2018) 32, 173–178.
- (3) Topilow N, Chen Y, Capó H, Tse DT. J Oral Maxillofac Surg. 2020 Aug;78(8):1328-1333.

Workshop #7  
Friday, March 31, 2023  
7:00 AM – 8:15 AM

### **What's New and Important in Pediatric Ophthalmology**

Emily McCourt; Eunice Kohara; Smith Ann Chisholm; Hersh Varma; Lauren Mehner; Casey Smith; Catherine Choi;  
Robert Tauscher; Alex Khammar; Grace Wang

University of Colorado  
Aurora, Colorado

**Purpose/Relevance:** The attendees will be able to give an overview of the most current and important published information in pediatric ophthalmology and strabismus. The course is intended to keep both comprehensive and pediatric ophthalmologists current in pediatric ophthalmology and strabismus, and to help them decide which articles to read in full.

**Target Audience:** Pediatric ophthalmologists, general ophthalmologists, researchers, orthoptists

**Current Practice:** Currently reviewing all of the current literature relevant to the pediatric ophthalmologist is impossible.

**Best Practice:** Our committee has reviewed all the pediatric relevant journals over the last year, summarized all of these articles in a handout. Next, we created an all stars handout of the top articles and finally will present the best articles over the last year.

The learner will be updated on the most current and important papers and improve their practice based on the latest data presented in this workshop.

**Expected Outcomes:** This course is updated annually to provide a clinically-relevant summary of the latest and most important pediatric ophthalmology and strabismus literature to the audience

**Format:** This will be a didactic lecture

**Summary:** The American Association for Pediatric Ophthalmology and Strabismus (AAPOS) Professional Education Committee has been hard at work reviewing journals to bring you the latest developments in the field of pediatric ophthalmology and strabismus. The course instructors will summarize, analyze and present the most important information published in the last year from more than 20 medical journals. The audience will receive a summary of all published articles in pediatric ophthalmology and strabismus, organized by topic area, as well as an abbreviated summary of the truly 'best and most important' articles published this year.

This course is updated annually to provide a clinically-relevant summary of the latest and most important pediatric ophthalmology and strabismus literature to the audience

**References:** Randomized controlled trial of a dichoptic digital therapeutic for amblyopia. [Xiao S, Angjeli E, Wu HC, Gaier ED, Gomez S, Travers DA, et al. for the Luminopia Pivotal Trial Group. *Ophthalmology* 2022;129:77-85.

Workshop #8  
Friday, March 31, 2023  
7:00 AM – 8:15 AM

## **Intraoperative Cataract and Anterior Segment Dilemmas: Cases with Expert Opinions**

Azam Qureshi; Ken Nischal; M. Edward Wilson; Sarah Eppley

University of California, San Francisco Children's Hospital Oakland  
Oakland, California

**Purpose/Relevance:** We present a discussion of unique anterior segment intraoperative situations in the pediatric population with 'expert' opinions on management. Cases include traumatic cataract, prolapsed iris, outward-veering CR, small CR, Toric IOLs, IOL exchange, and small aphakic eye. Surgical video footage will be reviewed and discussed.

**Target Audience:** Pediatric ophthalmologists

**Current Practice:** Uncommonly encountered surgical anterior segment conditions, such as traumatic cataracts or intraoperative complications during pediatric cataract surgery, pose a challenge to the practicing pediatric ophthalmologist who perform limited numbers of these types of surgeries per year. For example, should all pediatric traumatic cataracts be treated with primary IOL implantation? What are the surgical and non-surgical options for small aphakic eyes requiring high IOL powers?

**Best Practice:** Traumatic cataract in children carries a guarded prognosis, with post-operative visual impairment being common. A recent study found that surgeons implanted an IOL at the time of lensectomy in the majority of cases, though younger patients were more likely to be aphakic (1). A standard of care for traumatic cataract removal in the initial globe repair has not been established. Furthermore, intraoperative considerations must be considered when managing each case.

**Expected Outcomes:** This workshop will improve physician strategies and performance in addressing challenging pediatric anterior segment cases. The workshop will provide open discussion between experts regarding the management of specific cases that different techniques may be employed.

**Format:** This will be an 'Ask the Expert' panel discussion with Dr. Nischal and Dr. Wilson serving as the experts covering cases, surgical options, and video of the surgery.

**Summary:** This workshop will present uncommon surgical anterior segment cases that pose a challenge to pediatric ophthalmologists in an 'Ask the Expert' format. Cases will be introduced by a panelist, then management options will be discussed by the expert. Discussion will be supplemented with video footage of the surgery that was performed for each case.

**References:** 1. Writing Committee for the Pediatric Eye Disease Investigator Group (PEDIG). (2021). Visual Outcomes and Complications After Lensectomy for Traumatic Cataract in Children. *JAMA Ophthalmology*, 139(6), 647-653.  
2. Shah, M. A., Shah, S. M., Applewar, A., Patel, C., & Patel, K. (2012). Ocular Trauma Score as a predictor of final visual outcomes in traumatic cataract cases in pediatric patients. *Journal of Cataract and Refractive Surgery*, 38(6), 959-965. <https://doi.org/10.1016/j.jcrs.2011.12.032>  
3. Struck, M. C. (2015). Long-term Results of Pediatric Cataract Surgery and Primary Intraocular Lens Implantation From 7 to 22 Months of Life. *JAMA Ophthalmology*, 133(10), 1180-1183.

Workshop #9  
Friday, March 31, 2023  
8:30 AM – 9:45 AM

## How to Use Posterior and Anterior OCT and OCT Angiography in Your Clinical Practice

Yasmin Bradfield; Savleen Kaur; Mays El-Dairi; Ken Nischal

University of Wisconsin, Duke University, University of Pittsburgh, Postgraduate Institute of Medical Education and Research Chandigarh India  
USA and India

**Purpose/Relevance:** Optical coherence tomography (OCT) is a useful tool in clinical practice, but newer applications such as anterior segment OCT (AS OCT) and OCT angiography are not widely utilized in pediatric ophthalmology. An overview of this technology and examples of its use in clinical decision-making across various diagnoses can improve awareness and practical utilization of OCT.

**Target Audience:** Pediatric Ophthalmologists

**Current Practice:** Pediatric ophthalmologists may not have adequate training in the clinical usefulness of OCT in their practice, or the current availability of anterior segment OCT devices and OCT angiography.

**Best Practice:** AS OCT is valuable in guiding management in surgical cases, including strabismus reoperations, and pediatric cornea and cataract surgery. AS OCT can be used in complex cataract surgery to improve outcomes and as a teaching tool for trainees. It is used to assess corneal scarring and dermoid depth, diagnosis of corneal dystrophies and extent of conjunctival lesions during excision. Posterior segment OCT and OCT angiography may be useful in differentiating optic disc edema from pseudopapilledema, diagnosing an optic neuropathy vs. retinopathy in nystagmus or unexplained vision loss, and following progressive pathologies over time (compressive, metabolic or inflammatory).

**Expected Outcomes:** Workshop participants will have a further understanding the types of devices and usefulness of OCT in a case-based format. Attendees will gain knowledge of which imaging test to perform for a spectrum of pediatric ophthalmology disorders and strabismus, and that it can be performed successfully across a wide age range.

**Format:** The format will include case-based presentations and panel discussions.

**Summary:** Our workshop will consist of case-based presentations highlighting how different types of OCT helped in the diagnosis and management of various pediatric ocular disorders. These tools can be a valuable supplement to a patient's clinical examination. A question and answer session will be held during the workshop.

**References:** Kaur S, Sukhija J, Korla S, Sachdeva K, Chaurasia S, Raj S. Comparison of the swept-source anterior segment optical coherence tomography and wide-field ultrasound biomicroscopy for imaging previously operated horizontal extraocular muscles. *J AAPOS*. 2021 Aug;25(4):212.e1-212.e6.

Bradfield Y, Barbosa T, Blodi B, Tompson SW, McLellan GJ, Struck M, Young TL. Comparative Intraoperative Anterior Segment OCT Findings in Pediatric Patients with and without Glaucoma. *Ophthalmol Glaucoma*. 2019 Jul-Aug;2(4):232-239.

Odden JL, Davis AA, Shazly TA, Nischal KK. Use of Integrated Intraoperative Ocular Coherence Tomography in Pediatric Cataract Surgery: Thinking outside the Box. *Dev Ophthalmol*. 2021;61:46-52.

Hsu ST, Ngo HT, Stinnett SS, Cheung NL, House RJ, Kelly MP, Chen X, Enyedi LB, Prakalapakorn SG, Materin MA, El-Dairi MA, Jaffe GJ, Freedman SF, Toth CA, Vajzovic L. Assessment of Macular Microvasculature in Healthy Eyes of Infants and Children Using OCT Angiography. *Ophthalmology*. 2019 Dec;126(12):1703-1711.

Workshop #10  
Friday, March 31, 2023  
8:30 AM – 9:45 AM

## **Controversies in Pediatric Eye Trauma: An Evidence-Based Topic Debate and Discussion**

Ankoo S. Shah; Kara M. Cavuoto, MD; Eric D. Gaier, MD, PhD; Efren Gonzalez, MD; Charlotte Gore, MD; Courtney L. Kraus, MD; Prethy Rao, MD; J. Reeves Ellis Samaha, MD, MPH; Natalie C. Weil, MD; Marguerite C. Weinert, MD

**Purpose/Relevance:** To prepare attendees to tackle pediatric eye emergencies and eye muscle trauma.

**Target Audience:** Pediatric ophthalmologists; Orthoptists

**Current Practice:** Approximately 250,000 serious pediatric eye injuries occur worldwide each year (1). However, medical and surgical eye trauma training is limited with 83% of ophthalmology residents reporting doing less than 10 open-globe injury surgical cases during their training (2).

**Best Practice:** Perceived preparedness and competence in ocular trauma is associated with structured curriculum and expert discussion (2). This course provides a curriculum of hot topics in pediatric eye trauma with experts providing pro and con arguments followed by general discussion among panelists and attendees.

**Expected Outcomes:** After attending this workshop, participants will be prepared to make judgements on their approach to pediatric eye injuries as well as eye muscle injury.

**Format:** This workshop will highlight 5 areas for discussion:

1. Systemic Antibiotics after open-globe injury (OGI) - 1 dose vs Extended dosing;
2. Traumatic cataract extraction after OGI - Early vs Late;
3. Surveillance of hyphema after CGI - Daily vs Less frequent;
4. Vitreous hemorrhage - Observation versus surgical intervention;
5. Traumatic muscle laceration - Proximal-distal anastomosis vs scleral fixation of the cut muscle.

For each topic area, a panelist will present each argument and counter-argument for 5 minutes followed by an open discussion among panelists and the audience for 4 minutes. The last 5 minutes will be reserved for open discussion.

**Summary:** Panelists will argue controversies in eye trauma including antibiotic use after open-globe injury, hyphema and vitreous hemorrhage management, and eye muscle injury using evidence. Panelists and audience members will then discuss the controversy. Attendees will leave with evidence to make judgements for their next eye trauma.

**References:** 1. Abbott J, Shah P. The epidemiology and etiology of pediatric ocular trauma. *Surv Ophthalmol.* 2013;58:476-85.

2. Zafar S, Chen X, Woreta F, Sikder S. Self-perceived preparedness and competence among ophthalmology residents for open globe repair. *Clin Ophthalmol.* 2019 Jul 16;13:1273-1278.

3. Bowe T, Serina A, Armstrong M, Welcher J, Adebona O, Gore C, Staffa SJ, Zurakowski D, Shah AS. Timing of Ocular Hypertension After Pediatric Closed-Globe Traumatic Hyphema: Implications for Surveillance. *Am J Ophthalmol.* 2021 May 12:S0002-9394(21)00269-5.



Workshop #11  
Friday, March 31, 2023  
8:30 AM – 9:45 AM

### **AOC/AAPOS Joint Workshop: Thinking Outside the BOTOX: A Tribute to Alan Scott**

Sarah Whitecross, CO; Doug Fredrick, MD; Alejandra de Alba Campomanes, MD; Joseph L. Demer, MD;  
William V. Good, MD; Dusty Gronemyer, CO; Eugene Helveston, MD; David G. Hunter, MD, PhD;  
Sarah MacKinnon, CO; Gill Roper-Hall, CO

Boston Children's Hospital  
Boston, MA

**Purpose/Relevance:** In the late 1970s, Alan Scott pioneered the pharmacologic treatment of strabismus using botulinum toxin injected into the extraocular muscles. Botulinum toxin type-A is nowadays used in a variety of medical conditions, including strabismus in children and adults where it can be used as initial treatment, adjuvant to simultaneous or following eye muscle surgery or in combination with bupivacaine. While the development of Botox was Dr. Scott's most well-known contribution to our specialty, his contributions to the understanding of the physiology of the extraocular muscles and innovative surgical techniques deserve acknowledgement.

**Target Audience:** pediatric ophthalmologists, orthoptists

**Current Practice:** Caring for patients with strabismus requires thorough understanding of the anatomy and physiology of extraocular muscles as well as knowledge of the psychophysical substrates of vision and fusion. Ophthalmologists working with orthoptists must offer their patients the full array of medical and surgical therapies when caring for these patients. Lack of exposure to use of Botox during training limits the number of physicians offering this therapeutic option.

**Best Practice:** Ophthalmologists and orthoptists will gain confidence in adding the use of chemodenervation and innovative surgical techniques into their therapeutic armamentarium. Adoption of these techniques when appropriately indicated will improve the outcomes for patients with strabismus.

**Expected Outcomes:** Attendees will learn the role of Botox, other chemotherapeutics & other treatments pioneered by Alan Scott in treating strabismus.

**Format:** Panelists will use didactic lectures and case presentations to demonstrate how Dr Scott's innovations have led to a better understanding of the causes of strabismus and improved outcomes for our patients with complex strabismus. Audience polling will determine if the audience has adopted many of these innovations.

**Summary:** This panel will discuss the therapeutic applications of botulinum toxin, other chemotherapeutics & other Scott techniques in pediatric and adult strabismus patients as we pay tribute to one of the giants in the profession.

**References:** 1. Wan MJ, Mantagos IS, Shah AS, Kazlas M, Hunter DG. Comparison of Botulinum Toxin with Surgery for the Treatment of Acute-Onset Comitant Esotropia in Children. *Am J Ophthalmol*. 2017; 176:33-39. doi:10.1016/j.ajo.2016.12.024  
2. de Alba Campomanes AG, Binenbaum G, Eguiarte GC. Comparison of botulinum toxin with surgery as primary treatment for infantile esotropia. *J Am Assoc Pediatr Ophthalmol Strabismus*. 2010;14(2):111-116. doi:10.1016/j.jaapos.2009.12.162  
3. Scott AB, Magoon EH, McNeer KW, Stager DR. Botulinum Treatment of Childhood Strabismus. *Ophthalmology*. 1990;97(11):1434-1438. doi:10.1016/S0161-6420(90)32390-4  
4. Issaho DC, Carvalho FR de S, Tabuse MKU, Carrijo-Carvalho LC, de Freitas D. The Use of Botulinum Toxin to Treat Infantile Esotropia: A Systematic Review with Meta-Analysis. *Invest Ophthalmol Vis Sci*. 2017;58(12):5468-5476. doi:10.1167/iops.17-22576  
5. Binenbaum G, Chang MY, Heidary G, et al. Botulinum Toxin Injection for the Treatment of Strabismus: A Report by the American Academy of Ophthalmology. *Ophthalmology*. doi:10.1016/j.ophtha.2021.05.009  
6. Dawson ELM, Marshman WE, Lee JP. Role of botulinum toxin A in surgically overcorrected exotropia. *J Am Assoc Pediatr Ophthalmol Strabismus*. 1999;3(5):269-271. doi:10.1016/S1091-8531(99)70021-2  
7. Yang HK, Kim DH, Hwang J-M. Botulinum toxin injection without electromyographic guidance in consecutive esotropia. *PLoS One*. 2020;15(11):e0241588. doi:10.1371/journal.pone.0241588  
8. Cunha TM, Miller JM, Scott AB. Injection of Bupivacaine & Botulinum Type A Toxin to Treat Strabismus. *Advances in Strabismus*. *ISA Transactions* 2019:120-123.

Workshop #12  
Friday, March 31, 2023  
8:30 AM – 9:45 AM

## Pharmapalooza 2023: Drug Updates for the Pediatric Ophthalmologist

Tammy L. Yanovitch MD MHSc; Maria Lim MD; Laura B. Enyedi MD; Sawyer Vaclaw BS; Michael Siatkowski MD MBA

Dean McGee Eye Institute/University of Oklahoma  
Oklahoma City, OK

**Purpose/Relevance:** The purpose of this workshop is to equip pediatric ophthalmologists with current drug information on (1) new medications used to treat ophthalmic conditions, (2) new medications with ocular side effects, and (3) established medications that have updated information on ocular side effects and screening protocols.

**Target Audience:** Pediatric Ophthalmologists

**Current Practice:** The pharmaceutical industry has exploded over the past decade. Last year alone, the FDA approved 50 novel drugs. This surge in growth makes it challenging for pediatric ophthalmologists to stay up-to-date on new ophthalmic drugs and their indications and drugs with potential ocular side effects. How are we to keep up with this explosion of information?

**Best Practice:** Ideally, pediatric ophthalmologists would know all the new agents with ocular toxicities and be able to order indicated testing and schedule appropriate follow-up visits for their patients. They would be aware of new ophthalmic medications that have been FDA approved for pediatric use. Additionally, they would update their practices based on new side-effect or screening information for established drugs.

**Expected Outcomes:** After attending this workshop, attendees will be able to:

- (1) recall and prescribe agents recently approved by the FDA for use in pediatric patients to treat ophthalmic conditions,
- (2) recognize drugs that have newly been FDA-approved in the pediatric population with potential ocular toxicities and screen and treat patients on these medications,
- (3) institute changes, if necessary, in screening protocols and treatment guidelines for established medications with ocular side effects based on updated recommendations, and
- (4) recognize and report ocular side effects from newly approved agents.

**Format:** Didactic lecture, panel discussion, case presentation, audience quiz

**Summary:** This workshop will give a concise update on need-to-know information for the busy clinician. Medications covered will include ivacaftor, selumetinib, netarsudil, latanoprostene bunod, dupilumab, vigabatrin, hydroxychloroquine, teprotumumab, and COVID-19 vaccines. The format will summarize information in a manageable and meaningful way.

**References:** Mullard A. 2021 FDA approvals. *Nat Rev Drug Discov.* 2022 Feb;21(2):83-88. doi: 10.1038/d41573-022-00001-9. PMID: 34983958.

Workshop #13  
Friday, March 31, 2023  
8:30 AM – 9:45 AM

### **Novel Strabismus Surgery Techniques - A Hands-on Lab**

Kenneth W. Wright, MD; Yi Ning Strube, MD; Rebecca Leenheer, MD; Lisa Thompson, MD; Cem Mocan, MD

Wright Foundation  
Los Angeles, California

**Purpose/Relevance:** The purpose of this course is to teach novel strabismus surgical techniques by providing a hand-on experience using an anatomically correct silicone model. Knowledge learned will be directly transferable to the participant's surgical practice.

**Target Audience:** Physicians who perform strabismus surgery including veteran surgeons, ophthalmology residents, and pediatric ophthalmology fellows.

**Current Practice:** The treatment of small angle strabismus is fraught with overcorrections so they are often ignored. Adults with diplopia due to small or micro deviations are usually treated with prism glasses. With the advent of refractive surgery and multi-focal IOLs, prism glasses are no longer a good option for many patients. A minimally invasive surgical option is needed. There continues to be a risk of retinal perforation in 2 to 12% of strabismus surgeries. There is a long felt need to reduce or illuminate this potentially blinding complication.

**Best Practice:** A significant improvement in the practice of strabismus is to accurately correct small angle strabismus and micro-deviations causing diplopia using minimally invasive strabismus surgery. Reducing the complication of retinal tear by using a grooved hook for suturing the muscle and hang-back glue for rectus recessions would improve the safety of strabismus surgery.

**Expected Outcomes:** Use of minimally invasive strabismus surgery can correct 80%-90% of small angle strabismus and can eliminate the need for prism glasses in most cases of diplopia. Use of a grooved hook and hang-back rectus recession can significantly reduce the complication of retinal tear while maintaining excellent outcomes with success rate over 85%.

**Format:** This is a skills transfer hands-on lab where participants will do the surgical techniques on an anatomically correct silicone model with face, nose, orbit and globe with rectus muscles. This model has been used in many strabismus surgery courses including the annual AAO meeting. The silicone model with face plate and eyes will be provided by the presenting authors foundation. All that is needed in the room are table and chairs. Maximum of 50 participants to work on 25 model heads - 2 people per head.

**Summary:** Recent surgical innovations have made strabismus surgery safer and more effective especially for small angle deviations. We will present a hands-on lab teaching new surgical techniques. Specific procedures will include use of a grooved hook for muscle suturing, rectus recession with hang-back glue, central tenotomy for micro verticals, and central plication. Participants will have the opportunity to perform techniques on anatomically correct life like silicone models under the supervision of experienced faculty.

**References:** Bradbury JA, Taylor RH. Severe complications of strabismus surgery. J AAPOS 2013; 17(1): 59–63

Leenheer RS, Wright KW. Mini-plication to treat small-angle strabismus: A minimally invasive procedure. J AAPOS. 2012 Aug; 16(4): 327-330

Kenneth W Wright , Majd Arow1, Mike Zein , Yi Ning J Strube, Wright hang-back recession with fibrin glue compared with standard fixed suture recession for the treatment of horizontal strabismus, Can J Ophthalmol. Aug ,2021

Workshop #14  
Friday, March 31, 2023  
10:30 AM – 11:45 AM

### YAAPOS Rapid Fire Cases

Smith Ann Chisholm; Sasha Strul; Zachary Elkin; Lauren Mehner, Stephanie Tillitt, Iniya Adhan, Alex Kwok, Tiffany Chen, Bryce Baugh, Carleigh Bruce, Maria Stunkel, Crystal Cheung, Brandon Kennedy, Matthew Javitt

Medical College of Wisconsin  
Milwaukee, WI

**Purpose/Relevance:** As part of our efforts to support the professional development of young ophthalmologists and to recruit trainees into the field of pediatric ophthalmology, the young ophthalmology committee recommends a workshop consisting of rapid fire cases presented by medical students, residents, fellows, and pediatric ophthalmologists in their first 5 years of practice. Studies have shown that having medical students attend national conferences increases their interest in that field, so ultimately, we hope that this workshop will increase the pediatric ophthalmology workforce.

**Target Audience:** Pediatric ophthalmologists interested in discussing stimulating cases while encouraging a new generation of physicians to pursue pediatric ophthalmology for their career.

**Current Practice:** Because these cases are rare, current practice may vary across physicians.

**Best Practice:** Best practice may not be established scientifically, but case presentations will help deliver lessons learned from the experiences of others.

**Expected Outcomes:** We expect the audience to gain the information required to successfully manage unique cases in their practice. This workshop will also give young ophthalmologists an opportunity to present at a national conference and will encourage trainees to attend the AAPOS meeting.

**Format:** The workshop will consist of rapid-fire cases presented by medical students, residents, fellows, and young pediatric ophthalmologists. The cases will be 4 minutes long and separated into 3 sections. In between each section, there will be 8 minutes for questions and discussion about the cases.

**Summary:** This workshop will give medical students, residents, fellows, and pediatric ophthalmologists in their first 5 years of practice the opportunity to present at our national meeting. This will allow for the discussion of interesting cases while promoting our young colleagues and helping to recruit trainees into our field.

**References:** 1) Hearn VL, Anderson SM, Akkad W, Meyerink B, Schweinle WE. Promoting Student Interest in Family Medicine Through National Conference Attendance. *PRiMER* 16;1:18 (2017).  
2) Thi Nguyen VA, Könings KD, Scherpbier AJJA, et al. Attracting and retaining physicians in less attractive specialties: the role of continuing medical education. *Hum Resour Health* 19:69 (2021).

Workshop #15  
Friday, March 31, 2023  
10:30 AM – 11:45 AM

## **Myopia and Amblyopia are Common Diagnoses in Pediatric Ophthalmology Practice. When Should You Suspect More?**

Alina V. Dumitrescu, MD; Arif O. Khan, MD; Matthew Weed, MD; Janice Zeid, MD; Jaime Tejedor, MD; Kathryn M. Haider, MD; Robert K. Koenekoop, MD, PhD; Arlene V. Drack, MD; Jefferson Doyle, MD, PhD, MHS, MA

The Genetic Eye Disorders Committee

**Purpose/Relevance:** Myopia and amblyopia are among the most common conditions in pediatric ophthalmology practice. They are easy to diagnose and treat, however, they can lead to permanent vision loss due to complications or not responding to treatment. In addition, several sight- or life-threatening conditions can present as juvenile myopia or amblyopia. This workshop aims to discuss ocular or systemic disorders that may masquerade as simple myopia or amblyopia and clinical clues to the complete diagnosis. Prompt and correct identification of these underlying disorders may decrease systemic and ocular morbidity.

**Target Audience:** pediatric ophthalmologists, general ophthalmologists, orthoptists, optometrists, pediatricians, residents

**Current Practice:** Diagnosing myopia based on cycloplegic refraction and treating it with glasses/contact lenses and diluted atropine and/or peripheral defocusing. Diagnosing amblyopia based on visual acuity and treating it with glasses, patching and/or atropine.

**Best Practice:** Ophthalmologists identify risk factors for progressive high myopia and pathologic myopia based on personal history, family history, age of onset, the pattern of progression, associated symptoms, and ancillary testing such as ERG, OCT, etc. Likewise, underlying pathology that can complicate amblyopia and decrease response to treatment is astutely recognized and managed. Ophthalmologists refer patients promptly for a systemic work-up in this setting, affording a genetic diagnosis and multisystemic management. The goal is to reduce/manage associated morbidity, including cardiac, neurologic, and developmental abnormalities.

**Expected Outcomes:** Participants of the workshop will recognize patients at risk for ocular or systemic conditions such as connective tissue disorders, congenital stationary night blindness, retinal degenerations, juvenile glaucoma, albinism, optic nerve pathology, and others initially presenting with myopia, amblyopia, or both. Heightened awareness of these disease associations will lead to prompt diagnosis and management.

**Format:** Panel discussion with audience participation

**Summary:** The panel will discuss clinical scenarios of patients presenting as simple myopia or amblyopia and when to suspect underlying conditions that should prompt further work-up.

### **References:**

1. Tedja MS, Haarman AEG, Meester-Smoor MA, Kaprio J, Mackey DA, Guggenheim JA, Hammond CJ, Verhoeven VJM, Klaver CCW; CREAM Consortium. IMI - Myopia Genetics Report. *Invest Ophthalmol Vis Sci*. 2019 Feb 28;60(3):M89-M105. doi: 10.1167/iops.18-25965. PMID: 30817828; PMCID: PMC6892384.
2. Flitcroft DI, Loughman J, Wildsoet CF, Williams C, Guggenheim JA; CREAM Consortium. Novel Myopia Genes and Pathways Identified From Syndromic Forms of Myopia. *Invest Ophthalmol Vis Sci*. 2018 Jan 1;59(1):338-348. doi: 10.1167/iops.17-22173. PMID: 29346494; PMCID: PMC5773233.
3. Duan M, Skoch J, Pan BS, Shah V. Neuro-Ophthalmological Manifestations of Craniosynostosis: Current Perspectives. *Eye Brain*. 2021 Jan 29;13:29-40. doi: 10.2147/EB.S234075. PMID: 33542671; PMCID: PMC7853409.

Workshop #16  
Friday, March 31, 2023  
10:30 AM – 11:45 AM

### **Transition of Care - Why? When? How? (An AAP Sponsored Workshop)**

Gregg T. Lueder, MD; Mary Louise Collins, MD; David Epley, MD; Dan Karr, MD; Alex Levin, MD; Sheryl Menacker, MD

Washington University  
Saint Louis, MO

**Purpose/Relevance:** Pediatric ophthalmologists transfer care of their patients for many reasons: patient age, need for ongoing specialty care, stable conditions that no longer require monitoring by a pediatric ophthalmologist, and others. The purpose of this workshop is to discuss proper care transition and the steps one should take to ensure appropriate ongoing care for patients.

**Target Audience:** Pediatric ophthalmologists, general ophthalmologists

**Current Practice:** The American Academy of Pediatrics has recognized the importance of establishing guidelines for appropriate and safe transfer of care from pediatric to adult practices. Specific guidelines for pediatric ophthalmologists do not currently exist.

**Best Practice:** Establish general guidelines for transition of care in one's practice, communicate with patients and families to prepare them for transition, identify appropriate individuals for ongoing care, supply relevant medical information at the time of transfer, and provide a safety net for patients if they experience problems during transition.

**Expected Outcomes:** Attendees will understand the principles and practice of proper care transition.

**Format:** Introductory description of issues surrounding transition of care, presentation of cases and discussion by panel, and open audience questions and input.

**Summary:** This workshop is intended to 1) formally present principles of proper transition of patient care, 2) discuss methods to optimize this transition using case presentations, and 3) foster discussion of these issues between the panel and the audience.

**References:** Okumura MJ. The transition journey: time to systematically address transition planning to adult health care. *Pediatrics* 2018;142. pii:e20182245. doi: 10.1542/peds.2018-2245. Epub 2018 Sep 17.  
Lebrun-Harris LA, McManus MA, Ilango SM, et al. Transition planning among US youth with and without special health care needs. *Pediatrics* 2018; 142. pii:e20180194. doi: 10.1542/peds.2018-0194. Epub 2018 Sep 17.

Workshop #17  
Friday, March 31, 2023  
10:30 AM – 11:45 AM

## Torsional Diplopia – Evaluation and Evolving Treatment Options

Jon Peiter Saunte, MD; Sara Flodin, CO, PhD; Jonathan M. Holmes, MD; Pradeep Sharma, MD; Stacy Pineles, MD, MS;  
Federico Velez, MD

Rigshospitalet  
Copenhagen, Denmark

**Purpose/Relevance:** Ocular torsional diplopia may be a barrier to fusion and interfere with normal visual function. In clinical evaluation of ocular torsion, evidence-based approach is desirable<sup>1</sup>. Multiple surgical techniques may correct torsion; this workshop aims to discuss systematic evaluation and treatment of ocular torsion.

**Target Audience:** Strabismus surgeons at moderate to advanced level.

**Current Practice:** Torsion cannot be treated by conventional prisms, therefore surgery is indicated for symptomatic cases. Excyclotropia often requires strengthening of the superior oblique or inferior oblique transpositions. Incyclotropia may be associated with tight superior oblique tendons and may be addressed with superior oblique weakening procedures.

**Best Practice:** Symptoms of torsion may include torsional diplopia, strain and blur, and torsion should be assessed in straight-ahead gaze, downgaze and additional positions of gaze. Double-Maddox Rods, Single Maddox Rods and Synoptophore evaluation have important roles. Excyclotropia may be corrected by modifications of the Harada - Ito procedure<sup>2</sup>, and inferior oblique anterior nasal transposition (IOANT) has become an alternative approach. Incyclotropia associated with tight superior oblique muscles, may be best addressed with an adjustable spacer to allow for delayed adjustment to correct torsional diplopia, or by superior oblique tendon thinning. Considering the variability of each case, one size does not fit all, so there is need to customize and do a controlled procedures on the inferior or superior obliques or inferior recti, to correct the relative vertical deviation or torsion.

**Expected Outcomes:** The audience will achieve an overview of diagnostic methods and surgical treatment options for symptomatic torsion, including classic surgical methods, but with particular focus on newer and evolving surgical techniques.

**Format:** Cases and panel discussion:

Sara Flodin: Evidence based orthoptic evaluation of ocular torsion

Jonathan M. Holmes: Modified Harada Ito procedures to correct excyclotropia

Pradeep Sharma: Inferior Oblique Anterior Nasal Transposition (IOANT) to correct excyclotropia

Stacy Pineles: Transposition of inferior rectus muscles to correct excyclotropia

Federico Velez: Superior oblique thinning to correct incyclotropia

Jon Peiter Saunte: Superior oblique adjustable spacer suture to correct incyclotropia

**Summary:** Symptomatic torsion may be difficult to evaluate and treat. Strabismologists now have an increasing portfolio of diagnostic tests and surgical techniques to address torsional symptoms.

**References:** 1. Cyclotropia Measured in a Patient Population Using Three Different Methods: A Comparative Study. Flodin S, et al. Strabismus. 2016.

2. Dose Effect and Stability of Postoperative Cyclodeviation After Adjustable Harada-Ito Surgery. Liebermann, Holmes et al. Am J Ophthalmol. 2018

Workshop #18  
Friday, March 31, 2023  
1:15 PM – 2:30 PM

## Myopia Control: Bringing Near-sighted Treatment into Focus

Brenda Bohnsack; Rahul Bhola; David Epley; Magdalena Stec; Allison Summers; Noreen Shaikh

Ann & Robert H. Lurie Children's Hospital of Chicago  
Chicago, IL

**Purpose/Relevance:** Myopia is increasing in prevalence such that half of the population is predicted to be near-sighted by 2050. The increased axial length in myopia predisposes for retinal detachment, maculopathy, optic nerve abnormalities and glaucoma. Different modalities have been used in myopia control including low-dose atropine eye drops, peripheral defocus soft contact lenses, extended depth of focus soft contact lenses, and orthokeratology. Guidance is needed to understand the pros and cons of these treatments and determine the best option for individual patients.

**Target Audience:** Pediatric ophthalmologists, pediatric optometrists, fellows, residents

**Current Practice:** Pediatric ophthalmologists have various experiences with different myopia control modalities with low-dose atropine being most common. Since the majority of studies on low-dose atropine originate from the Asian continent, its use and applicability in the US has been variable. Better guidance in regards to patient selection is needed for both low-dose atropine and the use of contact lenses for myopia control.

**Best Practice:** Knowledge of the available options for myopia control will improve patient compliance and outcomes. Coordinated care between ophthalmology and optometry can optimize and individualize treatment.

**Expected Outcomes:** Attendees will gain a better understanding of 1) pathogenesis of myopia progression in children, 2) patient selection criteria for different myopia control modalities, 3) current multi-center US data on low-dose atropine, 4) use of soft and hard contact lenses for myopia control, 5) application of myopia control with consideration for diversity, equity, and inclusion.

**Format:** Didactic lectures with Q&A sessions and open discussion

**Summary:** Due to the increasing prevalence of myopia, control mechanisms to decrease progression during childhood are important and evolving topics in pediatric ophthalmology. We will discuss the current and future states of myopia control treatments taking into consideration age, socioeconomic status, and amount of refractive error.

**References:** 1. Holden BA, Fricke TR, Wilson DA, Jong M, Naidoo KS, Sankaridurg P, Wong TY, Naduvilath TJ, Resnikoff S. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. *Ophthalmology*. 2016 May;123(5):1036-42. doi: 10.1016/j.ophtha.2016.01.006. Epub 2016 Feb 11. PMID: 26875007.  
2. Li SM, Wu SS, Kang MT, Liu Y, Jia SM, Li SY, Zhan SY, Liu LR, Li H, Chen W, Yang Z, Sun YY, Wang N, Millodot M. Atropine slows myopia progression more in Asian than white children by meta-analysis. *Optom Vis Sci*. 2014 Mar;91(3):342-50. doi: 10.1097/OPX.000000000000178. PMID: 24445721.  
3. Bullimore MA, Ritchey ER, Shah S, Leveziel N, Bourne RRA, Flitcroft DI, The Risks and Benefits of Myopia Control, *Ophthalmology* (2021), doi: <https://doi.org/10.1016/j.ophtha.2021.04.032>



Workshop #19  
Friday, March 31, 2023  
1:15 PM – 2:30 PM

## Oculoplastics for the Pediatric Ophthalmologist

Smith Ann Chisholm, MD; Daniel Weaver, MD; William Katowitz, MD; Heather Stiff, MD; Jenny Dohlman, MD

Medical College of Wisconsin  
Milwaukee, WI

**Purpose/Relevance:** This workshop will discuss management of pediatric oculoplastic challenges including vascular malformations, slings for ptosis, congenital nasolacrimal duct obstruction, dacryocystoceles, and congenital lid abnormalities. Emphasis will be on treatment of these conditions, including pre-operative evaluation/planning and post-operative care/complications.

**Target Audience:** Pediatric ophthalmologists and trainees.

**Current Practice:** Pediatric ophthalmologists are presented with a challenging variety of cases including many disorders of the eyelids, orbit, and lacrimal drainage system. Pediatric ophthalmologists can benefit from discussion of surgical and non-surgical techniques and pearls for their own practices to help them manage patients, sometimes in conjunction with an orbital/oculoplastic surgeon.

**Best Practice:** Pediatric ophthalmologists will review common procedures and learn new techniques to manage pediatric oculoplastic problems and improve patient outcomes.

**Expected Outcomes:** At the conclusion of the workshop, the panel will have shared their experiences and techniques for the management of pediatric oculoplastic problems. The practitioner in the audience is expected to gain understanding and confidence in these procedures.

**Format:** Panelists include pediatric ophthalmologists with experience in oculoplastics and oculoplastic surgeons with expertise in treating pediatric patients. Each panelist will present photographs, videos, and diagrams of pediatric oculoplastic cases and discuss management techniques. There will be time for questions and panel discussion between each of the presentations.

**Summary:** This workshop will present surgical and non-surgical approaches to oculoplastic problems commonly encountered by pediatric ophthalmologists. Pediatric and oculoplastic ophthalmologists will discuss vascular malformations, slings for ptosis, congenital nasolacrimal duct obstruction, dacryocystoceles, and congenital lid abnormalities.

**References:** 1) Rootman J, Heran M, Graeb D. Vascular Malformations of the Orbit: Classification and the Role of Imaging in Diagnosis and Treatment Strategies. *Ophthalmic Plastic and Reconstructive Surgery* 30(2), 91-104 (2014).  
2) Davies R, Watkins W, Kotecha S, et al. The presentation, clinical features, complications, and treatment of congenital dacryocystocele. *Eye* 32, 522-526 (2018).

Workshop #20  
Friday, March 31, 2023  
1:15 PM – 2:30 PM

## **How (Not) to Manage Pediatric Uveitis: Lessons Learned from Complicated Cases**

Stefanie L. Davidson, MD; Kara C. LaMattina, MD; Jennifer Jung, MD; Erin Stahl, MD; Bharti Gangwani, MD;  
Melissa Lerman, MD; Mays El-Dairi, MD

AAPOS Pediatric Uveitis Committee

**Purpose/Relevance:** 'To err is human...' Complications occur when caring for patients in any field of medicine, including children with uveitis. Challenging cases provide a unique learning opportunity to improve patient care and visual outcomes. Uveitis specialists will share 'real life' cases of clinical and surgical complications to illustrate core teaching points in the management of pediatric uveitis.

**Target Audience:** Pediatric ophthalmologists, fellows, residents

**Current Practice:** Best practices in the evaluation and management of common pediatric uveitis cases are well-described. However, poor visual outcomes still occur by several mechanisms, including: misdiagnosis (treating an infectious case as non-infectious and vice versa), delayed treatment (possibly due to a breakdown in multidisciplinary team management), and sub optimally timed management in cataract surgery (such as implanting an intraocular lens in an eye in which the inflammation is not adequately controlled).

**Best Practice:** Ideal management of pediatric uveitis includes timely diagnosis based on clinical features with supportive ancillary testing (including laboratory and imaging studies as indicated) and early initiation of appropriate treatment. Treatment often requires coordination with other subspecialties, particularly rheumatology; urgent referral and ongoing communication are critical to prevent vision-threatening complications. In patients who present with or develop cataracts, intraocular lenses are considered only if the disease is well-controlled.

**Expected Outcomes:** Cases will be presented to illustrate challenges in uveitis patient care and impact on patient outcomes. Through this workshop, basic knowledge on the initial evaluation, clinical and surgical management will be solidified. Panel discussion with ophthalmologists and rheumatologists will provide additional instruction.

**Format:** Case examples, panel discussion with audience participation

**Summary:** The goal of this workshop is to provide updates in the medical and surgical management of children with uveitis using 'real life' cases. The practice of medicine is humbling, but willingness to learn, reflect and share these lessons will improve uveitis care.

### **References:**

Angeles-Han ST, et al. Juvenile Idiopathic Arthritis Disease-Specific and Uveitis Subcommittee of the Childhood Arthritis Rheumatology and Research Alliance (CARRA). CARRA Consensus Treatment Plans for Juvenile Idiopathic Arthritis-Associated and Idiopathic Chronic Anterior Uveitis. *Arthritis Care Res.* 2019 Apr; 71(4):482-491.

Workshop #21  
Friday, March 31, 2023  
1:15 PM – 2:30 PM

### **IPOSC Workshop: Surprises in Pediatric Ophthalmology & Strabismus: Cases with a Twist**

Jan Tjeerd de Faber, MD; Faruk Orge, MD; Tamara Wygnanski-Jaffe, MD; Scott R. Lambert, MD; Sonal Farzavandi, MD;  
Rohit Saxena, MD, PhD; Giovanni B. Marcon, MD; Alex V. Levin, MD

Rotterdam Eye Hospital  
The Netherlands

**Purpose/Relevance:** Pediatric ophthalmologists commonly encounter complicated cases and unpredicted findings, contrary to what they had expected. We strive to share and learn new skills from the initial evaluation to the final outcome by gaining experience, using different approaches, and by discussions with experts in the field.

**Target Audience:** Pediatric ophthalmologists and strabismologists, orthoptists, fellows

**Current Practice:** Ophthalmologists may not be familiar with various strategies, diagnosis options, surgical pearls, as well as surprising imaging tips and tricks to handle unexpected findings in pediatric ophthalmology. Sharing various experiences can help us investigate, avoid, and deal with any unexpected complications, if and when they occur in order to avoid misdiagnoses, further surgeries, and poor outcomes.

**Best Practice:** Ophthalmologists should be familiar with dealing with the unexpected, plan, investigate, and diagnose appropriately with unexpected, unpredictable, and puzzling situations. Surgeons and clinicians should also be familiar with particularly complex cases and be able to plan suitable approaches to effectively help their patients.

**Expected Outcomes:** Through many case presentations and expert panel discussions, the attendees will be able to familiarize themselves with complex cases and will enhance their clinical, surgical, and management skills.

**Format:** Members of the panel will present clinical and surgical cases along with dilemmas, followed by an open question/answer session between the panel and the audience

**Summary:** The workshop will focus on multiple presentations of intriguing cases in pediatric ophthalmology and surgery. Several topics will be led by one of the authors, along with a case presentation, followed by a panel discussion, the author's approach, and a presentation of various outcomes. Time will be devoted to attendee questions, answers, and contributions.

**References:** Plews-Ogan M, May N, Owens J et al. Wisdom in medicine: What helps physicians after medical error? Acad Med.2016;91(2): 233-41.

Workshop #22  
Friday, March 31, 2023  
2:45 PM – 4:00 PM

## **Surgical Management of Childhood Glaucoma - Pearls Learned the Hard Way**

Sharon F. Freedman; Alex V. Levin; Allen D. Beck; Ta Chen Peter Chang; Brenda L. Bohnsack; Matthew L. Haynie

University of Rochester, Flaum Eye Institute  
Rochester, New York

**Purpose/Relevance:** Glaucoma can be difficult to diagnose and treat in children, even for those with decades of experience. The nuances regarding surgical treatment are often individually learned, but not widely disseminated. This workshop will provide a platform for experienced pediatric glaucoma specialists to share pearls and pitfalls regarding the surgical management of childhood glaucoma.

**Target Audience:** Pediatric ophthalmologists, comprehensive and glaucoma-trained ophthalmologists, and ophthalmologists-in-training.

**Current Practice:** Most pediatric ophthalmologists will find themselves treating pediatric glaucoma to some degree, although the heterogeneity of childhood glaucoma and the variety of surgical treatment options can make it difficult to know how to best manage individual cases. It can take years to see a sufficient number of cases to begin to feel comfortable determining the best surgery for a specific child, and to tailor that surgery to the case at hand.

**Best Practice:** This workshop will unveil some of the most valuable lessons learned by leading ophthalmologists in the surgical management of childhood glaucoma. They will share their wisdom in determining which procedure is best in certain circumstances, and in optimizing the surgical outcome in goniotomy, trabeculotomy, glaucoma drainage tubes, laser treatments, trabeculectomy and more.

**Expected Outcomes:** Our intention is to provide a shortcut to a little 'surgical glaucoma wisdom.' The attendee may be able to avoid years of trial and error, and instead more confidently decide which surgery to perform and how to optimize their surgical outcomes.

**Format:** Pediatric glaucoma specialists will share case-based experiences and surgical pearls (video-highlighted), including those learned as a result of mistakes/adverse outcomes along the way. Panel discussion and audience participation will be encouraged.

**Summary:** Pediatric glaucoma specialists share lessons they've learned in surgically managing pediatric glaucoma, with over 110 years of experience among them. This will include surgical treatments such as goniotomy, trabeculotomy, glaucoma drainage tubes, lasers, trabeculectomy and more.

**References:** Giangiacomo A, Beck A. Pediatric glaucoma: review of recent literature. *Curr Opin Ophthalmol.* 2017 Mar;28(2):199-203. doi: 10.1097/ICU.0000000000000349. PMID: 27875350

Workshop #23  
Friday, March 31, 2023  
2:45 PM – 4:00 PM

## Management of Complex Strabismus: Pearls and Pitfalls

Saurabh Jain; Gillian Adams; Jonathan M. Holmes; Rosario Gomez de Liano; Seyhan B. Ozkan; Jon Peiter Saunte;  
Federico Velez; Anthony Vivian

Royal Free Hospital  
London, U.K.

**Purpose/Relevance:** Management of strabismus can be challenging with multiple dosage tables, rules, and exceptions to those rules. The purpose of our workshop is to remove some of the mysticism around strabismus management through expert case-based discussion

**Target Audience:** Pediatric and Adult Ophthalmologists, Residents in training, Orthoptists

**Current Practice:** Surgical management of strabismus remains an elusive art to master seeming at times completely unscientific. We have assembled an expert panel who have many years of experience in dealing with all kinds of deviations. They will present complex cases of horizontal, cyclotorsional, and vertical strabismus which have presented a challenge and discuss their decision-making algorithms

**Best Practice:** We anticipate that this workshop will cover several common and uncommon dilemmas in strabismus management. It will illustrate how to plan for eventualities where the outcome may not be certain and help clarify the thought processes behind those decisions. This workshop will also equip attendees with the tools to develop robust surgical algorithms and techniques to assist in their own clinical practice

**Expected Outcomes:** We anticipate that the case-based approach in this workshop will assist attendees by introducing them to different surgical scenarios, assessments, and management strategies to manage these patients and modify their surgical practice where practicable.

**Format:** Case presentation, Videos, Audience quiz, and Skills transfer

**Summary:** Strabismus assessment and management is a specialized skill that is complicated by the heterogeneous nature of the presentation and variability in surgical outcomes|This workshop will showcase techniques, algorithms, and strategies developed by an experienced group of strabismologists and highlight pitfalls to avoid. We anticipate that this workshop will assist attendees in evaluating and refining their own practice.

**References:** 1.Diagnosis and Management of Strabismus Syndromes. Gad Dotan, MD; Saurabh Jain, FRCOphth; Aldo Vagge, MD, PhD Leonard B. Nelson, MD, MBA

Workshop #24  
Friday, March 31, 2023  
2:45 PM – 4:00 PM

## Scratching Below the Surface: Clinical Pearls in Pediatric Ocular Surface Diseases

Kamiar Mireskandari; Asim Ali; Simon Fung; Angela Zhu

The Hospital for Sick Children  
Toronto, Canada

**Purpose/Relevance:** Pediatric ocular surface diseases are commonly encountered by pediatric ophthalmologists. Often inflammatory in nature, pediatric ocular surface diseases could be highly amblyogenic or even sight-threatening. A well-structured diagnostic approach and a disease-specific guideline for medical and surgical management of these conditions are vital resources in a pediatric ophthalmologist's therapeutic armamentarium.

**Target Audience:** Comprehensive Ophthalmologists, Pediatric Ophthalmologists, Fellows and Residents.

**Current Practice:** Pediatric ocular surface diseases could lead to permanent visual impairment. Patients often present with a prolonged history of fluctuating symptoms and after a range of management has been tried and failed. Patients can become steroid-dependent resulting in the development of cataracts and secondary glaucoma

**Best Practice:** Timely and accurate diagnosis, along with the use of steroid-sparing therapies can relieve symptoms, reduce disease complications, and maintain vision in children with pediatric ocular surface diseases.

**Expected Outcomes:** After completing the workshop, the participants would develop a systematic approach to the diagnosis and management of pediatric ocular surface diseases, and be able to collaboratively manage cases with corneal subspecialist when needed.

**Format:** Case-based presentations demonstrating disease processes, diagnostic approaches, and principles of management. Relevant literature will be referenced.

**Summary:** Topics to be covered include

1. Allergic eye disease, including vernal and atopic keratoconjunctivitis
2. Blepharokeratoconjunctivitis, phlyctenular keratoconjunctivitis
3. Cicatricial conjunctivitis, including Stevens-Johnson syndrome
4. Herpes simplex blepharitis and keratoconjunctivitis

- References:**
1. Catt CJ, Hamilton GM, Fish J, Mireskandari K, Ali A. Ocular manifestations of Stevens-Johnson syndrome and toxic epidermal necrolysis in children. *Am J Ophthalmol.* 2016;166:68-75.
  2. Hammersmith KM. Blepharokeratoconjunctivitis in children. *Curr Opin Ophthalmol.* 2015;26:301-305.
  3. Solomon A. Corneal complications of vernal keratoconjunctivitis. *Curr Opin Allergy Clin Immunol.* 2015;15:489-494.

Workshop #25  
Friday, March 31, 2023  
2:45 PM – 4:00 PM

## Hot Topics in Pediatric Neuro-Ophthalmology

Jason Peragallo; Melinda Chang; Mays El-Dairi; Gena Heidary; Julius Oatts; Stacy Pineles

**Purpose/Relevance:** Neuro-ophthalmologic patients are among the most complicated cases seen by pediatric ophthalmologists. New insights into disease mechanisms, ancillary diagnostic tests, and screening recommendations for pediatric neuro-ophthalmologic disorders have been recently published in the literature. The purpose of this workshop is to provide an update on these findings.

**Target Audience:** Pediatric ophthalmologists

**Current Practice:** Pediatric neuro-ophthalmology patients are complex. Ancillary diagnostic testing may be helpful, but practitioners face difficult decisions when determining which tests to order, how often they should be performed, and how to interpret the results.

**Best Practice:** Pediatric ophthalmologists should understand the work-up and prognosis of children with disorders of the optic nerve and neurologic conditions that affect the visual system.

**Expected Outcomes:** In this workshop co-sponsored by the Consortium for Pediatric Neuro-Ophthalmologists (CPNO), participants will learn about optical coherence tomography (OCT) algorithms to evaluate the optic nerve in children; the recommended work-up and prognosis of neurologic conditions associated with pediatric optic neuritis, including myelin oligodendrocyte glycoprotein (MOG)-associated disorder; evidence for electroretinography (ERG) and fundus examinations to screen for vigabatrin toxicity in children; and diagnostic criteria and management of NF1 with or without optic pathway gliomas.

**Format:** Case presentation, literature review, panel discussion, question and answer

**Summary:** Children with neuro-ophthalmic conditions require appropriate work-up to identify and treat ophthalmic and systemic complications. Recent literature provides guidance on the roles of OCT, ERG, serum antibody testing, and other assessments in a variety of neuro-ophthalmic conditions.

### References:

1. Chen JJ, Pineles SL, Repka MX, Pittcock SJ, Henderson RJ, Liu GT; Pediatric Eye Disease Investigator Group (PEDIG). MOG-IgG Among Participants in the Pediatric Optic Neuritis Prospective Outcomes Study. *JAMA Ophthalmol*. 2021 May 1;139(5):583-585.
2. Gospe SM, Bhatti MT, El-Dairi MA. Emerging Applications of Optical Coherence Tomography in Pediatric Optic Neuropathies. *Semin Pediatr Neurol*. 2017 May;24(2):135-142.
3. Heidary G, Fisher MJ, Liu GT, Ferner RE, Gutmann DH, Listernick RH, Kapur K, Loguidice M, Ardern-Holmes SL, Avery RA, Hammond C, Hoffman RO, Hummel TR, Kuo A, Reginald A, Ullrich NJ. Visual field outcomes in children treated for neurofibromatosis type 1-associated optic pathway gliomas: a multicenter retrospective study. *J AAPOS*. 2020 Dec;24(6):349.e1-349.e5.

Workshop #26  
Friday, March 31, 2023  
4:15 PM – 5:15 PM

AAPOS President's Symposium – 2023

## **The Importance of Storytelling in Medical Practice**

Kerry Sanders

**Purpose/Relevance:** Telling a story, whether through the media or in an exam room, can help ensure medical guidance, treatment plans, and other communications are understood by patients and their families.

**Target Audience:** Pediatric Ophthalmologists and all annual meeting attendees.

**Current Practice:** Communications challenges are common in medical settings due to a variety of factors, including education levels and language barriers. These challenges may negatively impact the success of treatment plans, such as patching for strabismus, and ultimately lead to poorer patient outcomes.

**Best Practice:** Storytelling – crafting a narrative to guide medical conversations – can help bridge communications gaps and challenges by reframing difficult concepts in easy-to-understand language that patients and their families are more likely to retain and follow.

**Expected Outcomes:** Based on the experiences of a national television reporter, attendees will explore how they might better incorporate storytelling into their medical practice.

**Format:** Lecture and videos with question and answer session

**Summary:** Through storytelling and effective narrative strategies, healthcare providers and their teams can better communicate the benefits of available treatment options and compliance with instructions, leading to more effective outcomes for patients, and better overall care.



Workshop #27  
Sunday, April 2, 2023  
7:30 AM – 9:00 AM

### **Difficult Problems--Non-Strabismus**

Phoebe Lenhart; Julius Oatts; Tina Rutar; Melinda Chang; Eniolami Dosunmu; Kamiar Mireskandari; KC LaMattina

Emory University School of Medicine  
Atlanta, GA

**Purpose/Relevance:** This workshop will discuss pediatric ophthalmology cases in which the diagnosis, findings, and / or treatment pose a clinical dilemma to even an experienced pediatric ophthalmologist. These cases may include rare diagnoses or more common diagnoses with unusual presentations and / or atypical courses. Discussion will include the experiences with similar cases of a panel of seasoned pediatric ophthalmologists, as well as audience participants, and consideration of alternative evaluation and treatment plans.

**Target Audience:** Pediatric ophthalmologists, orthoptists, vision scientists, and trainees

**Current Practice:** Pediatric ophthalmologists are presented with a challenging variety of cases. Consultation with colleagues and review of the literature can provide insights into best practices.

**Best Practice:** If the diagnosis and / or treatment plan for a particular patient is in doubt, consultation with colleagues can help to provide patients with the best potential for good outcomes. Group presentation of cases is helpful, particularly with very rare pediatric ophthalmology problems. Advanced practitioners and audience members have valuable insights that can improve patient care.

**Expected Outcomes:** At the conclusion of the workshop the audience and the panel will have shared their experiences and strategies for the diagnosis and management of a few challenging non-strabismus pediatric ophthalmology cases. The practitioner in the audience is expected to gain new insights into the clinical reasoning behind each diagnosis and the purpose of any intervention.

**Format:** Each panelist will present one case and invite the other panelists to discuss their approaches to diagnosis and treatment. The audience will participate by asking questions or providing personal insights.

**Summary:** This workshop will be a case-based learning experience involving challenging non-strabismus pediatric ophthalmology cases discussed by experienced pediatric ophthalmologists. Panelists will present teaching points that are important for complicated and rare conditions, but also pearls that are relevant for less complex cases.

**References:** To be determined

Workshop #28  
Sunday, April 2, 2023  
9:10 AM – 10:40 AM

### **Difficult Problems in Strabismus**

William V. Good, MD; Steven Brooks, MD; Susan M. Carden; Linda Dagi, MD; Jane Edmond, MD; Evelyn Paysse, MD;  
David Plager, MD; Kristina Tarczy-Hornoch, MD

Smith-Kettlewell Eye Research Institute  
San Francisco, California

**Purpose/Relevance:** This workshop will address difficult cases of strabismus to fill a potential knowledge gap for the practicing ophthalmologist.

**Target Audience:** Pediatric ophthalmologists, strabismus specialists, orthoptists, fellows and residents

**Current Practice:** Strabismus has many different etiologies, and management of some cases can be challenging. There are few randomized trials guiding practice. Practitioners often utilize strategies and surgical techniques taught in fellowship or addressed at professional meetings, on the listserv, in journals, and/or as a result of peer-to-peer discussion.

**Best Practice:** This workshop allows the attendees to observe challenging cases presented and discussed by experienced strabismologists, and the discussion will be enhanced by audience participation. New techniques, such as Marcaine combined with botox will be discussed.

**Expected Outcomes:** At the conclusion of the workshop, the audience and the panel will have shared their experiences and strategies for the diagnosis and management of challenging cases. The future practice of participants will be enhanced when they apply concepts they learn during the workshop.

**Format:** The workshop will consist of case-based presentations of patients with interesting and/or difficult forms of strabismus. Didactic presentations that are case-centered will be short and will highlight salient points about the cases. Panelists will discuss the differential diagnoses and potential treatment options. Audience questions and participation will be encouraged, time permitting.

**Summary:** Each panelist will present a difficult strabismus case for discussion by other panelists and the audience.

**References:** Good W.V. Strabismus Management. Butterworth Publishing. 1990 and revisions.