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2021 VIRTUAL MEETING

APRIL 9–11

DISCOVER NEW POINTS OF VIEW

ABSTRACTS

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Lecture #1
Thursday, 10:30 am – 10:55 am

Costenbader Lecture AAPOS 2021

Childhood Glaucoma – how I came to know so much and yet so little!

Sharon F. Freedman, MD

Purpose/Relevance: This presentation will give the audience an overview of my circuitous path to becoming a pediatric glaucoma specialist, and my opportunities to explore real-life clinical questions with the help of my "clinical laboratory" and my inspirational mentors, colleagues, and trainees.

Target Audience: Pediatric Ophthalmologists, pediatric optometrists permitted to attend AAPOS, orthoptists, and trainees.

Current Practice: Childhood glaucoma continues to challenge the ophthalmologist in general, and the pediatric ophthalmologist and the glaucoma specialist in particular.

Best Practice: I hope to provide attendees a peek into the slow upward climb toward better understanding a difficult clinical challeng.

Expected Outcomes: This workshop is intended to increase the attendee's understanding of: 1) the forks in my own road and how I handled them; 2) the opportunity each of us has as a clinician to ask clinically relevant questions and the help answer some of them; and 3) the amazing privilege I have enjoyed as someone with great mentors and amazing trainees in our subspecialty.

Format: Honest appraisal of how I got to where I am, as well as of my shortcomings and how much remains to be figured out in the future by the next generation.

Summary: I hope to expose the honest development of my careers, and how much I have benefitted from my mentors, my patients, and my trainees. I will highlight some of our discoveries along the way, and point out how much room there still is for ongoing study, even by humble clinicians like myself.

Papers

Paper #1
Friday, April 9, 2021
10:55 AM – 11:02 AM

Effect of Dichoptic Digital Therapeutic for Amblyopia: A Randomized Controlled Trial

David G. Hunter, MD, PhD; Scott Xiao; Endri Angjeli, MS; Hank C. Wu, MS, MBEE; Eric D. Gaier, MD, PhD; Gil Binenbaum, MD, MSCE; Michael X. Repka, MD, MBA; Luminopia Pivotal Trial Group

Introduction: We conducted a prospective, randomized controlled trial evaluating the safety and efficacy of a dichoptic digital therapeutic for amblyopia, a neurodevelopmental disorder for which current treatments are often limited by poor adherence and residual disease [1-3].

Methods: 105 children aged 4-7 years with unilateral amblyopia from anisometropia and/or mild strabismus were enrolled and randomized at 22 sites. The treatment group received a therapeutic that allowed participants to select video content, modified by software into visual stimuli and delivered dichoptically through a head-mounted display. The treatment group used the therapeutic at-home for 1 hour/day, 6 days/week with full-time refractive correction. The comparison group continued full-time refractive correction alone. The primary efficacy outcome was change in amblyopic eye best-corrected visual acuity (BCVA) at 12 weeks.

Results: The mean age was 6.1 years; 79% had prior amblyopia treatment. After 12 weeks, amblyopic eye BCVA improved 1.8 lines (95% CI: 1.3-2.3 lines) in the treatment group and 0.8 lines (95% CI: 0.4-1.3 lines) in the glasses-only group. The difference between groups was significant (p=0.0012, 96.48% CI: 0.31-1.67 lines). Adverse events were rare and comparable between groups. Median adherence (minutes usage / minutes prescribed) with the therapeutic was 88.2% over 12 weeks.

Conclusion/Relevance: Our findings provide support for the efficacy of the therapeutic and binocular approaches for amblyopia treatment. Excellent adherence and patient satisfaction are important advantages over current approaches for some patients.

References: 1. Pediatric Eye Disease Investigator Group, Repka MX, Kraker RT, et al. A randomized trial of atropine versus patching for treatment of moderate amblyopia: follow-up at age 10 years. Arch Ophthalmol. 2008;126(8):1039-1044.
2. Scheiman MM, Hertle RW, Kraker RT, et al. Patching vs atropine to treat amblyopia in children aged 7 to 12 years: a randomized trial. Arch Ophthalmol. 2008;126(12):1634-1642.
3. Stewart CE, Moseley MJ, Stephens DA, Fielder AR. Treatment Dose-Response in Amblyopia Therapy: The Monitored Occlusion Treatment of Amblyopia Study (MOTAS). Invest Ophthalmol Vis Sci. 2004;45(9):3048-3054.

Paper #2
Friday, April 9, 2021
11:06 AM – 11:13 AM

A Novel Eye-Tracking-Based, Binocular Digital Therapeutic with High Compliance Improves Visual System Performances in Amblyopic Children – A Pilot Study

Tamara Wygnanski-Jaffe, MD; Michael Belkin, MD; Oren Yehezkel, PhD

Goldschleger Eye Institute , Sheba Medical Center
Israel

Introduction: The effectiveness of the present binocular amblyopia therapy is often unsatisfactory due to low compliance or unsuitable software and hardware.

Methods: A prospective pilot study was conducted on 20 children aged 4-16 (8.08±3.2 years) with anisometropic or mixed amblyopia. Subjects watched a movie of their choice 5 times a week for 90 minutes over a period of three months. An eye tracker was used to identify the gaze point of each eye, and dichoptic movies were presented with the foveal area of the non-amblyopic eye blurred to visual acuity 2 lines below the amblyopic eye. The best corrected visual acuity (BCVA) at near and distance, stereoacuity, and reading performance were assessed at each visit.

Results: The mean compliance with treatment dosage was 95%. BCVA improved by 3.34±0.05 ETDRS lines for near (95% CI 0.235-0.375, $p<0.005$) and by 1.8±0.04 for distance (95% CI 0.145-0.257, $p<0.005$) with 6 months of follow-up. Binocular VA improved by 1.1±0.04 and 0.13±0.03 lines for near and distance ($p<0.01$, paired t-test). The mean stereoacuity improved from 285±66 to 73±14 seconds of arc (3 octave steps 95% CI 105-292, $p< 0.005$). Reading speed improved by an average of 40%. No adverse effects were reported; 2 children reported difficulty adhering to the study protocol.

Conclusion/Relevance: Subjects exhibited a significant improvement in visual acuity of the amblyopic eye, stereo acuity, and reading speed. Improvement of binocular VA indicates a reduction in interocular suppression.
The tested Curesight system is a potentially effective home treatment for amblyopia, with high compliance and no difficulty in fitting or calibration, with a year of follow-up.

References: 1. Holmes JM, Manh VM, Lazar EL, et al.; Pediatric Eye Disease Investigator Group. 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): 1391-4000.
2. Brown R, Blanchfield P, Fakis A, et al.; I-BiT Study Group.Clinical investigation plan for the use of interactive binocular treatment (I-BiT) for the management of anisometropic, strabismic and mixed amblyopia in children aged 3.5-12 years: a randomized controlled trial. Trials 2019; 20(1): 437.
3. Xiao S, Gaier ED, Mazow ML, et al.; Improved adherence and treatment outcomes with an engaging personalized digital therapeutic in amblyopia. Sci Rep. 2020;doi:10.1038/s41598-020-65234-3.

Paper #3
Friday, April 9, 2021
11:17 AM – 11:24 AM

Multifocal Electroretinography in Amblyopia

Elza Rachid; Alaa Bou Ghannam, MD; Zeinab El-Moussawi, MD; Karine Ismail; Marwan Atallah, MD; Larissa Smeets; Hasan Chahine, MD; Christiane Al-Haddad, MD

Amercian University of Beirut Medical Center
Cairo Street, Hamra; Beirut, Lebanon

Introduction: Cortical pathology has been incriminated as the major site of involvement in amblyopia. The purpose of this study was to identify whether there were functional abnormalities in the retina of amblyopic eyes using multifocal electroretinography (mfERG).

Methods: This was a prospective study of patients >/=7 years of age with unilateral amblyopia. Multifocal ERG and flash ERG were performed to compare parameters between amblyopic and contralateral eyes. A complete analysis of the five ring averages was done. The p-value was set at 0.01 after applying a Bonferroni correction.

Results: 38 patients (18 strabismic and 20 anisometropic) were included. Mean age was 14.3±7.3 years. Responses across the rings in mfERG were diminished in amblyopic eyes compared to non-amblyopic eyes with significant differences detected in the central rings (p=0.001). However, flash ERG did not show any consistently significant difference. When grouped by severity, amplitudes were significantly lower in severely amblyopic eyes but not in mild amblyopia. No differences were demonstrated between the anisometropic and strabismic groups.

Conclusion/Relevance: Knowing that mfERG gives more specific measurements than pattern ERG, significant and consistent diminishment in amplitudes was demonstrated in amblyopic eyes, which correlated well with severity. Few other studies have looked at mfERG or at strabismic amblyopia. Multifocal ERG amplitudes, especially for the central rings, were significantly diminished in amblyopic eyes, which was not observed on flash ERG. This correlated with severity but not with type of amblyopia (strabismic vs anisometropic). These findings may help clarify the pathophysiology of amblyopia and open doors for ways to monitor treatment response.

References: Brown, B., Feigl, B., Gole, G., Mullen, K. and Hess, R. (2013). Assessment of neuroretinal function in a group of functional amblyopes with documented LGN deficits. [online] Wiley Online Library. Available at: https://onlinelibrary.wiley.com/action/showCitFormats?doi=10.1111%2Fopo.12024 [Accessed 10 Sep. 2019].

Masoud Shoushtarian, S., Mirdehghan Farashah, M., Valiollahi, P., Tajik, A., Adhamimoghaddam, F. and Malekzadeh, S. (2010). Electroretinogram in amblyopic and non-amblyopic children. [online] Springer Link. Available at: https://link.springer.com/article/10.1007/s12098-010-0075-4 [Accessed 10 Sep. 2019].

Paper #4
Friday, April 9, 2021
11:24 AM – 11:31 AM

Clinical Evaluation of the Retinal Polarization Scanning-Based Vision Screening Device

Lorenzo E. Bosque; Cailyn R. Yamarino; Natalia Salcedo; Andrew J. Schneier, MD; Robert S. Gold, MD; Louis C. Blumefeld, MD; David G. Hunter, MD, PhD

Eye Physicians of Central Florida
Orlando, F.L.

Introduction: Most current vision screening devices test for refractive risk factors with suboptimal sensitivity and specificity for detection of amblyopia and strabismus, leading to under-detection and over-referral. Recently the blinq vision scanner, which detects amblyopia and strabismus directly via a retinal scan, was released. We conducted a clinical study to evaluate its accuracy.

Methods: Prospective, cross-sectional diagnostic accuracy study with planned enrollment of 200 consecutive subjects ages 1-20. All enrolled subjects were scanned by individuals masked to the diagnosis, followed by complete ophthalmologic examination by pediatric ophthalmologists masked to the screening result. Previously treated patients were analyzed separately.

Results: The study cohort comprised 193 subjects, of which 53 were previously treated, leaving 140 treatment-naïve subjects, including 65 (46%) with amblyopia and/or strabismus, 11 (8%) with risk factors/suspected binocular vision deficit without amblyopia/strabismus, and 64 (46%) controls. Sensitivity was 100%, with all 66 patients with referral-warranted ocular disease referred. Five patients with intermittent strabismus receiving pass results were deemed 'appropriate pass' when considering patient risk factors and amblyogenic potential. Specificity was 91%, with 7 incorrect referrals. Subanalysis of children aged 2-8 years (n=92) provided similar results (sensitivity 100%; specificity 89%).

Conclusion/Relevance: The blinq device shows very high sensitivity and specificity for detecting referral-warranted amblyopia and strabismus. Implementation of the device in vision screening programs may lead to improvement in disease detection, as well as a reduction in false referrals. Future studies should confirm the specificity of the blinq device in a non-enriched primary care setting.

References: Sanchez, I., Ortiz-Toquero, S., Martin, R., & de Juan, V. (2016). Advantages, limitations, and diagnostic accuracy of photoscreeners in early detection of amblyopia: a review. Clinical ophthalmology (Auckland, N.Z.), 10, 1365–1373. doi:10.2147/OPTH.S93714

Epelbaum M, Milleret C, Buisseret P, Dufier JL. The sensitive period for strabismic amblyopia in humans. Ophthalmology. 1993;100(3):323-327.

American Academy of Ophthalmology (AAO) Pediatric Ophthalmology/Strabismus Panel. Preferred practice pattern guidelines: amblyopia. AAO website. https://www.aao.org. 2012. Accessed December 11, 2019.

Paper #5
Friday, April 9, 2021
11:31 AM – 11:38 AM

Validity and Reliability of Eye Tracking for Visual Assessment in Children with Cortical/Cerebral Visual Impairment

Melinda Chang, MD; Mark Borchert, MD

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Los Angeles, CA

Introduction: Cortical/cerebral visual impairment (CVI) is the leading cause of pediatric visual impairment in developed countries. Visual assessment is challenging due to frequent neurologic and ocular comorbidities. Eye tracking (ET) is a novel technology that could serve as an objective and quantitative measure of visual function in these children.

Methods: We prospectively recruited children with CVI diagnosed by a pediatric neuro-ophthalmologist. Visual acuity was graded clinically using a previously published 6-level scale (higher numbers indicate better visual acuity). The EyeLink® system tracked eye position while subjects viewed gratings of increasing frequency presented randomly to the left or right side of a computer monitor on a luminance-matched background to establish the threshold grating acuity by ET. ET was performed at baseline and 1 month later. Grating acuity by ET was correlated to clinical acuity using Pearson's correlation coefficient. Intraclass correlation coefficient (ICC) assessed test-retest reliability.

Results: Nine children with CVI were included (ages 2 to 12 years). Clinical acuity ranged from 3 to 6 on the 6-level scale. Grating acuity by ET ranged from 1.5 to 20 cpd (Snellen equivalent 20/400 to 20/30). Correlation between clinical acuity and grating acuity by ET was strong ($r=0.78$, $p=0.01$). Test-retest reliability was excellent (ICC=0.98).

Conclusion/Relevance: This pilot study suggests that ET may be valid and reliable for visual acuity assessment in pediatric CVI. Additional studies are underway to evaluate other visual and oculomotor characteristics by ET. ET could potentially serve as an outcome measure in future clinical trials of treatments for children with CVI.

References: 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.

Handa S, Saffari SE, Borchert M. Factors Associated With Lack of Vision Improvement in Children With Cortical Visual Impairment. J Neuroophthalmol. 2018 Dec;38(4):429-433.

Paper #6
Friday, April 9, 2021
11:38 AM – 11:45 AM

Cataract Surgery in Children from Birth to Less than 13 Years of Age in the PEDIG Registry: Status Five Years Following Surgery

Michael X. Repka, MD, MBA; Trevano W. Dean, MPH; Raymond T. Kraker, MSPH; Zhuokai Li, PhD; Kimberly G. Yen, MD; Alejandra G. de Alba Campomanes, MD, MPH; Marielle P. Young, MD; Bahram Rahmani, MD; Kathryn M. Haider, MD; George F. Whitehead, MD; Scott R. Lambert, MD; Sudhi P. Kurup, MD; Courtney Kraus, MD; Susan A. Cotter, OD, MS; Jonathan M. Holmes, BM, BCh

Pediatric Eye Disease Investigator Group, Jaeb Center for Health Research
Tampa, Florida

Introduction: To describe visual acuity (VA) and complications 5 years following cataract surgery in children <13 years of age.

Methods: Prospective observational study with annual medical record review following lensectomy for 1268 eyes of 994 children. We report VA and change in refractive error with cumulative proportion of glaucoma or glaucoma suspect and additional intraocular surgery.

Results: Five years postoperatively, median (range) best corrected VA was 20/80 (20/12 to <20/800) in 156 bilateral aphakic eyes, 20/40 (20/16 to 20/640) in 184 bilateral pseudophakic eyes, 20/160 (20/20 to <20/800) in 101 unilateral aphakia eyes, and 20/80 (20/16 to <20/800) in 177 unilateral pseudophakic eyes.

Overall, the 5-year cumulative rate of glaucoma or glaucoma suspect was 23% (95% CI: 17%-28%) in 1055 eyes that did not have a preoperative diagnosis of glaucoma (111 glaucoma and 39 glaucoma suspect); 41% (95% CI: 28%-52%) in 345 eyes of children <6 months of age at lensectomy. The 5-year cumulative rate of additional intraocular surgery was 40% (95% CI: 36%-43%), most commonly to clear the visual axis.

Median (range) myopic shift over 5 years was -1.62D (-13.00D to +3.50D) in 130 bilateral pseudophakic eyes and -1.93D (-8.75D to +13.62D) in 112 unilateral pseudophakic eyes.

Conclusion/Relevance: VA in the operated eye(s) was (were) better with bilateral cataracts, especially for older children receiving an implant. Glaucoma or glaucoma suspect and additional surgery to clear the visual axis are common adverse events during the five years following pediatric cataract surgery. Myopic shift was modest following placement of an IOL.

References: none

Paper #7
Friday, April 9, 2021
11:45 AM – 11:52 AM

Myopic Shift and Anisometropia after Unilateral IOL Implantation: Outcomes at the 10.5 Year Visit in the Infantile Aphakia Treatment Trial (IATS)

David R. Weakley, MD; Scott Lambert, MD; Deborah K. VanderVeen, MD; Edward Wilson, MD; Stacey Kruger, MD; Azhar Nizam

University of Texas Southwestern Medical Center
Dallas, Texas

Introduction: We report the myopic shift and anisometropia at 10.6 (+/-0.3) years of age in 36 patients undergoing unilateral lens implantation from 48-210 days of age in the IATS. (1)

Methods: Cycloplegic refractions at the final 10.5 year examination were compared to our previously published refractive data at age 5 years to evaluate the progression of myopic shift and anisometropia (2-3).

Results: Of the 57 patients initially randomized to IOL implantation 21 were excluded from analysis: glaucoma (12), IOL exchange (3), lost to follow-up/incomplete data (4), IOL not implanted (1) Stickler's Syndrome (1); resulting in 36 patients analyzed. Mean refractive error was -5.57+/-5.86 D compared to -2.15 +/- 4.61D at the age 5-year exam. Mean change in refraction (10.5-year minus 5-year) for the 36 patients was -3.43 ± 2.42 D (95% confidence interval (-4.25, -2.61)). The mean change in refraction per year of follow-up between the two examinations was -0.60 ± 0.41 D (95% confidence interval (-0.74, -0.46)). All but one of the treated eyes were more myopic at 10.5 years. There was no association between change in refractive error and the following baseline characteristics: age at surgery, axial length, average keratometry, IOL power implanted. The mean anisometropia at the age 10.5 exam increased to -6.40D (IQR -8.78,-2.56) from -2.75 (IQR -6.38, -0.75) at the age 5 year exam.

Conclusion/Relevance: Myopic shift continued in pseudophakic eyes between 5 and 10.5 years of age though at a slower rate than prior to age 5 years. Anisometropia increased by a similar magnitude.

References: 1)Infant Aphakia Treatment Study Group, Lambert SR, Buckley EG, Drews-Botsch C, DuBois L, Hartmann E, Lynn MJ, Plager DA, Wilson ME. Infant aphakia treatment study: design and clinical measures at enrollment Arch Ophthalmol. 2010 Jan;128(1):21-7.

2)Myopic shift 5 years after IOL implantation in the Infant Aphakia Treatment Study. David R. Weakley Jr. MD, Michael J. Lynn, MS, Lindreth Dubois MS, George Cotsonis MS, M Edward Wilson MD, Edward G. Buckley MD, David A Plager, MD, Scott R. Lambert, MD, for The Infant Aphakia Treatment Study Group, Ophthalmology. 2017 Jun;124(6):822-827. doi: 10.1016/j.ophtha.2016.12.040. Epub 2017 Feb 16.

3)Anisometropia at Age 5 Years after Unilateral Intraocular Lens Implantation During Infancy in the Infant Aphakia Treatment Study (IATS) David Weakley, George Cotsonis, M Edward Wilson, David A. Plager, Edward G. Buckley, and Scott R. Lambert for the Infant Aphakia Treatment Study; Am J Ophthalmol. 2017 May Epub 16. pii: S0002-9394(17)30205-2. doi: 10.1016/j.ajo.2017.05.008 2017 Aug:180: 1-7

Paper #8
Friday, April 9, 2021
11:52 AM – 11:59 AM

Long-term Outcome of Angle-supported Anterior Chamber Intraocular Lens Implantation For Pediatric Aphakia

M. Edward Wilson; Carolina Adams; Anastasia Alex; Rupal Trivedi

Medical University of South Carolina
Charleston SC USA

Introduction: To report long-term outcome of Angle-supported Anterior chamber IOL implantation for pediatric aphasia.

Methods: Retrospective chart review of consecutive patients operated by a single surgeon.

Results: Thirty five eyes of 22 children received an angle-supported AC IOL at a median age of 10.6 years (Unilateral 8, bilateral 14). Ectopia lentis was detected in 25 eyes. Intraocular lens was implanted as primary implantation in 12 eyes and as secondary implantation in 23 eyes. Five eyes received surgery for IOL malposition. Seven eyes received an IOL exchange with placement of an Artisan iris-claw IOL. Glaucoma surgery was not required in any eye. Surgery for RD was required in one eye. Median BCVA was 20/25 at final follow-up (n-26).

Conclusion/Relevance: IOL exchange was the most common complication after Angle-supported Anterior chamber IOL implantation in children. These lenses are not recommended for children.

References: Wagoner MD, Cox TA, Ariyasu RG, Jacobs DS, Karp CL; American Academy of|Ophthalmology. Intraocular lens implantation in the absence of capsular support:|a report by the American Academy of Ophthalmology. Ophthalmology. 2003|Apr;110(4):840-59.

Paper #9
Friday, April 9, 2021
11:59 AM – 12:06 PM

Unilateral Cataract Surgery Outcomes in Children 2 to 7 years of age using the STORM Cataract Kids Cohort

Anastasia A. Alex, MD; Carolina Adams, MD; Rupal Trivedi, MD, MSCR; M. Edward Wilson, MD

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Charleston, SC

Introduction: The Toddler Aphakia and Pseudophakia Study (TAPS) demonstrated a reduced incidence of complications and adverse events (AE) after intraocular lens (IOL) implantation in children age 7-24 months compared to that of infants less than 7 months at surgery. The purpose of this study was to evaluate the outcomes of unilateral cataract surgery in slightly older children.

Methods: The medical charts of patients who underwent unilateral cataract surgery between the ages of 2-7 years at the Storm Eye Institute were analyzed retrospectively. Traumatic cataracts and ectopia lentis were excluded. Outcomes were compared to those of the TAPS and Infant Aphakia Treatment Study (IATS).

Results: Sixty-two children were included with a mean follow-up of 4.3 years. All received a primary IOL. The median visual acuity recorded at the follow-up visit closest to 10 years of age was 20/40. The proportion of intraoperative complications (8%) and need for additional intraocular surgery (6%) were significantly lower than those reported in the IATS study ($p<0.01$) but not significantly different than TAPS. No patients developed glaucoma by the study end. Forty-four percent of children had a final visual acuity better than 20/40 compared to just 11% in the TAPS study ($p<0.001$).

Conclusion/Relevance: Cataract surgery with IOL implantation in slightly older children carries less risk for vision-threatening complications or events compared to infants and results in better visual outcomes than in toddler-aged children. The excellent final vision in our cohort of older children with unilateral cataracts may be the result of a more insidious onset of cataract that developed much later in the course of visual development.

References: 1. Bothun ED, Wilson ME, Traboulsi EI et al. Outcomes of unilateral cataracts in infants and toddlers 7 to 24 months of age: Toddler Aphakia and Pseudophakia Study (TAPS). Ophthalmol. 2019 Aug;126(8):1189-1195.
2. Infant Aphakia Treatment Study Group. The Infant Aphakia Treatment Study: design and clinical measures at enrollment. Arch Ophthalmol. 2010:128(1):21-27.

Paper #10
Friday, April 9, 2021
12:06 PM – 12:13 PM

Bilateral Cataract Surgery Outcomes in Children 2 to 7 years of age using the STORM Cataract Kids Cohort

Carolina Adams, MD; Anastasia Alex, MD; Rupal Trivedi, MD, MSCR; M. Edward Wilson, MD

Storm Eye Institute/ Medical University of South Carolina

Introduction: To evaluate the outcomes of bilateral cataract surgery in children 2 to 7 years of age and to compare them to the bilateral infant and toddler outcomes reported from the Toddler Aphakia Pseudophakia Study (TAPS) registry.

Methods: The medical charts of children who underwent bilateral cataract surgery between the ages of 2-7 years of age with a minimum of three years of postoperative follow-up at the Storm Eye Institute were retrospectively reviewed. Patients with a history of trauma or subluxated lens were excluded. Outcomes included best-corrected visual acuity (BCVA), strabismus requiring surgery, adverse events, and re-operations.

Results: One hundred thirty-six eyes (68 children) were selected. The median age of cataract surgery was 4.6 years. One hundred thirty eyes (95.6%) received primary in-the-bag IOL implantation. At the visit closest to ten years of age, the mean BCVA of the better-seeing eye was 0.12 LogMAR (Snellen equivalent, 20/26; range 0-0.88) and the worst-seeing eye was 0.33 LogMAR (Snellen equivalent, 20/42; range 0-3.0). Strabismus surgery occurred in three patients. Adverse events occurred in 12/68(17.5%) first-operated eyes, which was significantly less than TAPS cohort of 1–7 months (*P*=0.0001), yet there was no statistical difference compared to TAPS 7 months–2 years (*P*=0.74). Glaucoma/glaucoma suspect were identified in four patients. Eleven additional intraocular re-operations were needed (8 visual axis opacifications, 2 lysis of vitreous wick, and 1 glaucoma surgery).

Conclusion/Relevance: Compared to TAPS, bilateral cataract surgery performed between 2 to 7 years was associated with significantly less adverse events. BCVA in this age group was excellent after bilateral cataract surgery.

References:

1. Bothun ED, Wilson ME, Vanderveen DK, et al. Outcomes of bilateral cataracts removed in infants 1 to 7 months go age using the toddler aphakia and pseudophakia treatment study registry. Ophthalmology 2020; 127:501-510.
2. Bothun ED, Wilson ME, Yen KG, et al. Outcomes of Bilateral Cataract Surgery in Infants 7 to 24 Months of Age: Toddler Aphakia and Pseudophakia Study (TAPS). Ophthalmology 2020; in-press.

Paper #11
Friday, April 9, 2021
1:45 PM – 1:52 PM

Retinal Hemorrhage Patterns: A New Paradigm

Gil Binenbaum, MD, MSCE; Brian J. Forbes, MD, PhD; Agnieshka Baumritter, MS; Angell Shi, MD; Alex V. Levin, MD

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Philadelphia, PA

Introduction: The current paradigm for interpretation of retinal hemorrhages (RH) focuses on diagnosis of abusive head trauma based upon severity of RH, for which classifications have been published. While RH severity has value, there is overlap in severity between accidental and abusive injuries; some patterns are diagnostic even if RH are not severe, and medical diagnoses are not addressed. We sought to develop a new paradigm for RH interpretation using patterns that distinguish medical from traumatic causes of RH.

Methods: Three masked ophthalmologists reviewed 188 fundus photographs of RH from many causes in an iterative process to identify patterns that distinguish medical from traumatic causes. Based upon these patterns, a new framework for interpreting retinal findings in child abuse evaluations was developed.

Results: Distinguishing patterns were defined. Traumatic patterns included 'peri-macular,' 'central macular sparing,' 'mid-peripheral sparing,' 'cherry hemorrhages,' 'too numerous to count hemorrhages with non-radiating areas,' and 'carpeting'. Medical patterns included sectoral distribution, numerous RH in radiating pattern, superficial peripapillary RH with disc swelling, and primarily peripapillary preretinal or vitreous hemorrhage. Presence of focal white lesions, lipid, or disc swelling also supported a medical cause.

Conclusion/Relevance: In a newly developed paradigm, diagnostic interpretation of RH should first involve ophthalmologist identification of these patterns to distinguish between a medical and traumatic cause, not to diagnose abuse. Once a traumatic pattern is identified, the severity of RH and non-ocular injuries can be used by the child abuse team to evaluate the plausibility of the history provided by caregivers.

References: 1. Bhardwaj G, Chowdhury V, Jacobs MB, et al. A systematic review of the diagnostic accuracy of ocular signs in pediatric abusive head trauma. Ophthalmology 2010; 117:983.
2. Binenbaum G, Mirza-George N, Christian CW, Forbes BJ. Odds of abuse associated with retinal hemorrhages in children suspected of child abuse. J AAPOS 2009; 13:268.
3. Christian CW, Levin AV, COUNCIL ON CHILD ABUSE AND NEGLECT, et al. The Eye Examination in the Evaluation of Child Abuse. Pediatrics 2018; 142.

Paper #12
Friday, April 9, 2021
1:52 PM – 1:59 PM

Exploring the Vitreoretinal Interface using Computer Simulation and Animal Models to Explain Retinal Hemorrhage Patterns in Abusive Head Trauma

Donny W. Suh, MD

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Omaha, NE

Introduction: Vitreoretinal traction (VRT) may plays a major role in Retinal Hemorrhage (RH) in Abusive head trauma (AHT). Combining computer simulation and animal models, we tested the hypothesis that VRT during forcible shaking can exceed vitreoretinal adhesion from rotational and translational forces. We also studied the distribution of the forces in different layers and locations of the retina to explain the patterns of RH seen in AHT

Methods: Computer simulation model was developed to computationally measure retinal stresses induced by the vitreous traction during shaking. Also, young sheep and monkey eyes were utilized to determine the vitreoretinal adhesion using biaxial planar materials analyzer.

Results: Calculated stress values from CSM ranged from 7 to 10 kPa at the vitreoretinal interface. Maximal stress was observed at periphery of the retina and vessel bifurcations. Stress values were similar throughout all three layers of the retina. Replicates of the ex vivo sheep and monkey models revealed separation between retina and vitreous required only 1-5 kPa.

Conclusion/Relevance: Our CSM predicted stress patterns consistent with the diffuse RH in AHT. Also, it demonstrated similar stress forces in all layers of the retina, consistent with RH commonly found in multiple layers of the retina. Furthermore, CSM showed that intraocular forces attained during forcible shaking can exceed the minimum threshold needed to produce vitreoretinal separation as measured in ex vivo sheep and monkey eyes. These data can help explain the RH patterns commonly found in AHT.

References: 1. Hedlund, Gary L. Subdural Hemorrhage in Abusive Head Trauma: Imaging Challenges and Controversies. Journal of the American Osteopathic College of Radiology. 2012;1(1):23-30.
2. Binenbaum G, Mirza-George N, Christian CW, Forbes BJ. Odds of abuse associated with retinal hemorrhages in children suspected of child abuse. J AAPOS. 2009;13(3):268-272. doi:10.1016/j.jaapos.2009.03.005
3. Schroeder, Lauryn. Hot Spots - Pinpointing Shaken Baby Syndrome Cases | Medill Justice Project. Accessed January 16, 2018. http://www.medilljusticeproject.org/2013/12/10/hot-spots/

Paper #13
Friday, April 9, 2021
1:59 PM – 2:06 PM

Appearance of the Optic Nerve in Children with Resolved Papilledema

Pimpiroon Ploysangam, MD; Sidney Gospe, III, MD; Sharon F. Freedman, MD; Mays El-Dairi, MD

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Introduction: Children with resolved papilledema have demonstrated hyper-reflectivity on optical coherence tomography (OCT) of the optic nerve head (ONH).[1] We previously hypothesized these were ONH drusen. Since then, the Optic Disc Drusen Studies Consortium has redefined OCT classification of drusen, where hyper-reflectivity with and without calcifications are renamed as drusen and peripapillary hyper-reflective ovoid mass-like structures (PHOMS), respectively.[2] Clinical significance of this finding is unknown.

Methods: Retrospective study of sequential pediatric patients with resolved papilledema at a single academic center from 2013-2020. OCT ONH (non-enhanced depth imaging [non-EDI]) scans were evaluated by two masked readers for PHOMS and calcifications. A chi-squared analysis was used to correlate visual acuity change with presence of hyper-reflectivity under the ONH. Inter-reader reliability was measured.

Results: This study has thus far included 48 patients (96 eyes). Mean age was 11.6±6.4 years. Papilledema causes included idiopathic intracranial hypertension (41), intracranial mass (6), and meningitis (1). Visual acuity was improved or unchanged in 92.5% (37/40) of eyes with hyper-reflectivity compared to 80.4% (45/56) of eyes without. Presence of hyperreflectivity did not affect visual acuity (p=0.52). There was 57.5% reader agreement on presence of hyper-reflectivity (κ =0.09) and 66.6% agreement on presence of calcifications (κ =0.24).

Conclusion/Relevance: Hyper-reflectivity under the ONH on non-EDI OCT scans is a subjective finding with poor inter-grader agreement. Their co-existence with papilledema did not predict final visual acuity. Further studies with higher resolution imaging will hopefully shed more light on the structural and visual significance on this finding in children with resolved papilledema.

References:

1. Gospe SM, Bhatti MT, El-Dairi MA. Anatomic and visual function outcomes in pediatric idiopathic intracranial hypertension. Br J Ophthalmol 2016;100(4):505-9.
2. Malmqvist L, B.L., Costello F, et al. The Optic Disc Drusen Studies Consortium recommendations for diagnosis of optic disc drusen using optical coherence tomography. J Neuroophthalmol. 2018;38(3):299-307.

Paper #14
Friday, April 9, 2021
2:06 PM – 2:13 PM

Two-Year Follow-Up of the Prospective Outcomes Study of Pediatric Optic Neuritis

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Introduction: We report 2-year outcomes of a non-randomized, prospective observational study of children with optic neuritis (ON).

Methods: In a non-randomized observational study,[1] we prospectively enrolled children ages 3 to <16 years with a clinical diagnosis of acute ON (onset within 2 weeks) and at least one of the following: visual acuity (VA) deficit >/=0.2 logMAR below age-based norms in the affected eye, diminished color vision, abnormal visual field, or optic disc swelling based on clinical appearance and/or OCT. The primary outcome was percentage of study eyes within age-normal VA after 2 years.[2,3]

Results: 44 participants with 54 affected eyes were enrolled; 27 (61%) completed 2-year follow-up visits. 13 (48%) were female. Final diagnosis at 2 years was isolated unilateral ON in 9 (33%), bilateral isolated ON in 3 (11%), acute disseminated encephalomyelitis (ADEM) in 2 (7%), myelin oligodendrocyte glycoprotein-associated demyelination in 6 (22%), multiple sclerosis in 4 (15%), and neuromyelitis optica spectrum disorder in 3 (11%). Two (7%, 95% confidence interval=1%-24%) participants, both of whom were diagnosed with multiple sclerosis, had a recurrence of ON between the 6-month and 2-year exams. Of the 30 eyes with 2-years of follow-up, 22 (73%, 95% confidence interval = 54% to 88%) had age-normal VA at 2 years compared with 8 (27%, 95% CI = 12% to 46%) at enrollment.

Conclusion/Relevance: Over half of patients had an underlying etiology to ON. Most children with ON recovered normal VA when assessed two years from onset, despite some suffering a recurrence.

References: 1. Writing Committee for the Pediatric Eye Disease Investigator Group. Assessment of Pediatric Optic Neuritis Visual Acuity Outcomes at 6 Months. JAMA Ophthalmol. 2020 DOI:10.1001/jamaophthalmol.2020.4231.
2. Pan Y, Tarczy-Hornoch K, Cotter SA, et al. Visual acuity norms in pre-school children: the Multi-Ethnic Pediatric Eye Disease Study. Optom Vis Sci. 2009;86(6):607-612.
3. Drover JR, Felius J, Cheng CS, Morale SE, Wyatt L, Birch EE. Normative pediatric visual acuity using single surrounded HOTV optotypes on the Electronic Visual Acuity Tester following the Amblyopia Treatment Study protocol. J AAPOS. 2008;12(2):145-149.

Paper #15
Friday, April 9, 2021
2:13 PM – 2:20 PM

Visual Outcomes of Optic Pathway Glioma Treated with Chemotherapy in Neurofibromatosis Type 1

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Introduction: Our aim was to analyse the visual outcomes following chemotherapy for optic pathway glioma (OPG) in children with neurofibromatosis type-1 (NF1).

Methods: Retrospective cohort study of 58 children with OPG between 2003-2019. Best corrected visual acuity (BCVA) at diagnosis and at last follow-up were analysed. Correlation tests were performed to determine whether final BCVA was predicted by initial BCVA or initial Dodge stage or retinal nerve fiber layer (RNFL) thickness.

Results: Twenty-four of the children (41%) received chemotherapy. Median age at diagnosis was 3 years, 61% were female. There was a non-statistically significant difference in mean BCVA from the first visit to the last follow-up in non-treated and treated eyes (p=0.208, p=0.161 respectively), a moderate and strong positive correlation was found (*r*= 0.58 and *r*= 0.72, respectively). At last follow-up, in non-treated patients BCVA remained stable in 73% and improved in 27%. In chemotherapy treated group, BCVA worsened in 27%, remained stable in 63% and improved in 10%. At last follow-up, BCVA and Dodge stage had a very weak negative correlation in non-chemotherapy patients (r=-0.08) and very weak positive correlation in chemotherapy patients (r=0.18). No association was found between RNFL thickness stability and BCVA </= 0.2 or a change </= 0.2 in logMAR (p=0.998) in chemotherapy group. A negative moderate correlation was identified between RNFL thickness and BCVA in the last follow-up (r=-0.43 in the non-treated group and r=-0.45 in the chemotherapy group).

Conclusion/Relevance: Children treated with chemotherapy experienced worsened BCVA and a poorer visual outcome. There was an association between final BCVA and initial BCVA, initial Dodge stage and RNFL thickness.

References:

Paper #16
Friday, April 9, 2021
2:24 PM – 2:31 PM

The Incidence of Retinoblastoma Has Increased: Analysis Based on Results from 40 European Countries

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Introduction: Treatments for retinoblastoma have improved survival in recent decades, but the impact on survivor fitness and the incidence of retinoblastoma have not been studied. The incidence rate of retinoblastoma is reported to be in the range of 1 case in 15,000-18,000 live births. The aim of this study was to estimate the incidence of retinoblastoma in Europe and assesses factors predictive of higher incidence

Methods: A multicenter, cross-sectional study was conducted of all patients presenting to European centers with newly diagnosed retinoblastoma during 2017. Incidence rates were calculated for each country and for the entire sample using publicly available population data. Linear regression was used to evaluate factors predictive of higher incidence rates. Final analysis was performed on countries reporting complete data.

Results: A total of 40 European countries and 517 new retinoblastoma patients were included in the study. Of the 40 countries, 24 provided complete data. When estimated based on live births, the incidence rate was 1 in 13,844. When estimated based on population, the incidence was 14.1 and 4.6 per one million children less than 5 and 15 years of age, respectively. Linear regression analysis showed that a higher proportion of familial retinoblastoma predicted a higher national incidence rate (p=0.002).

Conclusion/Relevance: The present study demonstrates a higher retinoblastoma incidence rate than previously reported. The incidence of retinoblastoma likely has increased because of improved survival and reproductive capabilities of survivors of heritable retinoblastoma. Therapeutic intervention is increasing the population frequency of pathogenic variants of RB1, associated with dominant cancer predisposition.

References: Broaddus E, Topham A, Singh AD. Incidence of retinoblastoma in the USA: 1975-2004. Br J Ophthalmol. 2009 Jan 1;93(1):21-3.

Paper #17
Saturday, April 10, 2021
10:00 AM – 10:07 AM

A Randomized Trial Evaluating Effectiveness of Overminus Spectacles in Children 3 to 10 Years of Age with Intermittent Exotropia

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on behalf of the Pediatric Eye Disease Investigator Group

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Introduction: We evaluated whether overminus spectacles improve control of intermittent exotropia (IXT).

Methods: We enrolled 386 children 3 to 10 years of age with a mean distance IXT control score of 2 or worse (on a 0-5 scale) and cycloplegic refractive error between -6.00 diopters (D) and +1.00D. Participants were randomly assigned to overminus spectacles (-2.50 D over cycloplegic refraction) or non-overminus spectacles. In the overminus group, overminus lenses were reduced to -1.25 D at 12 months and discontinued at 15 months. Masked outcomes were distance control score at 12 months (on-treatment) and 18 months (off-treatment). Change in refractive error from baseline to 12 months was evaluated with cycloplegic retinoscopy.

Results: Mean distance control at 12 months was better with overminus spectacles than non-overminus spectacles (1.8 vs 2.8 points, adjusted difference = -0.8; 95% confidence interval (CI) = -1.0 to -0.5). At 18 months, there was no significant difference in mean distance control between treatment groups (2.4 vs 2.7 points, adjusted difference = -0.2; 95% CI = -0.5 to 0.04). There was greater myopic shift over 12 months in the overminus than in the non-overminus group (-0.42 D vs -0.04 D, adjusted difference = -0.37 D; 95% CI = -0.49 to -0.26).

Conclusion/Relevance: In children 3 to 10 years of age with IXT, overminus spectacles improved distance exotropia control while worn, but the effect was not maintained after participants were weaned from overminus lens treatment. Overminus spectacles were associated with a myopic shift.

References: none

Paper #18
Saturday, April 10, 2021
10:07 AM – 10:14 AM

Early vs. Late Surgery for Intermittent Exotropia: A Prospective Observational Study

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Introduction: To compare the motor and sensory outcomes of early surgery (</=5 years of age) versus late surgery (>/= 7 years of age) for intermittent exotropia.

Methods: A prospective observational study was performed on 136 patients with intermittent exotropia divided into two groups according to the age at surgery. In the late surgery group, bilateral lateral rectus recession was performed according to standard tables. In the earlier surgery group, the amount of lateral rectus recession was reduced by 0.5 mm. Motor alignment and sensory functions were followed up for six months. Complete success was defined as esophoria or intermittent esotropia < 5 PD to exophoria/tropia <8 PD for both distance and near with spectacles at 6 months. The study was registered in Clinical trial.gov (NCT04307160).

Results: The mean age at surgery was 3.45 ± 1.00 years and 11.40 ± 5.35 years in the early and late surgery groups respectively. Success rate was 84% in the early surgery group and 68% in the late surgery group. The higher success rate in the early group was statistically significant (P =0.0392). Overcorrection occurred in 2 patients in the early group (3%) and 5 patients (8%) in the late group. There was no statistically significant change in the postoperative stereoacuity after surgery in both groups.

Conclusion/Relevance: Surgery at younger age was associated with a higher success rate at 6 months. The risk of overcorrection can be minimized with a reduced surgical dose. Longer follow up is needed to test the stability of the results.

References: Repka MX, Chandler DL, Holmes JM, Donahue SP, Hoover DL, Mohney BG, Phillips PH, Stout AU, Ticho BH, Wallace DK; Pediatric Eye Disease Investigator Group. The Relationship of Age and Other Baseline Factors to Outcome of Initial Surgery for Intermittent Exotropia. Am J Ophthalmol. 2020 Apr;212:153-161. doi: 10.1016/j.ajo.2019.12.008. Epub 2019 Dec 17.

Paper #19
Saturday, April 10, 2021
10:18 AM – 10:25 AM

Evaluation of Fenestration Technique of the Medial Rectus Muscle in Pediatric Partially Accommodative Esotropia

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Introduction: Different compartmental innervation and function of extraocular muscle has been described by several authors, suggesting that surgery to a portion of the muscle may successfully correct strabismus.(1,2)

Methods: This is a prospective study to evaluate the efficacy and safety of medical rectus fenestration as a weakening procedure in partially accommodative esotropia. Fenestration technique involves making two splitting incision by blunt dissection parallel to the muscle fibers on the superior and inferior borders of the muscle, leaving 1 mm of muscle fibers on each edge. The rectangular wide central part is excised from the insertion and between the two splitting incision to a point back 5-8 mm depending on the angle of the esotropia. This is a sutureless procedure.

Results: The study was conducted on 50 patients with esotropia between 20 and 40 PD with a 1 year follow up. The procedure achieved successful result in 84% of the patients (8PD of ET or less). The remaining 16% were undercorrected. The procedure was shorter in time than a regular recession and well tolerated by patients.

Conclusion/Relevance: Fenestration technique is a safe and effective weakening procedure for medial rectus in cases of partially accommodative esotropia.

References: 1. Demer JL, Clark RA, da Silva Costa RM, Kung J, Yoo L. Expanding repertoire in the oculomotor periphery: selective compartmental function in rectus extraocular muscles. Ann N Y Acad Sci 2011;1233:8-16.
2. Da Silva Costa RM, Kung J, Poukens V, Yoo L, Tychsen L, Demer JL. Intramuscular innervation of primate extraocular muscles: unique compartmentalization in horizontal recti. Invest Ophthalmol Vis Sci 2011;52(5):2830-6.

Paper #20
Saturday, April 10, 2021
10:25 AM – 10:32 AM

A Novel Suture: Adjustable Superior Oblique Spacer with Optional 7 Days Delayed Adjustment

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Introduction: Superior Oblique (SO) spacer sutures may correct tight SO incomitant strabismus. Suh described SO-spacer for optional intraoperative suture adjustment (1). To our knowledge, no former technique describes adjustable SO-spacer with optional delayed suture adjustment.

Methods: A novel suture technique was developed. A double-armed Mersilene 6-0 suture spacer for the SO tendon was combined with a short-tag-noose Vicryl 6-0 and an extra Vicryl 6-0 'belt' around the tendon and spacer sutures. Adjustment was only performed if needed.

Results: 59 SO-spacers were placed in 56 patients, age 5-84 (mean 46y), 34 women.
Diagnoses: A-pattern ET, Brown syndrome, vertical incomitant deviation, thyroid eye disease, myokymia, 3rd nerve palsy, blow-out fracture. Mean spacer length was 5.9mm (range 4-10mm). Preoperatively exaggerated forced duction test showed decreased excyclotorsion: median 5º (range 0º-20º), which increased to median 30º (range 20º-60º) after surgery. Mean effect on vertical deviation in PP was 5,1 PD/mm tendon lengthening. Mean reduction of vertical deviation on contralateral sidegaze was 10,3 PD (range 2-28 PD). Two patients were outside target and adjusted to within target on postoperative day 6 and 7, respectively. At long term follow-up (median 120 days, range 1-330 days) success was achieved in 88%.

Conclusion/Relevance: A table for SO-spacer length surgery is currently unavailable, thus adjustable sutures are warranted (2). This novel suture technique allows for delayed adjustment of SO spacers if primary surgery falls outside preoperative target. The technique was found safe in all patients, and in two of 56 patients, delayed suture adjustment was performed to collapse A-pattern or correct induced excyclotorsion.

References: 1. An adjustable superior oblique tendon spacer with the use of nonabsorbable suture., Suh DW, Guyton DL, Hunter DG, J AAPOS. 2001 Jun;5(3):164-71.
2. Loenkvist CS, Torp-Pedersen TE, Saunte JP: Effect on vertical deviation in superior oblique spacer surgeries - 31 cases. Poster, ESA meeting, Porto, Portugal 2017.

Paper #21
Saturday, April 10, 2021
10:32 AM – 10:39 AM

The Flipped Classroom Approach to Teaching Horizontal Strabismus in Ophthalmology Residency: A Multi-Centered Randomized Controlled Study

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Introduction: The flipped classroom involves watching pre-recorded lectures at home followed by group learning exercises within the classroom. This study compares the flipped classroom to the traditional classroom for teaching horizontal strabismus didactics in ophthalmology residency.

Methods: In this multi-center, randomized controlled survey study from October 2017 to July 2018, 110 ophthalmology residents were taught esotropia and exotropia sequentially, randomized by order and classroom style. Flipped classroom participants were assigned a pre-class video lecture prior to the in-class case-based activity. The traditional classroom included a preparatory reading assignment and an in-person lecture. Residents completed three identical 5-question assessments (pre-test, post-test, and 3-month retention) and surveys for each classroom. The primary outcome measured residents' preferences for classroom styles; the secondary outcome compared knowledge acquisition.

Results: Among 110 participants, the flipped classroom resulted in greater at-home preparation than the traditional classroom ($p=.001$), was preferred by 33/53 (62%) of residents, and 45/53 (85%) wished to see the flipped classroom utilized ≥25% of the time. The exotropia flipped classroom scored higher than the traditional classroom on the pre-test (3.71/5 vs. 2.87/5, $p<.001$), post-test (4.53/5 vs. 4.13/5, $p=.01$), but not the 3-month retention test (3.53/5 vs. 3.37/5, $p=.48$). The esotropia classroom styles did not differ on pre-test or post-test but demonstrated higher scores for traditional classroom at 3-month retention (3.43/5 vs. 2.92/5, $p=.03$). Advantages cited for flipped classroom include being interactive and engaging while incentivizing better classroom preparation.

Conclusion/Relevance: The flipped classroom method was received favorably by trainees and may complement traditional methods of teaching.

References: Cabrera MT, Yanovitch TL, Gandhi NG, Ding L, Enyedi LB. The flipped-classroom approach to teaching horizontal strabismus in ophthalmology residency: a pilot study. J AAPOS. 2019;23(4):200 e201-200 e206.
HEW, K.F., LO, C.K. Flipped classroom improves student learning in health professions education: a meta-analysis. BMC Med Educ 18, 38 (2018).
Jill Allenbaugh, Carla Spagnoletti, and Kathryn Berlacher (2019) Effects of a Flipped Classroom Curriculum on Inpatient Cardiology Resident Education. Journal of Graduate Medical Education: April 2019, Vol. 11, No. 2, pp. 196-201.

Paper #22
Saturday, April 10, 2021
10:43 AM – 10:50 AM

OPTIC-X Study: Teprotumumab Use as Retreatment and in Longer Duration Thyroid Eye Disease (TED)

Raymond S. Douglas, MD, PhD; Saba Sile, MD; Terry J. Smith, MD; George J. Kahaly, MD, PhD

Introduction: Teprotumumab, an IGF-IR inhibitory antibody, improves proptosis, diplopia, inflammatory signs/symptoms, and quality of life in TED.[1,2] In the phase 3, double-masked, randomized, placebo-controlled trial (OPTIC), 83% receiving teprotumumab were responders (≥2 mm proptosis reduction) after 24-weeks (vs. 10% placebo).[2] Extension of OPTIC (OPTIC-X) examined retreatment benefit (additional 24-weeks) in those with: disease exacerbation (flare) or initial non-response and longer-term TED course.

Methods: Teprotumumab/placebo OPTIC non-responders (n=36 placebo, n=5 teprotumumab) at Week-24 of OPTIC (<2 mm proptosis reduction) enrolled in OPTIC-X as did flared (n=1 placebo, n=9 teprotumumab) (≥2 mm proptosis or ≥2 CAS increase from Week-24 with absolute CAS ≥4 and symptom development) during OPTIC follow-up. Primary efficacy endpoint was proptosis responder rate.

Results: In OPTIC-X, 14 teprotumumab patients were retreated and 37 placebo patients (mean TED duration of 12.3 versus 6.2 mo in OPTIC teprotumumab) received first treatment with teprotumumab. 89% of previous placebo patients were responders (mean -3.5 mm), comparable to OPTIC results. In those retreated, 2/5 OPTIC non-responders (proptosis reduction averaged 1.5 mm from OPTIC-X baseline, 2.5 mm from OPTIC baseline) and in 5/8 patients who flared during follow-up (proptosis reduction averaged 1.9 mm from OPTIC-X baseline, 3.3 mm from OPTIC baseline). 1 additional flare patient (5 mm proptosis reduction) had a delayed visit due to COVID and was excluded from Week-24 analysis. No new safety signals were identified.

Conclusion/Relevance: Teprotumumab exhibits comparable efficacy in longer duration disease to that of shorter duration. Patients who have an initial insufficient response or flare after response may safely benefit from additional teprotumumab therapy.

References: 1. Smith TJ, et al. N Engl J Med 2017;376:1748-1761. 2. Douglas RS, et al. N Engl J Med 2020;382:341-352.

Paper #23
Saturday, April 10, 2021
10:54 AM – 11:01 AM

Evaluating a More Conservative Approach to the Management of Congenital Nasolacrimal Duct Obstruction: Analysis of Outcomes over a Ten-Year Period

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Introduction: Congenital nasolacrimal duct obstruction is conventionally followed until 12 months when patients undergo a probing procedure under general anesthesia. This study evaluates clinical outcomes for deferred intervention beyond 12 months of age.

Methods: This retrospective chart review at a single tertiary children's hospital from 2007 to 2017 compared early vs. late spontaneous resolution (cut off 12 months) and intervention (cut off 15 months) groups, testing for non-inferiority (margin: 10%) of the late group with regard to anisometropia (≥ 1 D of sphere or cylinder), amblyopia (≥ 2 levels difference in Teller acuity or optotype testing), and surgical success. Missing data was obtained by phone calls to parents/guardians.

Results: A total of 462 patients were included (152 early; 310 late group). Surgery was performed in 95% early and 82% late patients (at median age 12.0 [interquartile range: 10.0, 14.0] vs. 27.0 [interquartile range: 20.0, 37.5] months, respectively). Anisometropia was seen in 12% early vs. 11% late patients (P=0.003, 90% CI [-0.22, -0.02]), and amblyopia in 3% early vs. 5% late patients (P=0.001, 90% CI [-0.05,0.04]). Spontaneous resolution was seen in 76% between 12 and 24 months (n=41). All statistics are for non-inferiority.

Conclusion/Relevance: Delayed intervention for congenital nasolacrimal duct obstruction beyond 12 months in|a retrospective sample was not associated with worse clinical outcomes, with frequent|spontaneous resolution. This study supports the practice of offering some patients|deferred intervention up to 2 years of age.

References: 1) Fick RP, Katusic SK, Colligan RC et al. Cognitive and behavioral outcomes after early exposure to anesthesia and surgery. Pediatrics 2011;128(5):e1053-61.
2) Matta NS, Singman EL, Silbert DI. Prevalence of amblyopia risk factors in congenital nasolacrimal duct obstruction. J AAPOS. 2010 Oct;14(5):386-8
3) Pediatric Eye Disease Investigator Group. Resolution of congenital nasolacrimal duct obstruction with nonsurgical management. Arch Ophthalmol. 2012 Jun;130(6):730-4
4) Schellini SA, Ferreira Ribeiro SC, Jaqueta E, Padovani CR, Padovani CR. Spontaneous resolution in congenital nasolacrimal obstruction after 12 months. Semin Ophthalmol. 2007 Apr-Jun;22(2):71-4.
5) Sathiamoorthi S, Frank RD, Mohney BG. Spontaneous resolution and timing of intervention in congenital nasolacrimal duct obstruction. JAMA Ophthalmol. 2018;136(11):1281-1286.

Paper #24
Saturday, April 10, 2021
11:05 AM – 11:12 AM

Patient and Provider Experience During Real-Time Pediatric Ophthalmology Telemedicine Consultations

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Introduction: Telemedicine adoption hinges on positive experiences for patients and providers.[1,2] We report participants' experience from our prospective study.[3]

Methods: Examinations were conducted by an optometrist using digital exam instruments and streamed to an ophthalmologist. The ophthalmologist, optometrist, parent, patient (if >10 years), and research coordinator completed surveys capturing satisfaction/experience outcomes.

Results: 348 examinations were conducted with 210 patients (aged 0-17). 99% of parents (98% of patients) were comfortable with exam quality and 97% of parents (71% of patients) indicated they would have another telemedicine exam. 54/55 consented for surgery during the initial telemedicine examination. Telemedicine increased access, reducing wait times by 7 months. However, 34% of families traveled >1 hour to their appointment, and 1/3 of parents and patients missed a full day of work or school. Technical proficiency was most challenging with the digital indirect ophthalmoscope; however all exams were adequate for diagnosis. On average, exams lasted 1.3 hours if comprehensive and 43 minutes if problem-focused. Equipment challenges caused delays in 40/348 (11.5%) of visits. Most involved the Pivothead (18/40) or Polycom codec (13/40) with the majority of delays 5-10 minutes. In 9/40 cases a backup piece of equipment was used. Telemedicine enabled the optometrist to manage or co-manage more complex patients, with a pipeline to the ophthalmologist for surgical cases.

Conclusion/Relevance: All parties were satisfied with telemedicine, despite longer durations and learning curve. Results indicate a demand for telemedicine in community settings to improve access to specialized care. In the right setting, collaborative telemedicine consultations may be beneficial to one's practice.

References:

1. Sreelatha OK, Ramesh SV. Teleophthalmology: improving patient outcomes? Clin Ophthalmol. 2016;10:285-95.
2. Kurji K, Kiage D, Rudnisky CJ, et al. Improving diabetic retinopathy screening in Africa: Patient satisfaction with teleophthalmology versus ophthalmologist-based screening. Middle East Afr J Ophthalmol 2013; 20: 56-60.
3. Nallasamy S, Coffey-Sandoval , Stewart C, et al. Reliability of Telemedicine for Real-Time Pediatric Ophthalmology Consultation. AAPOS 2019 Paper Presentation.

Paper #25
Saturday, April 10, 2021
12:30 PM – 12:37 PM

The Relationship between Reversal of Optic Nerve Head Cupping and Morphometric Changes as Measured by Intra-Operative Mounted Optical Coherence Tomography in Childhood Glaucoma

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Introduction: Optic Nerve Head (ONH) cupping reversal after intraocular pressure (IOP) reduction has been considered an indicator of treatment success in childhood glaucoma; however, the functional significance of cupping reversal in infants and young children remains unknown. Here we examine structural changes occurring in the ONH and macula in infants with childhood glaucoma, as captured by intra-operative spectral-domain optical coherence tomography (SD-OCT), following clinically observed IOP reduction and ONH cupping reversal.

Methods: Ongoing prospective case series of childhood glaucoma patients, imaged with mounted SD-OCT pre- and post-glaucoma intervention, and demonstrating ONH cupping reversal. Clinical parameters and SD-OCT peripapillary retinal nerve fiber layer (pRNFL) and macular scans (3mm volume) were evaluated for quantitative changes.

Results: Fourteen eyes of 11 children (mean age 1.24±0.99 yrs, range 0.3-4.19) were included to date. Mean interval between SD-OCT imaging was 138 days (range 35-595). Following intervention, mean reduction in cup-to-disc ratio was 0.31±0.13 (p=0.000001), mean decrease in axial length was 0.35±0.21mm (p=0.0002), and mean IOP reduction was 42% (pre- vs. post-treatment IOP was 26.2±6.9 vs. 14.5±3.8mmHg, respectively, p=0.00004). Mean pRNFL thickness pre- vs. post-treatment was 94.1±16.3 vs. 96.2±17.1µm, respectively, p=0.21. Mean macular volume pre- vs. post-treatment was 2.11±0.26 vs. 2.14±0.27mm3, respectively, p=0.06.

Conclusion/Relevance: In very young children with glaucoma, clinical ONH cupping reversal after IOP-lowering intervention was associated with axial length reduction, but not with changes in the SD-OCT-assessed pRNFL thickness or macular volume. ONH cupping reversal likely marks stabilization but any pre-intervention pRNFL (and by extension, ONH) damage likely persists despite ONH cupping reversal.

References: Meirelles, S. H. S., Mathias, C. R., Bloise, R. R., Stohler, N. S. F., Liporaci, S. D., Frota, A. C., & Simões, C. C. (2008). Evaluation of the factors associated with the reversal of the disc cupping after surgical treatment of childhood glaucoma. Journal of glaucoma, 17(6), 470-473.
Chang, T. C., & Grajewski, A. L. (2016). Paradoxical thinning of the retinal nerve fiber layer after reversal of cupping: a case report of primary infantile glaucoma. Indian journal of ophthalmology, 64(9), 690.
Ely, A. L., El-Dairi, M. A., & Freedman, S. F. (2014). Cupping reversal in pediatric glaucoma—evaluation of the retinal nerve fiber layer and visual field. American journal of ophthalmology, 158(5), 905-915.

Paper #26
Saturday, April 10, 2021
12:37 PM – 12:44 PM

Anterior Segment Optical Coherence Tomography (AS-OCT) Findings in the Infant Aphakia Treatment Study (IATS)

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Introduction: The IATS has noted a 22% prevalence of glaucoma and 18% glaucoma suspect at ten years of follow-up 1. However the mechanism of glaucoma following congenital cataract surgery remains unclear.

Methods: A multicenter randomized controlled trial of 114 infants with unilateral congenital cataract who were between 1-6 months old at surgery. 110 subjects had a 10.5-year visit (55 in each of the intraocular lens (IOL) and contact lens (CL) groups). AS-OCT was attempted on both eyes of all patients who presented for the IATS 10 year examination using the Heidelberg SPECTRALIS anterior segment module (Heidelberg Engineering GmbH). An image of both the nasal and temporal angle was required to use the angle measuring software to determine the angle opening distance (AOD) and the anterior chamber angle (ACA). Two masked readers (AB and SF) used a standardized protocol to assess AOD and ACA for all readable images.

Results: 42/110 (38.2%) subjects had readable images for both of their eyes. 54/110 (49.1%) treated eye images and 58/110 (52.7%) fellow eyes were readable. The average nasal and temporal AOD and ACA were not significantly different between the IOL and CL groups, between treated eyes and fellow eyes, or between treated eyes with glaucoma or without glaucoma.

Conclusion/Relevance: AS-OCT did not demonstrate significant differences in AOD or ACA in eyes with glaucoma compared to those without glaucoma in IATS. This finding is consistent with prior studies demonstrating that glaucoma following congenital cataract surgery is predominantly open angle 2.

References: 1. Freedman SF, Beck AD, Nizam A, et al, for the Infant Aphakia Treatment Study Group. Glaucoma-related adverse events at 10 years in the Infant Aphakia Treatment Study: a randomized clinical trial. JAMA Ophthalmology in press.
2. Chen TC, Walton DS, Bhatia LS. Aphakic glaucoma after congenital cataract surgery. Arch Ophthalmol 2004;122(12):1819-25.

Paper #27
Saturday, April 10, 2021
12:44 PM – 12:51 PM

One-year Results of Circumferential Trabeculotomy in Pediatric Glaucoma following Cataract Surgery

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Introduction: The management of pediatric glaucoma following cataract surgery (GFCS)is challenging. This study looks at the results of 2-site trabeculotomy in eyes with pediatric aphakic and pseudophakic glaucoma, 1 year postoperatively

Methods: This prospective,institutional study was performed on 33 eyes of patients with GFCS, aged </=14 years. Patients underwent a 2-site trabeculotomy using the rigid probe trabeculotome, through a superonasal and an inferotemporal scleral flap. Intraocular pressure (IOP), complications, and success rates at one year were reported. Success was defined as IOP < 23 mmHg or 30% IOP reduction at 1 year, without the need for another glaucoma procedure

Results: Patients were aged 5.73±1.79 years. We excluded 4 eyes in which >180-degree incision could not be achieved. Sixteen eyes were aphakic and 13 eyes were pseudophakic. A complete, circumferential incision was achieved in 14 eyes (48%). At 1-year, median IOP reduction was 50.8%. Success was achieved in 26 eyes (89.6%), of which 15 were controlled without medications. All pseudophakic patients had surgical success, while the success rate in the aphakic group was 81.2%, with 3 eyes requiring further glaucoma procedures to control their IOP (P=0.2). One eye required core vitrectomy for vitreous hemorrhage

Conclusion/Relevance: Two-site trabeculotomy can be considered as a first-line procedure in eyes with GFCS that do not have extensive synechial angle closure. Non-clearing vitreous haemorrhage is the most serious possible complication which, although uncommon, may require pars plana vitrectomy

References: 1.Dao JB, Sarkisian SR Jr, Freedman SF. Illuminated microcatheter-facilitated 360-degree trabeculotomy for refractory aphakic and juvenile open-angle glaucoma. J Glaucoma. 2014 Sep;23(7):449-54.
2.Lim ME, Dao JB, Freedman SF. 360-Degree Trabeculotomy for Medically Refractory Glaucoma Following Cataract Surgery and Juvenile Open-Angle Glaucoma. Am J Ophthalmol. 2017 Mar;175:1-7.
3.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.

Paper #28
Saturday, April 10, 2021
12:51 PM – 12:58 PM

Dual Blade Ab-interno Trabeculectomy versus Goniotomy in Primary Congenital Glaucoma

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Introduction: Management of primary congenital glaucoma (PCG) is challenging. Kahook dual blade (KDB) removes a strip of the trabecular meshwork which could make it superior to simple goniotomy in treating the angle anomaly. This study compares KDB ab-interno trabeculectomy to conventional goniotomy in PCG

Methods: 42 eyes with PCG were randomized to undergo ab-interno trabeculectomy using the KDB or goniotomy using a 25-gauge irrigating needle, targeting 120-140 degrees of the nasal iridocorneal angle. Patients were seen at 1, 3, 6 and 12 months. Success was defined as IOP</=21 mmHg at final follow-up, with no evidence of glaucoma progression or need further surgery

Results: KDB group included 21 eyes with a median age of 6 months and the goniotomy group included 21 eyes with a median age of 5 months at time of surgery. There was a significant reduction in IOP in both groups at all follow-up visits. The reduction in number of glaucoma medications was significant at 1,3 and 6 months postoperatively in the KDB group, and at 1 month in the goniotomy group.There was no significant difference in IOP or glaucoma medications between both groups at any follow-up visit. Success was achieved in 12 eyes (57.1%) in each group, with no eyes developing any serious complications.

Conclusion/Relevance: There was a significant reduction in IOP in both groups but no significant difference between both groups in IOP, glaucoma medications or success rates at final follow-up. One-year follow-up shows that KDB is at least as effective as goniotomy in the treatment of PCG

References: 1-Khouri AS, Wong SH.Ab Interno Trabeculectomy With a Dual Blade: Surgical Technique for Childhood Glaucoma.J Glaucoma. 2017 Aug;26(8):749-751
2- Elhusseiny AM, El Sayed YM, El Sheikh RH, Gawdat GI, Elhilali HM.Circumferential Schlemm's Canal Surgery in Adult and Pediatric Glaucoma. Curr Eye Res. 2019 Aug 29:1-10. doi: 10.1080/02713683.2019.1659975

Paper #29
Saturday, April 10, 2021
12:58 PM – 1:05 PM

Visual Acuity, Refractive Error and Regression Outcomes in 169 Children with High Myopia Implanted with Two Different IOLs

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Introduction: Reports of phakic IOL (pIOL) implantation performed on children to correct high myopia tend to be case reports or small series. Here we analyze outcomes in a large cohort of spectacle-aversive children treated by implantation of the Ophtec-Artisan or Visian pIOL.

Methods: Outcome data were collated retrospectively in 78 children (115 eyes) implanted with the Ophtec-Artisan iris-enclaved anterior chamber pIOL and 91 children (154 eyes) implanted with the Visian ICL (intraocular collamer lens) sulcus pIOL. All children had difficulties with spectacle and/or contact lens wear. Mean age at surgery was 9.9 yrs; mean follow-up was 3.9 yrs (range 0.6 - 14.1 yrs).

Results: Spherical correction averaged 12.3 ± 1.0 D. 92% of eyes were corrected to within ± 0.5 D of their target value. Refractive spherical regression was -0.04 D/yr at last follow-up. Uncorrected distance visual acuity (UDVA) improved from an average logMAR 1.8 to 0.4; CDVA improved an average of 0.3 logMAR. 68% of children treated had a gain in binocular fusion. 87% of the children had neurobehavioral and/or visuomotor co-morbidities. Five eyes (2%) developed retinal detachment an average 6 yrs after implantation. Nine eyes (3%) implanted with the Ophtec-Artisan pIOL required repositioning after trauma.

Conclusion/Relevance: Implantation of pIOLs in children is an effective method for correcting high myopia in spectacle non-compliant children. Rates of myopic regression after pIOL surgery are substantially lower than those reported for children treated by excimer laser photorefractive keratectomy (PRK). The prevalence of major complications was reasonably low in this high risk population.

References: N/A

Paper #30
Saturday, April 10, 2021
1:09 PM – 1:16 PM

Excimer Laser Keratectomy and Phakic Intraocular Lens Implantation Surgery for Children with Autism: Improvements in Visual Function and Behavior

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Introduction: Children with autism spectrum disorder (ASD), high ametropia, and spectacle noncompliance who undergo refractive surgery may experience visual, social and behavioral improvements.

Methods: Data were collated retrospectively for 36 children with a formal diagnosis of ASD. Myopic laser surgery was performed on 11 children (21 eyes); hyperopic laser on 13 (19 eyes); and myopic pIOL implantation on 12 (21 eyes) at Children's Hospital under general anesthesia. 75% (27/36) were treated for isoametropia and 25% (9/36) for anisometropia. 83% (30) were male. Median age was 13.9 yrs. (range 3.5 -22.7) and median follow-up 1.8 yrs. (0.5 - 11.9).|

Results: SEQRE in the hyperopic children corrected from +4.25 ± 2.3 D to +1.25 ± 0.8 D; in the myopic laser treated children from -5.75 ± 1.7 D to - 0.13 ± 0.9 D, and in the pIOL children from -10.4 ± 3.9 D to 0 ± 0.6 D. UDVA improved an average 0.62 logMAR, from 0.8 ± 0.3 (20/125) to 0.18 ± 0.2 (20/30). Social interactions and ASD behaviors improved in 69% (25/36) of the treated children. The behavioral gains included changes in: school performance; motor skills and depth perception; repetitive or stereotyped movements; anxiety/fear; and attention. There were no reports of decreased quality of life or exacerbations of ASD behaviors.

Conclusion/Relevance: Refractive error and UDVA improved substantially in this cohort of difficult-to-manage, special needs children. Excimer laser and phakic IOL implantation surgery appears to be effective for improving both visual function and behaviors in the majority of ametropic children with ASD.

References: N/A

Paper #31
Saturday, April 10, 2021
1:16 PM – 1:23 PM

Glasses versus Observation for Moderate Bilateral Astigmatism in 1- to 7-Year-Olds

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Introduction: Although uncorrected astigmatism in young children is associated with the development of amblyopia, guidelines for spectacle correction are based primarily on provider surveys.[1-2] This study compares visual outcomes in children with moderate bilateral astigmatism treated with glasses to those who were merely observed.

Methods: The medical records of all children aged 1 to 7 years diagnosed with moderate bilateral astigmatism (+1.25 to +3.25 diopters (D)) at a single institution over a twelve-year period were retrospectively reviewed. Children with anisometropia >/= 1.00D, hyperopia >/= +3.00D, myopia >/= -3.00D, amblyopia, or strabismus at diagnosis were excluded. Observation or full spectacle correction of astigmatism was at the provider's discretion. Kaplan-Meier rates of developing amblyopia and strabismus were assessed over a minimum of 18 months.

Results: Eighty-five (6.9 %) of 1235 subjects met inclusion criteria; 58 (68.2%) were prescribed glasses while 27 (31.8%) were observed. The groups differed by mean age at diagnosis (3.3±1.5 years for observed vs. 3.9±1.4 years for glasses [p=0.02]) and mean amount of astigmatism (1.73±0.43D for observed vs. 2.00±0.51D for glasses [p=0.03]). The Kaplan-Meier rate of developing amblyopia was 8.3% (95% CI 0-19.4%) in the observed group and 10.3% (95% CI 1.5-19.1%) in the glasses group [p=0.74] while strabismus was 7.1% (95% CI 0-20.6%) among those observed and 7.1% (95% CI 0.4-13.8%) of those prescribed glasses [p=0.60].

Conclusion/Relevance: Rates of amblyopia and strabismus were modest in this study of children with moderate bilateral astigmatism. These results suggest that spectacle correction may be no better than observation for children with these characteristics.

References: 1. Harvey, E.M., et al., Prescribing eyeglass correction for astigmatism in infancy and early childhood: a survey of AAPOS members. J AAPOS, 2005. 9(2): p. 189-91.
2. Miller, J.M. and E.M. Harvey, Spectacle prescribing recommendations of AAPOS members. J Pediatr Ophthalmol Strabismus, 1998. 35(1): p. 51-2.

Paper #32
Saturday, April 10, 2021
1:23 PM – 1:30 PM

A Different Type of Genetic Therapy: Correcting a Defective Gene using Antisense Oligonucleotide Treatment in CEP290 p.Cys998X LCA

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Introduction: LCA10, a common form of inherited retinal disease, causes severe childhood-onset vision loss/blindness. Sepofarsen is an RNA therapy targeted to treat LCA10 due to c.2991+1655A>G mutation in the CEP290 gene (p.Cys998X).

Methods: In a 12-month, multicenter, open-label, multiple-dose escalation, phase 1b/2 trial, subjects aged 8–44 years received sepofarsen at loading/maintenance dose of 160/80 µg or 320/160 µg via 1–4 intravitreal injections in the eye with worse best-corrected visual acuity (BCVA). Primary endpoint: frequency and severity of ocular adverse events (AEs) in the treated and untreated contralateral eyes. Secondary endpoints: serum PK, non-ocular AEs, and change in functional and anatomic ophthalmic findings.

Results: Eleven subjects were enrolled. Reported cases of cataracts, mild cystoid macular edema, and retinal thinning were 3, 0, and 0, respectively, in the 160µg/80µg group; 5, 2, and 2 in the 320µg/160µg group. No other safety concerns were identified. Pooled data (n=11) and the 160µg/80µg dose group (n=6) showed improvements from baseline to Month 12 in treated eyes versus untreated eyes in mean±standard error of the mean (SEM) BCVA (-0.55±0.26 versus -0.12±0.07 logMAR, $P<0.05$; -0.93±0.43 versus -0.22±0.11 logMAR, $P=0.13$; respectively), red full-field stimulus test (FST: -0.91±0.18 versus -0.16±0.16 log cd/m2, $P<0.01$; -0.66±0.14 versus +0.05±0.17 log cd/m2, $P<0.05$), and blue FST (-0.79±0.23 versus +0.02±0.11 log cd/m2, $P<0.02$; -0.63±0.31 versus +0.12±0.16 log cd/m2, $P=0.09$).

Conclusion/Relevance: Sepofarsen had a manageable safety profile and showed statistically significant differences for the within-subject improvement in mean BCVA and FST, in adults and children with LCA10. The phase 2/3 trial is ongoing.

References: Cideciyan AV, Jacobson SG, Drack AV, …et al. . Effect of an intravitreal antisense oligonucleotide on vision in Leber congenital amaurosis due to a photoreceptor cilium defect.. Nat Med. 2019 Feb;25(2):225-228. doi: 10.1038/s41591-018-0295-0. Epub 2018 Dec 17.

Paper #33
Sunday, April 11, 2021
10:20 AM – 10:27 AM

Validation of Use of Smartphone Based Screening for Retinopathy of Prematurity in Low Resource Setting

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Introduction: Retinopathy of prematurity (ROP) is an emerging public heath problem in developing countries. Setting up a cost effective tele screening is a big challenge. The aim of this project is to study the validity of smartphone based screening to detect ROP in the stage which needs immediate referral and treatment.

Methods: It was an observational validation study. All new patients fulfilling screening criteria (Birth weight ≤ 1700 gm Gestational age ≤ 35 weeks) were screened by pediatric ophthalmologist using gold standard indirect ophthalmoscopy. A trained photographer captured picture of fundus using smartphone fitted on an adapter. The photographs were graded by two masked graders (Retina specialists)

Results: A total of 84 children (168 eyes) were included. ROP was detected in 27.4% with gold standard examination, among which 14.85 % required immediate intervention. Sensitivity of grader 1 in detecting treatment required ROP was 85 %, specificity 97% (k= 0.81) Negative Predictive value (PPP) 97% and Positive Predictive (PPP) 85%. The sensitivity of Grader 2 was 83% Specificity 95% (k=0.744) PPV 74% and NPP 97%. The measured K for inter grader agreement was 0.93.

Conclusion/Relevance: The results are similar to other studies comparing digital images versus indirect ophthalmoscope. Studies on smartphone based screening are very few; one of which is its comparison with the Retcam. Screening ROP by using smartphone is a cost effective option in detecting disease which requires immediate referral and treatment.

References: 1. Telemedicine approaches to evaluating acute-phase ROP (e-ROP) Cooperative Group. Validity of a telemedicine system for the evaluation of acute- phase ROP. JAMA Ophthalmol. 2014 October; 132(10): 1178–1184

2. Dhaliwal C1, Wright E, Graham C, McIntosh N, Fleck BW. Wide-field digital retinal imaging versus binocular indirect ophthalmoscopy for retinopathy of prematurity screening: a two-observer prospective, randomised comparison. Br J Ophthalmol. 2009 Mar;93(3):355-

3.Maximilian W. M. Wintergerst, Michael Petrak, Petra P. Larsen, et al. Non contact smartphone based fundus photography in retinopathy of prematurity. ARVO 2018 # BO 156.

Paper #34
Sunday, April 11, 2021
10:27 AM – 10:34 AM

Update on International Classification of Retinopathy of Prematurity, 3rd Edition (ICROP3)

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Introduction: In 1984, a consensus classification of acute retinopathy of prematurity (ROP) was created by the International Classification of ROP (ICROP). In 2005, this was revisited to incorporate advances. Now, a third edition is required because: (1) There are concerns about subjectivity in critical elements of ROP classification. (2) Innovations in imaging are raising questions about validity of traditional ophthalmoscopic tenets. (3) Major advances in treatment (e.g. anti-VEGF agents) are creating new challenges regarding classification of post-treatment regression and reactivation.

Methods: An international committee (18 countries represented) of pediatric ophthalmologists (n=14) and retinal specialists (n=20) was assembled by the authors and facilitated by IPOS. The group was broken into three subcommittees (acute phase, regression/reactivation, imaging). Iterative videoconferences and two in-person meetings are used to develop consensus on classification.

Results: Key updates at this time include definition of more refined classification metrics (e.g. 'posterior zone II', 'notch' to describe disease incursion into a more posterior zone, sub-categorization of stage 5, continuous spectrum of vascular abnormality from normal to plus disease), definition of nomenclature representing ROP regression and reactivation, and description of long-term disease sequelae. These will be summarized, with review of classification metrics that remain unchanged.

Conclusion/Relevance: This will update ROP classification by integrating review of evidence-based literature with expert consensus opinion, and are of clinical relevance to every pediatric ophthalmologist. These principles will improve quality and standardization of ROP care worldwide, while providing a foundation for advancing research and clinical care in the future.

References: 1. An international classification of retinopathy of prematurity. The Committee for the Classification of Retinopathy of Prematurity. Arch Ophthalmol. 1984;102(8):1130-1134.
2. The International Classification of Retinopathy of Prematurity Revisited. Arch Ophthal. 2005;123(7):991-999.
3. Mintz-Hittner HA, Kennedy KA, Chuang AZ. Efficacy of intravitreal bevacizumab for stage 3+ retinopathy of prematurity. N Engl J Med 2001;364:603-615.

Paper #35
Sunday, April 11, 2021
10:34 AM – 10:41 AM

Effectiveness of Very Low-Dose Intravitreous Bevacizumab for Retinopathy of Prematurity

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Introduction: Intravitreous bevacizumab (0.25 to 0.625 mg) is commonly used to treat type 1 retinopathy of prematurity (ROP), but there are concerns about systemic toxicity, particularly the risk of neurodevelopmental delay. A much lower dose may be effective for ROP while reducing systemic risk. Previously, we reported that doses as low as 0.031 mg were effective in small cohorts of infants.

Methods: Fifty-nine premature infants (mean BW = 664 g; mean GA = 24.8 weeks) with type 1 ROP in one or both eyes were enrolled in a masked, multi-center, dose de-escalation study. In cohorts of 10-14, one eye per infant received 0.016 mg, 0.008 mg, 0.004 mg, or 0.002 mg of intravitreous bevacizumab. Diluted bevacizumab was prepared by individual research pharmacies and delivered using 300 microliter syringes with 5/16th inch, 30g fixed needles. Success was defined as improvement by 4 days post-injection, and no recurrence of type 1 ROP or severe neovascularization requiring additional treatment within 4 weeks.

Results: A successful 4-week outcome was achieved for 13 of 13 eyes receiving 0.016 mg, 9 of 9 eyes receiving 0.008 mg, 9 of 10 eyes receiving 0.004 mg, but only 17 of 23 eyes (74%) receiving 0.002 mg.

Conclusion/Relevance: Our data suggest we may have identified a lower limit of dose effectiveness of intravitreous bevacizumab for ROP. Further investigation is warranted to confirm effectiveness of this dose and its impact on plasma VEGF levels and peripheral retinal vascularization.

References: 1. Mintz-Hittner HA, Kennedy KA, Chuang AZ. Efficacy of intravitreal bevacizumab for stage 3+ retinopathy of prematurity. N Engl J Med. 2011;364(7):603-615.
2. Natarajan G, Shankaran S, Nolen TL, et al. Neurodevelopmental outcomes of preterm infants with retinopathy of prematurity by treatment. Pediatrics 2019;144(2).
3. Wallace DK, Kraker RT, Freedman SF, et al. Assessment of Lower Doses of Intravitreous Bevacizumab for Retinopathy of Prematurity: A Phase 1 Dosing Study. JAMA Ophthalmol. 2017;135(6):654-656.

Paper #36
Sunday, April 11, 2021
10:45 AM – 10:52 AM

Short-Term Risk of Retinal Detachment Following Treatment of Retinopathy of Prematurity with Laser Photocoagulation versus Intravitreal Anti-Vascular Endothelial Growth Factor

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Introduction: The choice of conventional retinal ablative laser photocoagulation or intravitreal injection of an anti-vascular endothelial growth factor agent (anti-VEGF) for initial treatment of retinopathy of prematurity (ROP) remains controversial. Comparative data are limited and describe retreatment rates rather than retinal structural outcomes predictive of long-term vision. Anti-VEGF acts faster than laser, which may be beneficial for more aggressive ROP.

Methods: We compared short-term retinal detachment rates following laser or anti-VEGF among 1,167 eyes of 640 infants with type 1 pre-threshold ROP. The primary outcome was rate of retinal detachment (ROP stage 4A, 4B, or 5) within 8 weeks of treatment, an endpoint predictive of poor long-term vision. The results were stratified by post-menstrual age at treatment, because earlier disease may be considered more aggressive. Cluster bootstrap analysis was used to compare primary outcomes between groups.

Results: Among 458 eyes treated before post-menstrual age 36 0/7 weeks, the short-term risk of retinal detachment was higher after laser (29/368 eyes, 7.9%) than after anti-VEGF (0/90 eyes, 0%) ($p<0.001$). Among 709 eyes treated at or after post-menstrual age 36 0/7 weeks, the short-term risk of retinal detachment did not differ between laser (20/635 eyes, 3.1%) and anti-VEGF (1/74 eyes, 1.4%)($p=0.26$).

Conclusion/Relevance: Intravitreal anti-VEGF results in better short-term structural outcomes than laser when type 1 ROP is treated prior to 36 0/7 weeks postmenstrual age. After this age, both treatments have very low short-term retinal detachment rates. The faster action of anti-VEGF is likely responsible for these findings.

References: 1. 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;121:1684-94.
2. Mintz-Hittner HA, Kennedy KA, Chuang AZ. Efficacy of intravitreal bevacizumab for stage 3+ retinopathy of prematurity. N Engl J Med 2011;364:603-15.
3. Barry GP, Tauber KA, Fisher M, Greenberg S, Zobal-Ratner J, Binenbaum G. Short-term retinal detachment risk after treatment of type 1 retinopathy of prematurity with laser photocoagulation versus intravitreal bevacizumab. J AAPOS 2019;23:260.e1-.e4.

Paper #37
Sunday, April 11, 2021
10:52 AM – 10:59 AM

Infants Initially Treated with Bevacizumab for Retinopathy of Prematurity (ROP): Follow-up for those Receiving Prophylactic Laser versus Continued Screening per Current United States ROP Screening Guidelines

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Introduction: Following anti-vascular endothelial growth factor (VEGF) treatment for retinopathy of prematurity (ROP), current United States ROP screening guidelines recommend examinations until complete retinal vascularization or >/=65 weeks postmenstrual age (PMA).[1] Since proliferative ROP can recur following anti-VEGF treatment,[2] some clinicians prophylactically laser remaining avascular retina. We compared ROP follow-up examinations (number/duration) among eyes initially treated with bevacizumab and either prophylactically lasered pre-hospital discharge or followed per current guidelines.

Methods: We included infants/eyes initially receiving bevacizumab for ROP (2015-2019) and longitudinally followed, including data previously reported from a phase 1 dose de-escalation study.[3] We divided infants/eyes into 3 groups: prophylactic laser, surveillance-only, or ROP reactivation meriting/receiving additional treatment. Number and duration (by PMA) of active ROP-screening examinations between prophylactic laser and surveillance-only groups were compared (Wilcoxon rank-sum test).

Results: Of 80 eyes (42 infants) initially treated with bevacizumab, 28(35.0%) received prophylactic laser, 42(52.5%) surveillance-only, and 10(12.5%) had ROP reactivation. The infants in the prophylactic laser group had fewer ROP-screening outpatient examinations (median=1.0vs7.0, p<0.001; median difference=6.0), and lower PMA at last ROP-screening examination vs. surveillance-only group (median=49.4vs61.3 weeks, p<0.001; median difference=11.9). Of eyes not prophylactically lasered pre-hospital discharge, 4(9.5%) had ROP reactivation meriting/receiving additional treatment.

Conclusion/Relevance: Following initial bevacizumab treatment for ROP, prophylactically lasering eyes pre-hospital discharge reduced the number and duration of outpatient ROP-screening examinations versus continued surveillance. Because it reduces the risk of late reactivation, examining older/larger infants is challenging, and adherence to frequent outpatient visits can be burdensome for families, prophylactic laser pre-hospital discharge may be beneficial.

References: 1. Fierson WM; American Academy of Pediatrics Section on Ophthalmology; American Academy of Ophthalmology; American Association for Pediatric Ophthalmology and Strabismus; American Association of Certified Orthoptists. Screening examination of premature infants for retinopathy of prematurity. Pediatrics. 2018 Dec;142(6):e20183061. doi:10.1542/peds.2018-3061
2. Hajrasouliha AR, Garcia-Gonzales JM, Shapiro MJ, Yoon H, Blair MP. Reactivation of Retinopathy of Prematurity Three Years After Treatment with Bevacizumab. Ophthalmic Surg Lasers Imaging Retina. 2017;48(3):255-259. doi:10.3928/23258160-20170301-10
3. Wallace DK, Dean TW, Hartnett ME, et al. A Dosing Study of Bevacizumab for Retinopathy of Prematurity: Late Recurrences and Additional Treatments. Ophthalmology. 2018;125(12):1961-1966. doi:10.1016/j.ophtha.2018.05.001

Paper #38
Sunday, April 11, 2021
10:59 AM – 11:06 AM

Angiographic Review of Choroidal Involution in Eyes with Retinopathy of Prematurity Post-Bevacizumab Treatment

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Introduction: Retinopathy of prematurity (ROP) is considered a disease of the inner retina; however, there is increasing evidence demonstrating choroidal vasculature loss, leading to degeneration of outer retinal function and visual deterioration. Central choroidal thinning is noted in children with history of ROP using optical coherence tomography (OCT) imaging. This study characterizes the presence and persistence of choroidal loss angiographically in eyes of infants treated with intravitreal bevacizumab (IVB) for stage 3 ROP

Methods: Retrospectively reviewed the fluorescein angiography (FA) images of 62 eyes of 31 infants treated with IVB monotherapy. The eyes with good quality early-, mid-, and late-phase imaging were included in this study. The presence of choroidal hypofluoresence involving the central and or peripheral retina were noted. In infants with multiple FAs, serial FAs were analyzed for persistence of choroidal hypofluorescence

Results: The mean age and birth weight of infants was 24.4 weeks PMA and 683 grams, respectively. All infants received IVB monotherapy. 24 of 62 angiography images of sufficient quality reviewed showed the presence of choroidal hypofluorescence involving central and peripheral lobular loss in the early phase and its persistence into mid and late phases. 12 eyes demonstrated persistent choroidal loss on sequential FA until three years chronological age

Conclusion/Relevance: The study demonstrates the sustained presence of choroidal vascular loss angiographically both central and peripheral fundus in infants with ROP. It highlights the critical role of choroidal involution in progressive outer retinal function with subsequent loss of retinal pigment epithelium and photoreceptors affecting the visual outcomes

References: 1. Shao Z, Dorfman AL, Seshadri S, et al. Choroidal involution is a key component of oxygen-induced retinopathy. Invest Ophthalmol Vis Sci. 2011;52(9):6238-48.
2. Rivera JC, Holm M, Austeng D, et al. Retinopathy of prematurity: inflammation, choroidal degeneration, and novel promising therapeutic strategies. J Neuroinflammation. 2017;14:165
3. Park KA, Oh SY. Analysis of spectral-domain optical coherence tomography in preterm children: retinal layer thickness and choroidal thickness profiles. Invest Ophthalmol Vis Sci. 2012;53:7201-7.

Paper #39
Sunday, April 11, 2021
11:06 AM – 11:13 AM

Vitreous Findings Quantified by Handheld Spectral Domain Optical Coherence Tomography Correlate with Retinopathy of Prematurity Severity

Michelle T. Cabrera; Alex T. Legocki; Emily Zepeda; Thomas B. Gillette; Phanith Touch; Aaron Y. Lee; Marcela Estrada; Kristina Tarczy-Hornoch

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Introduction: The relationship between vitreous anatomy and retinopathy of prematurity (ROP) is poorly understood. The goal of this study was to quantify punctate hyperreflective vitreous opacities and vitreous bands by handheld spectral domain optical coherence tomography (SD-OCT) and correlate these findings to ROP indicators.

Methods: In this prospective, observational study, premature infants requiring routine ROP screening were recruited between July 2015 and December 2017 at two academic medical center neonatal intensive care units. Handheld SD-OCT was performed at the time of routine ROP examinations. A subset of right eye images with known punctate hyperreflective vitreous opacities was selected for highest quality macular images. Two masked, trained graders then utilized a semi-automated approach to quantify punctate hyperreflective vitreous opacities within 5 B-scan images in and around the fovea (Vitreous Opacity Ratio).

Results: A total of 45 imaging sessions for 29 premature infant right eyes were included (55% female, mean birth weight 950.2±331.0 grams, mean gestational age 27.0+/-3.4 weeks). Two graders determined Vitreous Opacity Ratios (F1 score 0.82+/-0.36, Dice coefficient 0.97+/-0.04). Excluding post-laser visits, Vitreous Opacity Ratio was associated with ROP stage (P=0.02). Tractional vitreous bands on SD-OCT were associated with plus status (P=0.05).

Conclusion/Relevance: Punctate hyperreflective vitreous opacities may represent vitreous hemorrhage, astrocyte precursors released from the ROP ridge, inflammatory cells, and/or protein in advanced acute-phase ROP. Punctate hyperreflective vitreous opacities and tractional vitreous bands may represent OCT markers for ROP severity. Further studies should explore handheld OCT as a non-invasive ROP screening tool.

References: Zepeda EM, Shariff A, Gillette TB, et al. Vitreous Bands Identified by Handheld Spectral-Domain Optical Coherence Tomography Among Premature Infants. JAMA ophthalmology. 2018;136(7):753-758.

Poster Session A
(A1 – A75)

Poster #A1
Friday, April 9, 2021
12:30 PM – 1:30 PM

Clinical Profile of Amblyopia in a Community's Tertiary Care Facility without Effective Vision Screening in Saudi Arabia

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Saudi Arabia

Introduction: To evaluate the prevalence of amblyopia among patients referred to a tertiary care facility.

Methods: All patients between 1-14 years presenting to Amblyopia clinic from 2016 -2020 were retrospectively reviewed. Demographics, full eye examination, visual acuity, cycloplegic refraction, orthoptic workup was performed for all patients. Anisometropic amblyopia was defined as >1D difference in spherical equivalent (SE) or >1.5 D cylindrical difference between 2 meridians. Isometropic amblyopia was defined as VA < 20/30 in both eyes and high refractive error (> 3D SE).

Results: 383 patients (208 male) met our inclusion criteria. Mean age at presentation 5.05 ï‚± 2.49 years. Strabismus amblyopia was found in 184 (48.56%), refractive amblyopia in 107 (27.42%), mixed strabismus and refractive in 76 (19.84%), and deprivation amblyopia in 16 (4.18%) of the Refractive and mixed amblyopia, anisometropia in 85.25% and isometropia in 14.75%. Hyperopia was the most common refractive error in 50% of patients. Esotropia was the most common deviation (91.92%). We divided the patients to < or ï‚³ 5 years, strabismus and mixed amblyopia were significantly higher in <5 groups (74.1% Vs. 25.9% and 68.01% Vs. 32%). While refractive amblyopia was significantly higher in ï‚³ 5 years (60.4% Vs. 39.6%). (P values =0.000).

Conclusion/Relevance: Strabismic amblyopia was diagnosed much more commonly in our cohort, especially among patients <5 years of age. Refractive amblyopia may be under detected in this age group and our entire population in general due to the lack of proper vision screening. Our study highlights the importance of age-appropriate vision screening implementation.

References: 1. Birch EE, Holmes JM. The clinical profile of amblyopia in children younger than 3 years of age. J AAPOS. 2010;14(6):494–7.
2. Longmuir SQ, Boese EA, Pfeifer W, Zimmerman B, Short L, Scott WE. Practical community photoscreening in very young children. Pediatrics. 2013;131(3):4–11.
3. Guimaraes S, Vieira M, Queirós T, Soares A, Costa P, Silva E. New pediatric risk factors for amblyopia: strabismic versus refractive. Eur J Ophthalmol. 2018;28(2):229–33.

Poster #A2
Friday, April 9, 2021
12:30 PM – 1:30 PM

Amblyopia Treatment Outcomes in Patients with Neurodevelopmental Delay

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Introduction: Children with neurodevelopmental disorders (including along the autism spectrum) are at increased risk for amblyopia [1, 2]. Whether amblyopia treatment outcomes are different for patients with neurodevelopmental disorders is unknown.

Methods: Among 2311 patients diagnosed with amblyopia at Boston Children's Hospital department of Ophthalmology between 2010-2014, 637 patients met inclusion criteria for an interocular difference in best-corrected visual acuity (IOD) of >/=2 lines. Patients were grouped by neurodevelopmental diagnostic billing codes including autism spectrum disorders, language/speech delay, behavioral disorders, and genetic syndromes known to be associated with neurodevelopmental delay. Patients with amblyopia without a neurodevelopmental diagnosis comprised the control group.

Results: The neurodevelopmental group (n=66, age 6.1±2.4, 59% male) and control groups (n=571, age 5.6±2.1, 50%male) were similar in age and sex. Amblyogenic risk factors, prior amblyopia treatment, baseline amblyopic eye visual acuities (AEVA), baseline IOD, prescribed amblyopia treatments, and adherence were similar between groups (p values>0.12). At the 12-18 month follow up interval, neurodevelopmental patients had worse AEVA (neurodevelopmental: 0.30[0.18-0.48]logMAR, control: 0.18[0.10-0.40]logMAR, p=0.017) and a smaller change in IOD (neurodevelopmental: -0.12[-0.28-0.00]logMAR, control: -0.20[-0.40--0.12]logMAR, p=0.011). Neurodevelopmental patients had worse final AEVAs (0.30[0.10-0.40]logMAR) compared to control patients (0.18[0.10-0.40]logMAR, p=0.006). Fewer neurodevelopmental patients achieved resolution of their amblyopia (AEVA =0.18 LogMAR) at the 12-18 month follow up interval (neurodevelopmental: 10/66[34%], control: 180/571[56%], p=0.039) or at the final follow up visit (neurodevelopmental: 28/66[42%], control: 343/571[60%], p=0.008).

Conclusion/Relevance: Patients with neurodevelopmental diagnoses had worse visual outcomes and were more likely to have residual amblyopia compared to their cohorts without neurodevelopmental diagnoses.

References: [1] Ikeda J, Davitt BV, Ultmann M, Maxim R, Cruz OA. Brief report: incidence of ophthalmologic disorders in children with autism. J Autism Dev Disord. 2013;43:1447-51.
[2] Nielsen LS, Skov L, Jensen H. Visual dysfunctions and ocular disorders in children with developmental delay. I. prevalence, diagnoses and aetiology of visual impairment. Acta Ophthalmol Scand. 2007;85:149-56.

Poster #A3
Friday, April 9, 2021
12:30 PM – 1:30 PM

Fixational Eye Movements and Visual Functions in Amblyopia

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Introduction: Amblyopic patients have a constellation of visual function deficits including reduced visual acuity and contrast sensitivity, abnormal stereopsis, and increased fixation instability of fellow and amblyopic eye. The fixation instability arises from presence of nystagmus and altered physiologic fixation eye movements (FEMs)1,2. The purpose of the study is to examine the effects of presence of nystagmus on binocular and monocular functions of the fellow and amblyopic eye.

Methods: We recruited 19 controls and 44 amblyopes. We recorded FEMs and classified subjects into those without any nystagmus, those with fusion maldevelopment nystagmus (FMN) and patients with nystagmus without any structural anomalies that do not meet the criteria of FMN or idiopathic infantile nystagmus3. We measured optotype, grating and vernier acuities, and high/low spatial frequency contrast sensitivities in each eye using a staircase method. Stereoacuity was measured with the Titmus fly test.

Results: We found a strong effect of FEM type on stereopsis (ANCOVA with visual acuity as a covariate, effect of FEM type: $F(3,61) = 18.449$, $p<.001$). We also found high spatial frequency contrast sensitivity deficits in the fellow eyes of amblyopes of all FEM types (one-way ANOVA: $F(3,42) =11.541$, $p<.001$).

Conclusion/Relevance: The impact of amblyopia on visual function goes beyond that which is attributable to its effect on visual acuity. Stereo-acuity is worse in those with FMN than in other groups despite similar levels of visual acuity. In addition, high spatial frequency contrast sensitivity is affected in the fellow eye of amblyopic patients with and without nystagmus.

References: 1) Kang SL, Beylergil SB, Otero-Millan J, Shaikh AG, Ghasia FF. Fixational Eye Movement Waveforms in Amblyopia : Characteristics of Fast and Slow Eye Movements. JEMR. 2019 July 5; 12(6):9.
2) Shaikh AG, Otero-Millan J, Kumar P, Ghasia FF. Abnormal Fixational Eye Movements in Amblyopia. PLOS ONE. 2016 March 1.
3) Richard W. Hertle M.D. A Classification of Eye Movement Abnormalities and Strabismus (CEMAS) Report of a National Eye Institute Sponsored Workshop. Optometry and Vision Science. 2001 December.

Poster #A4
Friday, April 9, 2021
12:30 PM – 1:30 PM

Hand Kinematics during Visually-Guided Reaching in Children with Deprivation Amblyopia

Krista R. Kelly, PhD; Reed M. Jost, MS; Eileen E. Birch, PhD; Serena X. Wang, MD; Jeffrey Hunter, Jr., BA; Sofia E. Sacco; James Y. Tung, PhD; Ewa Niechwiej-Szwedo, PhD

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Introduction: Eye-hand coordination is important for normal child development and early academic success. Deprivation amblyopia due to a dense unilateral cataract disrupts visual development, and may disrupt fine motor development. We assessed hand kinematics during visually-guided reaching in children with deprivation amblyopia.

Methods: Nine children (age 7-15 years) with deprivation amblyopia and 20 age-similar controls completed a visually-guided reaching task with both eyes open. Children fixated a cross and were instructed to reach out and touch a small dot that appeared in one of four positions (±5° or ±10° horizontally displaced from fixation) as quickly and accurately as possible. Hand movements were recorded using the LEAP Motion device. Kinematic measures were time-to-reach onset, total reach duration, peak velocity, acceleration duration, and deceleration duration.

Results: Compared with controls, children with deprivation amblyopia had increased total reach duration (mean±SD=511±36 vs. 572±57 msec; p=0.012), increased acceleration duration (185±21 vs. 204±24 msec, p=0.034), increased deceleration duration (320±42 vs. 362±42 msec, p=0.021), and lower peak velocity (1.41±0.15 vs. 1.24±0.20 m/sec; p=0.013). Time-to-reach onset did not differ between groups (320±71 vs. 337±96 msec, p=0.59).

Conclusion/Relevance: Unlike our previous findings of strabismic children who only had increased deceleration duration[1], children with deprivation amblyopia were slower than controls in all aspects of visually-guided reaching. Lower peak velocity and longer acceleration in the initial approach may indicate impaired movement planning; longer deceleration in the final approach may indicate impaired use of visual feedback. Deprivation amblyopia impacts the development of eye-hand coordination, which may hinder academic and social success in children.

References: 1. Kelly, K.R., Jost, R.M., Birch, E.E., Collado, S., Niechwiej-Szwedo, E. (2019). Hand kinematics in strabismic children during visually-guided reaching. Association for Vision in Research and Ophthalmology meeting, Vancouver, B.C.

Poster #A5
Friday, April 9, 2021
12:30 PM – 1:30 PM

Implementation of a Novel, Web-Based Platform for Tracking Amblyopia Patients: Our Experiences

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Introduction: Compliance with occlusion and penalization therapy for amblyopia remains a major hurdle to successful outcomes [1]. Interventions including patient education, reward charts, and frequent ophthalmologist visits reveal mixed results [1-3]. We attempted to improve patient compliance and education with a novel, web-based platform.

Methods: Inside Out Medicine (Seattle, WA) is an online, HIPAA-compliant platform that enhances tracking of amblyopia treatment compliance. The platform's functionalities include creating a virtual 'log' in which parents record daily treatment (hours patched per day, patches used per day, which eye was patched, etc.), giving instructions for parents to assess and record their child's visual acuity, and providing educational materials and free patches.
Providers at an urban, academic center enrolled eligible patients (amblyopia patients undergoing occlusion or penalization therapies) by sending an email invitation to parents. Parents created an account on the platform, allowing them to log daily therapy, which was reviewed by the care team. After enrollment, ophthalmic medical technicians provided support calls to parents to troubleshoot and encourage compliance.

Results: Many parents have been excited by the platform, feeling it improves doctor-patient communication and gives them a greater sense of control over their child's treatment. Anecdotally, most parents find the platform easy to use from their smartphones.

Conclusion/Relevance: An online, easy to access, HIPAA-compliant platform provided a daily report on patients' amblyopia treatment. This self-reported tracking system provided a window into patient compliance, improving doctor-patient communication and patient tracking. We believe that this platform has great potential for improving outcomes for amblyopia patients.

References: 1. Wang J. Compliance and patching and atropine amblyopia treatments. Vision Res. 2015;114:31-40. doi:10.1016/j.visres.2015.02.012.
2. Tjiam AM, Holtslag G, Van Minderhout HM, Simonsz-Toth B, Vermeulen-Jong MH, Borsboom GJ et al. Randomised comparison of three tools for improving compliance with occlusion therapy: an educational cartoon story, a reward calendar, and an information leaflet for parents. Graefes Arch Clin Exp Ophthalmol. 2013;251(1):321-9. doi:10.1007/s00417-012-2107
3. Loudon SE, Polling JR, Simonsz HJ. Electronically measured compliance with occlusion therapy for amblyopia is related to visual acuity increase. Graefes Arch Clin Exp Ophthalmol. 2003;241(3):176-80. doi:10.1007/s00417-002-0570-z.

Poster #A6
Friday, April 9, 2021
12:30 PM – 1:30 PM

Vision Screening Practices of Pediatric Primary Care Providers in New Haven County, Connecticut

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Introduction: Despite guidelines that recommend early, age-appropriate screening in verbal and preverbal children to identify children with amblyopia, late identification may be a potential contributing factor limiting the number of children detected. This study was conducted to determine the vision screening and referral practices of pediatric primary care providers (PPCPs).

Methods: This study surveys providers in New Haven County, Connecticut and compares geographical status. Telephone questionnaires were administered to informed representatives of the various practices. Responses were binary and collated for chi-square analyses.

Results: A total of 150 providers from 31 practices were included in this study. Of these practices, 65% screen children ages 1-3. When analyzed by location, 43% of providers in cities screen children ages 1-3 years compared to 77% of providers in towns, while all the providers in cities and 98% of town providers screen children ages 4-6 years. 45% of providers in this study own a vision-screening instrument.

Conclusion/Relevance: There is a need for the adoption of improved screening tools and guidelines among practices for evaluating children age 1-3, particularly in those practices in urban settings. The adoption of these methods will enhance early detection of amblyopia and promote appropriate treatment.

References: 1. van Leeuwen R, Eijkemans MJ, Vingerling JR, Hofman A, de Jong PT, Simonsz HJ. Risk of bilateral visual impairment in individuals with amblyopia: the Rotterdam study. The British journal of ophthalmology. 2007;91:1450-1.
2. Thorisdottir RL, Faxen T, Blohme J, Sheikh R, Malmsjo M. The impact of vision screening in preschool children on visual function in the Swedish adult population. Acta ophthalmologica. 2019.
3.Holmes JM, Lazar EL, Melia BM, et al. Effect of age on response to amblyopia treatment in children. Archives of ophthalmology (Chicago, Ill : 1960). 2011;129:1451-7.

Poster #A7
Friday, April 9, 2021
12:30 PM – 1:30 PM

Change in Refractive Error With Atropine Penalization in Anisohypermetropic Amblyopia

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Introduction: Occlusion therapy (OT) and atropine penalization (AP) are both efficacious in management of anisometropic amblyopia.1 Atropine's secondary effect of reducing myopic shift may play a role in reducing anisometropia in some patients who experience a myopic shift in childhood.2,3 The purpose of this study was to compare the change in refractive error between OT and AP for the management of anisohypermetropic amblyopia.

Methods: A retrospective analysis of anisohypermetropic amblyopia patients ages 3 to 7 years presenting to our institution from 2008 to 2018 was conducted. Patients were grouped by treatment: OT or AP prescription for >1 year. Qualitative and quantitative analyses assessing changes in interocular difference (IOD) in spherical equivalence of refractive error (SE) and visual acuity (VA) were performed.

Results: OT (n=28) and AP (n=9) treatments were completed for median periods of 1.91 years (interquartile range [IQR], 1.25-2.65) and 2.16 years (IQR, 1.64-3.02), respectively. In the OT group, mean IODVA improved 0.25±0.35 logMAR and mean IODSE decreased 0.54±0.92D. In the AP group, mean IODVA improved 0.32±0.12 logMAR and mean IODSE decreased 1.08±0.70 D. There was a statistically significant difference in change in refractive error between the two groups, p=0.039.

Conclusion/Relevance: In our subjects with anisohypermetropic amblyopia, both OT and AP improved VA. There was a larger decrease in IODSE and smaller final IODSE in the AP group, but there were relatively few subjects in the OT group. AP treatment of anisohypermetropic amblyopia may be associated with a larger decrease in IODSE, and this role deserves further study with larger cohorts.

References: 1. Pediatric Eye Disease Investigator Group. A randomized trial of atropine vs.patching for treatment of moderate amblyopia in children. Arch Ophthalmol. 2002 Mar;120(3):268-78. 2. Repka MX, Kraker RT, Holmes JM, Summers AI, Glaser SR, Barnhardt CN, Tien DR; Pediatric Eye Disease Investigator Group. Atropine vs patching for treatment of moderate amblyopia: follow-up at 15 years of age of a randomized clinical trial. JAMA Ophthalmol. 2014 Jul;132(7):799-805. doi: 10.1001/jamaophthalmol.2014.392. 3. Chia A, Chua WH, Cheung YB, Wong WL, Lingham A, Fong A, Tan D. Atropine for the treatment of childhood myopia: safety and efficacy of 0.5%, 0.1%, and 0.01% doses (Atropine for the Treatment of Myopia 2). Ophthalmology. 2012 Feb;119(2):347-54. doi: 10.1016/j.ophtha.2011.07.031. Epub 2011 Oct 2.

Poster #A8
Friday, April 9, 2021
12:30 PM – 1:30 PM

Visual Acuity Outcomes and Loss to Follow-Up in the Treatment of Amblyopia in Children of Lower Socioeconomic Backgrounds

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Introduction: We compared visual acuity outcomes and loss to follow-up after initiation of treatment for unilateral amblyopia in children from different socioeconomic backgrounds.

Methods: Medical records of children diagnosed with unilateral amblyopia at an initial encounter between 2015 and 2018 were reviewed. Medicaid and private insurance were used as proxies for socioeconomic status (SES). Visual acuity (VA) improvement was the primary outcome variable in patients with at least one follow-up appointment. In a separate analysis, failure to attend a single follow-up was examined for associations with SES, race, gender, and distance travelled to appointments.

Results: Seventy-three patients met inclusion criteria; of these, 28 had Medicaid and 45 had private insurance. VA improved by 2.86 lines in the Medicaid group and 2.98 lines in the private insurance group (p=0.84). Number of missed appointments and distance travelled failed to correlate with VA improvement. In the loss to follow-up analysis, 40 out of 141 (28%) Medicaid patients and 11 out of 107 (10%) private insurance patients failed to attend a single follow-up (p=0.001). No association between loss to follow-up and race, gender, or distance travelled was found.

Conclusion/Relevance: Visual acuity outcomes of treatment for amblyopia did not differ between Medicaid and private insurance patients who followed up. Medicaid patients, however, were much more likely to be immediately lost to follow-up and may suffer worse visual acuity outcomes. Future research may investigate reasons for loss to follow-up in low SES patients and what measures eye care providers and pediatricians can take to increase follow-up.

References: Hudak DT, Magoon EH. Poverty predicts amblyopia treatment failure. Journal of American Association for Pediatric Ophthalmology and Strabismus. 1997;1(4):214-215. doi:10.1016/s1091-8531(97)90040-9.
Simons K, Preslan M. Natural history of amblyopia untreated owing to lack of compliance. British Journal of Ophthalmology. 1999;83(5):582-587. doi:10.1136/bjo.83.5.582.

Poster #A9
Friday, April 9, 2021
12:30 PM – 1:30 PM

Oculocardiac Reflex during Retinopathy of Prematurity Exams

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Introduction: Reducing physiologic stress during staging eye exams for retinopathy of prematurity (ROP) is desirable (1). Bradycardia to 39-90% of baseline is reported in 31% of ROP exams (2).

Methods: Electrocardiograph was prospectively monitored during ROP exams featuring indirect ophthalmoscopy with Alfonso lid speculum and See-Through scleral depressor. Clinical data was retrieved from ROP-Check software. Oculocardiac reflex (OCR) was defined as maximally-changed heart rate (HR) as a percent of baseline. Strabismus surgery patients served as controls.

Results: From 10/17 through 9/20, 281 infants had ROP exams, the median OCR was 55.9% of baseline H.R. (IQR 41.4% to 72.6%), the kurtosis 0.93 and skewness 1.01 from baseline HR 169±16 bpm to 102±39 bpm. In comparison, 1493 adult and pediatric strabismus surgery patients had less OCR median bradycardia 87.8% (IQR 72-98%), kurtosis 1.60 and skewness -1.18. ROP %OCR correlated with birth gestational age (%OCR = 2.5%(GA) – 11%, $r(279)=0.33$, $p<0.01$) and with birthweight (%OCR = 0.02%(BW) + 38%, $r(279) =0.35$, $p<0.01$). The duration of bradycardia induced by ROP exam averaged 92±34 seconds (range 34 to 240 seconds).

Conclusion/Relevance: Bradycardia is common during eye exams in the smallest premature infants with greater degree, more rapid onset and longer duration than OCR during strabismus surgery. Transient, profound bradycardia is a stress with ROP exams.

References: (1) Szigiato AA, et al: Effect of Eye Masks on Neonatal Stress Following Dilated Retinal Examination:. JAMA ophthalmology 2019.
(2) Clarke WN, et al: The oculocardiac reflex during ophthalmoscopy in premature infants. Am J Ophthalmol 1985, 99:649.

Poster #A10
Friday, April 9, 2021
12:30 PM – 1:30 PM

Deep Sedation for Ophthalmology Procedures Outside of the Operating Room

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Introduction: Deep sedation outside of the operating room offers a convenient alternative to general anesthesia for pediatric eye procedures. This study evaluates its safety and efficacy.

Methods: This is a retrospective review of 125 consecutive ophthalmology subjects who received deep sedation for nasolacrimal duct stenting, chalazion, skin tag, ERG or eye examination. Medications used were a combination of Propofol, Fentanyl or Ketamine. We used a control group of 1037 subjects receiving sedation for similarly invasive procedures: lumbar punctures with intrathecal chemo administration, bone marrow aspiration and biopsies, and botox injections.

Results: Of the 125 subjects reviewed, 19 (15.2%) experienced respiratory complications of which 12 required bag mask ventilation, 3 required additional oxygen, 2 required Oral/Nasal airway, 1 experienced a benign arrhythmia, and 1 had an allergic reaction. No subjects required cardiopulmonary resuscitation or unplanned hospital admission. All 125 cases were completed successfully and patients were discharged home. Subjects who experienced complications received a statistically significant larger dose of medication ($P=0.009$) than those with no complications. In comparison, only 3.8% of the control group suffered complications, and 96% of procedures were completed successfully.

Conclusion/Relevance: Deep sedation has a statistically significant higher complication rate for ophthalmology procedures then for other commonly performed procedures ($P<0.001$), however when performed in the appropriate hospital settings it is an alternative to general anesthesia for minimally to moderately invasive ophthalmology procedures in pediatric patients. No statistical significance was found between complication rate and gender, ethnicity or procedure.

References: Lalwani K, Tomlinson M, Koh J, Wheeler D. Office-based deep sedation for pediatric ophthalmologic procedures using a sedation service model. Anesthesiol Res Pract. 2012;2012:598593. doi:10.1155/2012/598593

Poster #A11
Friday, April 9, 2021
12:30 PM – 1:30 PM

Keratoconus Incidence among Children with High Regular Astigmatism: Tomographic and Refractive Changes over Time

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Introduction: To assess tomographic and refractive corneal changes and determine the incidence of keratoconus among children with high regular astigmatism.

Methods: This is a retrospective longitudinal study on corneal tomography for children with corneal astigmatism of ≥+3.50D. Patients with history of vernal keratoconjunctivitis, previous ocular surgery, systemic collagen disorders, those with a family history of keratoconus or unreliable imaging were excluded. Baseline and follow-up refractive and clinical data were collected.

Results: Thirty-seven patients (67 eyes) with average age of 9.1 ± 3.5 years were identified. Mean cylindrical refraction was +5.1 ± 1.3 diopters, with average follow-up of 2.1 ± 1.6 years. There was no significant change in best corrected vision, mean cylindrical refraction, keratometric values and thinnest pachymetry at last follow-up, except for spherical refraction ($p<0.001$). None of the eyes had progressed into forme fruste or manifest keratoconus and none of the tomographic parameters changed over time. All cases fell within normal limits of the keratometry-inferior-superior astigmatism index (KISA%) and inferior-superior dioptric asymmetry ratio. However the maximum posterior elevation, Belin/Ambrosio enhanced ectasia deviation value, vertical asymmetry, central keratoconus, height decentration and surface variance indices all falsely classified more than 50% of our cohort as having suspected or clinical keratoconus.

Conclusion/Relevance: Children with high regular astigmatism who have no other associated risk factors, did not progress to keratoconus during the follow-up period. Furthermore, current results suggest those children are often falsely diagnosed as having signs of subclinical or manifest keratoconus using commonly-used tomography screening indices.

References: 1-Motlagh MN, Moshirfar M, Murri MS, Skanchy DF, Momeni-Moghaddam H, Ronquillo YC, et al. Pentacam® Corneal Tomography for Screening of Refractive Surgery Candidates: A Review of the Literature, Part I. Med Hypothesis Discov Innov Ophthalmol. 2019; 8:177-203.
2- Hashem AO, Roshdy MM, Wahba SS, Saleh MI, Elkitkat RS. Normative Values of Various Pentacam HR Parameters for Pediatric Corneas. Cornea. 2020; 39:1394-400.
3- Mukhtar S, Ambati BK. Pediatric keratoconus: a review of the literature. Int Ophthalmol. 2018; 38:2257-66.

Poster #A12
Friday, April 9, 2021
12:30 PM – 1:30 PM

Idiopathic Bleb Formation in Childhood: Report of Two Cases and Literature Review

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Introduction: Subconjunctival blebs typically form as result of a cornea-scleral fistula connecting the anterior chamber to the subconjunctival space. Beyond glaucoma filtering surgery, a bleb can also be encountered uncommonly after an accidental penetrating injury.(1) It was also described in association with a variety of ocular and systemic abnormalities, including Axenfeld syndrome and Terrien marginal degeneration(3). We described the presentation and surgical management of two paediatric cases of idiopathic spontaneous bleb formation.

Methods: We presented two paediatric patients, a 7 months old boy and a 6 years old girl,whom presented to us with spontaneous bleb formation.Our cases represent the first description of paediatric patients with unilateral spontaneous subconjunctival bleb formation with no ocular abnormalities, no history of trauma and otherwise healthy with no rheumatological or inflammatory underlying diseases. In both of these cases, UBM proved to be a valuable tool in confirming the aetiology of the bleb and in planning surgical repair.

Results: Timely surgical management with a scleral patch graft at the scleral limbus was effective in resolving the bleb, presumably via closure of the corneoscleral fistula that was visualized on UBM. Vision-threatening corneal edema improved following repair, and amblyopia was successfully treated in both patients.

Conclusion/Relevance: A careful history and clinical examination is important to establish a diagnosis of an idiopathic bleb, and consideration should be given to both ocular and systemic associations, as well as occult trauma. UBM can play an important role in confirming the diagnosis and may be reassuring in surgical planning with scleral patch graft at the limbus.

References: 1. Tathem A, Karwatowski W, Kumar P. Spontaneous bleb formation. Clin Exp Ophthalmol. 2011;712-713.
2. Nemet P, Bracha R, Lazar M. Spontaneous filtering blebs in axenfeld syndrome.Am J Ophthalmol.1973; 76:590-591.
3. Soong HK, Fitzgerald J, Boruchoff SA, Sugar A, Meyer RF, Gabel MG. Corneal hydrops in Terrien's marginal degeneration. Ophthalmology. 1986;93:340-343.

Poster #A13
Friday, April 9, 2021
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Visual Outcomes of Herpes Simplex Keratitis in Children Age 6 Years and Younger

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Introduction: Herpes simplex keratitis is a leading cause of pediatric visual loss worldwide. This study explored the effects of delay in treatment and subsequent decreased vision from corneal scarring and amblyopia.

Methods: This study was a retrospective chart review of 35 cases of children aged 6 years and younger seen by a pediatric ophthalmology clinic. Parameters included initial and final visual acuity, time to presentation after symptoms began, presence of an initial misdiagnosis, initiation of an alternative medication prior to initiating anti-viral medications by mouth or topical, presence of corneal scarring and/or ghost dendrites.

Results: Presentation after 5 days since initial symptoms began was associated with worse initial ($p=0.0005$) and final visual acuities ($p=0.01$). Initial misdiagnosis of herpes simplex keratitis led to worse initial ($p<0.001$) and final visual acuities ($p=0.004$). Initial misdiagnosis and late presentation were associated with corneal scarring ($p<0.02$, $p=0.006$, respectively)
Herpes simplex keratitis is often misdiagnosed in the pediatric population. Patients who presented within 5 days of initial symptoms had better initial and final visual acuities than those who presented after 5 days of initial symptoms. Earlier diagnosis led to fewer ghost dendrites and less corneal scarring. Misdiagnosis and delay in treatment led to visually significant corneal scarring. Most patients had excellent response to oral acyclovir without any significant side effects.

Conclusion/Relevance: Early detection and initiation of appropriate anti-viral coverage can prevent vision loss in children. Furthermore, if corneal scarring does not take place, visual loss related to corneal scarring and amblyopia can be prevented.

References: 1- Serna-Ojeda JC, Loya-Garcia D, Navas A, et al. Long-term outcomes of penetrating keratoplasty for herpes simplex keratitis. Am J Ophthalmology. 2017; 173:139-144.
2-Revere K, Davidson SL. Update on management of herpes keratitis in children. Curr Opin Ophthalmol. 2013; 24:343-347.
3-Liu S, Pavan-Langston, Colby KA. Pediatric herpes simplex in the anterior segment: characteristics, treatment and outcomes. Ophthalmology. 2012; 119:2003-2008.

Poster #A14
Friday, April 9, 2021
12:30 PM – 1:30 PM

Open Globes in Children: Characteristics, Accuracy, and Prognosis of Computed Tomography Imaging in the Management of Pediatric Open Globe Injuries

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Introduction: Open globe injury is a sight-threatening ocular emergency requiring urgent surgical management. Pediatric patients present multiple challenges in prompt diagnosis and management. This study reports computed tomography (CT) characteristics, accuracy, and possible prognostic factors in pediatric open globe injuries.

Methods: 46 charts of patients less than 18 years of age with open globe injuries at Texas Children's Hospital were reviewed. These injuries occurred between 7/1/2010 and 7/1/2020. Retrospective analysis was performed to identify patient demographics, injury details, CT findings, and outcomes.

Results: In this cohort with an average follow up of 27 months, 73% of patients with open globes had a CT performed. CT report accuracy in detection of open globe was 64%. Open globe noted on CT demonstrated risk for reduced visual outcome with 17% achieving visual acuity of 20/40 or better compared to 53% in open globes which were not diagnosed on CT. Presence of orbital fracture or lens abnormality found on CT was associated with worse visual outcomes, with 75% and 86% respectively having LP or NLP vision at most recent follow up. Repeat open globe injury occurred in 3 patients in this study.

Conclusion/Relevance: CT is a useful tool in diagnosis of open globes and other ocular and orbital injuries. This study discusses CT findings in pediatric open globes in more detail than any prior study and associates prognostic value to certain findings on CT. This study also compares CT findings in open globes in children to findings reported in adults in the literature.

References: Li, Xintong, et al. Pediatric open globe injury: A review of the literature. J Emerg Trauma Shock. 2015;9:216-23.
Crowell, Eric. Et al. Accuracy of Computed Tomography Imaging Criteria in the Diagnosis of Adult Open Globe Injuries by Neuroradiology and Ophthalmology. Academic Emergency Medicine. Sept 2017;Vol 24, No. 9: 1072-9.

Poster #A15
Friday, April 9, 2021
12:30 PM – 1:30 PM

Anterior Segment Ischemia after Laser for Retinopathy of Prematurity Previously Treated with Anti-Vascular Endothelial Growth Factor

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Introduction: To assess the risk of vision-threatening anterior segment ischemia (ASI) among retinopathy of prematurity (ROP) patients treated with anti-vascular endothelial growth factor (VEGF) followed by laser photocoagulation.

Methods: The medical records of all infants treated for threshold ROP with laser photocoagulation with and without prior intravitreal anti-VEGF at a single institution from January 1, 2002, through December 31, 2018, were retrospectively reviewed for the prevalence of vision-threatening ASI.

Results: A total of 122 (241 eyes) infants were treated with a mean gestational birth age of 25.1 (range, 22.9 to 28.7) weeks and a mean birth weight of 687.6 (range, 360 to 1310) grams. Among the 54 eyes (27 patients) treated with anti-VEGF prior to laser, 4 eyes developed ASI compared to 2 of the 187 eyes (95 patients) treated with laser therapy alone ($p= 0.008$) including corneal edema, cataracts, and choroidal effusion. Infants receiving both anti-VEGF and laser had a younger gestational age at birth (24.5 weeks vs 25.3 weeks; $p<0.001$) and lower birth weight (591.4 grams vs 715.0 grams; $p<0.001$) than those who received laser alone. In multivariate analysis, early gestational age at birth was associated with the development of ASI ($p=0.03$) while the association with anti-VEGF treatment ($p=0.07$) fell short of statistical significance.

Conclusion/Relevance: The prevalence of vision-threatening ASI was higher among infants treated with intravitreal anti-VEGF followed by laser compared to those treated with laser alone. Further investigation is warranted to confirm this finding and identify potential factors for decreasing the risk.

References: 1. Fallaha N, Lynn MJ, Aaberg TM Jr, et al. Clinical outcome of confluent laser photoablation for retinopathy of prematurity. J AAPOS. 2002;6(2):81-5.
2. Lambert SR, Capone A, Cingle KA, et al. Cataract and phthisis bulbi after laser photoablation for threshold retinopathy of prematurity. Am J Ophthalmol. 2000;129(5):585-91.
3. Kaiser RS, Trese MT. Iris atrophy, cataracts, and hypotony following peripheral ablation for threshold retinopathy of prematurity. Arch Ophthalmol. 2001;119(4):615-7.

Poster #A16
Friday, April 9, 2021
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Combined Scheimpflug and Optical Coherence Tomography Imaging in Screening of Keratoconus in Down Syndrome Children

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Introduction: The aim of this study is to screen for keratoconus (KC) in a sample of children with Down Syndrome (DS), to correlate changes of combined Scheimpflug and optical coherence tomography (OCT) imaging in these children and to compare it with age matched control group with clinically normal cornea.

Methods: This observational, analytical, case-control study included 26 eyes of 26 children, divided into two groups: 13 with DS in group A and 13 age-matched healthy controls in group B. Both groups were evaluated using anterior segment optical coherence tomography (AS-OCT) and Scheimpflug camera topographer (Sirius, CSO).

Results: Our study revealed that 62% of patients in the DS group showed keratoconus like features. Assessment of the corneal parameters showed statistically significant correlation between Sirius topography and AS-OCT epithelium and pachymetry maps parameters in DS group.

Conclusion/Relevance: Combined use of AS-OCT epithelial mapping and corneal topography is of high significance and can be used for screening and early detection of KC in cooperative DS patients.

References: El-Khoury S, Abdelmassih Y, Hamade A, et al. Pediatric keratoconus in a tertiary referral center: incidence, presentation, risk factors, and treatment. J Refract Surg 2016;32:534-541.
Alio JL, Vega-Estrada A, Sanz P, et al. Corneal Morphologic Characteristics in Patients with Down Syndrome, JAMA Ophthalmol 2018;136:971-978.
Alio JL, Editor text book of Keratoconus recent advances in diagnosis and treatment, springer 2017;13-23.

Poster #A17
Friday, April 9, 2021
12:30 PM – 1:30 PM

Clinical Features of Posterior Polymorphous Corneal Dystrophy in Children

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Introduction: Posterior polymorphous corneal dystrophy (PPCD) is a genetically heterogenous endothelial disease characterized by abnormalities of Descemet's membrane and irregular endothelium with few reports in children. We present the largest case series to-date describing the clinical features of PPCD in children </= 15 years old with long-term follow-up.

Methods: Retrospective chart review of patients diagnosed with PPCD at Boston Children's Hospital from 1990 to 2020. Data collected include age at time of diagnosis, slit lamp findings, cycloplegic refraction, best corrected visual acuity (BCVA), central corneal thickness (CCT), specular microscopy, and corneal topography findings whenever available. Patients with pediatric glaucoma or other corneal disorders were excluded.

Results: Twenty-seven eyes of 19 patients were included (11 unilateral and 8 bilateral cases). Ten patients were female. Left eye was affected in 14 eyes. The mean age at diagnosis was 8.5±3.3 years with a mean follow-up of 5.3 years. In unilateral cases, there was a statistically significant difference in the endothelial cell count (p=0.02) and coefficient variation (p=0.03) between affected and unaffected eyes. There was no statistically significant difference in CCT between affected and unaffected eyes. The mean BCVA at initial presentation was 0.8±0.2 (20/25) compared to 0.9±0.08 (20/20) in unaffected eye (p=0.04). Mean astigmatism was higher in the affected eye (+1.7 D) compared to the unaffected eye (+1.00 D) (p=0.07). At initial presentation, 7/27 eyes had amblyopia which improved in 5 eyes with treatment.

Conclusion/Relevance: PPCD can present early in children, often unilaterally and with anisometropic amblyopia. Furthermore, it leads to progressive endothelial cell loss and polymegathism.

References: 1. Cibis GW, Krachmer JA, Phelps CD, Weingeist TA. The clinical spectrum of posterior polymorphous dystrophy. Archives of Ophthalmology 1977:95(9): 1529-1537.
2. Al-Amry M, Khan AO. Unilateral posterior polymorphous corneal dystrophy associated with ipsilateral anisometropic amblyopia. J Pediatr Ophthalmol Strabismus 2013:50 Online(e55-57.
3. Noguchi A, Okumura N, Sotozono C, Kinoshita S. Effect of posterior corneal vesicles on corneal endothelial cell density and anisometropic amblyopia. Cornea 2018:37(7): 813-817.

Poster #A18
Friday, April 9, 2021
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Efficacy of Systemic Immunomodulatory Therapy in Pediatric Anterior Uveitis

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Introduction: To evaluate efficacy of systemic immunomodulatory therapy (IMT) in pediatric|anterior uveitis

Methods: Retrospective chart review of all patients </= 16 years with anterior uveitis examined between 1997 to 2020 at tertiary eye care center.

Results: 134 patients (191 eyes, 86 females, 48 males) were analyzed. Mean age at time of diagnosis: 7 years. Median follow-up: 4 years. Juvenile idiopathic arthritis (42.5%), idiopathic (24.6%), psoriatic arthritis (8.9%) were common causes. All patients were started with topical steroids and cycloplegics. 84 patients (62.6%) required IMT. All 84 patients were started on Methotrexate(MTX). In 55 patients(41%), biologic agent was added to MTX (Adalimumab (48%), Infliximab (30%) and Abatacept (2.5%). 15 patients (27%) required switch to second biologic agent, 4 (7.2%) to third, and 3 (5.4%) to fourth biologic agent. Mean time to steroid remission was 25 months. At the last exam,18 patients had persistent inflammation (>0.5 grade). 55 patients (41%) had ocular complications. Ocular surgery was needed in 22 (16.4%) patients (cataract surgery 18(13%), glaucoma surgery 12(9.7%), YAG capsulotomy 4(3%), EDTA Chelation 4(3%)). 110 patients (82%) had a final best corrected visual acuity (BCVA) >/=20/40.

Conclusion/Relevance: It is important to follow step ladder approach to treat pediatric uveitis. Early|introduction of IMT in a timely manner is the key to achieve steroid free remission and reduce long term complications of steroids and uncontrolled uveitis. Pediatric uveitis is a challenging condition associated with visually significant complications. Systemic immunomodulatory therapy is safe and effective.

References: Clastiblanco C, Meese H, Foster SC. Treatment of pediatric uveitis with Adalimumab: The MERSI experience. J AAPOS 2016; 20:145-7
Utz VM, Bulas S, Looper S et al. Effectiveness of long-term Infliximab use and impact of treatment adherence to disease control in refractory, non-infectious pediatric uveitis. Pediatric Rheumatology 2019;17-79
Ashkenazy N, Saboo US, Abraham A et al. Successful treatment with Infliximab after Adalimumab failure in pediatric non-infectious uveitis. J AAPOS 2019;23:151 e1-5

Poster #A19
Friday, April 9, 2021
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Correlation of Central Corneal Thickness and Systemic Factors in Premature Infants with and without Retinopathy of Prematurity

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Introduction: Central corneal thickness (CCT) in premature infants is described in racially homogenous populations, and factors affecting CCT in infants are relatively unknown. (1-3) This study describes CCT in premature infants, and its association of steroid and oxygen requirements, gestational age (GA), birth weight (BW), race, and their relationship with CCT and corneal haze.

Methods: CCT measurements of 87 infants/174 eyes screened for retinopathy of prematurity (ROP) were taken between 30-44 weeks GA. CCT was analyzed using a mixed model for its relationship with BW, GA, race, corneal clarity, steroid and oxygen use.

Results: Average CCT decreased at a rate of 12.3 µm/week. Caucasians had the thickest corneas and Hispanics the thinnest ($p<0.01$) at baseline but the rate of CCT decline varied based on racial/ethnic group ($p=0.079$). Infants with BW <1000 grams had a higher CCT at baseline, but CCT decreased at a faster rate than infants with higher BW (-13.4µm/week vs -9.9 µm/week, $p=0.020$). Infants born <27 weeks GA had higher CCT at baseline, but CCT decreased at faster rate compared to patients born later (-13.3µm/week vs -10.1 µm/week, $p=0.029$). Steroid and oxygen use were not statistically significantly associated with CCT or corneal haze ($p>0.05$).

Conclusion/Relevance: CCT varies by racial group in premature infants. Lower BW and GA are associated with increased CCT at baseline but thin at a faster rate. On average, CCT decreases at a rate of 12.3 µm/week between 30 and 44 weeks GA and averages 550 µm by 44 weeks GA.

References: 1. Kirwan C, O'Keefe M, Fitzsimon S. Central corneal thickness and corneal diameter in premature infants: Acta Ophthalmologica Scandinavica 2005. Acta Ophthalmologica Scandinavica. 2005;83(6):751-753. doi:10.1111/j.1600-0420.2005.00559.x
2. Sekeroglu MA, Hekimoglu E, Petricli IS, et al. Central corneal thickness and intraocular pressure in premature infants. Int Ophthalmol. 2015;35(6):847-851. doi:10.1007/s10792-015-0062-x
3. Kardaras D, Papageorgiou E, Gaitana K, et al. The association between retinopathy of prematurity and ocular growth. Invest Ophthalmol Vis Sci. 2019;60(1):98. doi:10.1167/iovs.18-24776

Poster #A20
Friday, April 9, 2021
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Pediatric Corneal Collagen Crosslinking Clinical Outcomes at a Single Children's Hospital

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Introduction: Penetrating keratoplasty (PK) is often required in end-stage keratoconus, which can be more aggressive in children. Pediatric PK carries a guarded prognosis. Corneal collagen crosslinking (CXL) has provided a mechanism to arrest progression and avoid end-stage disease. CXL in pediatric patients carries unique challenges. The purpose of this study is to retrospectively examine the outcomes of CXL at a pediatric center.

Methods: Records of patients undergoing CXL at one children's hospital were reviewed with exempt status by the local IRB. Primary outcomes were best corrected visual acuity (BCVA), complications, treatment failure, and length of follow-up.

Results: Forty-three eyes of 27 patients underwent CXL. Median age at surgery was 15 years (range 10-24). Median follow-up was 328 days, with at least six-months in 60% of eyes. Median BCVA was 0.3 (logMAR) pre-operatively and 0.1 post-operatively. One eye received a PK post-operatively. One eye experienced an early exuberant inflammatory reaction, resulting in a visually-significant scar.

Conclusion/Relevance: Reasonable safety and efficacy of CXL were observed. The short follow-up interval was multi-factorial, including procedural referral from distant outside physicians with follow-up locally. The single PK occurred in a patient unable to travel for scleral contact lens fitting. The single exuberant inflammatory reaction was the only treatment complication in our cohort. Ancillary data, such as topography, in this age group is not always possible.
Corneal collagen crosslinking offers a safe, beneficial therapeutic option to arrest progression and decrease the need for PK in children.

References: Olivo-Payne O et al. Optimal management of pediatric keratoconus: challenges and solutions. Clinical Ophthalmology 2019 Jul 10; 13:1183-1191.
Hersh PS et al. United States Multicenter Clinical Trial of Corneal Collagen Crosslinking for Keratoconus Treatment. Ophthalmology 2017 Sep; 124(9):1259-1270.
Mazzotta C et al. Corneal Collagen Cross-Linking With Riboflavin and Ultraviolet A Light for Pediatric Keratoconus: Ten-Year Results. Cornea 2018 May; 37(5):560-566.

Poster #A21
Friday, April 9, 2021
12:30 PM – 1:30 PM

Population-Based Incidence and Clinical Features of Pediatric Anterior Segment Disorders

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Introduction: The purpose of this population-based study was to report the incidence, types, and clinical characteristics of pediatric anterior segment disorders.

Methods: The medical records of all patients ≤18 years diagnosed with any anterior segment disorder other than conjunctivitis or uveitis while residing within a well-defined geographic region from January 1, 2000, through December 31, 2009, were retrospectively and individually reviewed.

Results: A total of 1,119 children were diagnosed with an anterior segment condition during the 10-year period, yielding an incidence of 306 (95% CI 288-324) per 100,000 ≤18 years, or 1 in 327 ≤18 years. The median age at diagnosis was 13.2 years and 507 (43.7%) were females. The 10 most common diagnoses were subconjunctival hemorrhage in 265 (23.7%), corneal abrasion in 146 (13.0%), keratitis secondary to contact lens wear in 134 (12.0%), infectious keratitis in 72 (6.4%), nonspecific keratoconjunctivitis in 65 (5.8%), hyphema in 61 (5.4%), cataract in 41 (3.7%), episcleritis in 40 (3.6%), chemical injury in 40 (3.6%), and anisocoria in 38 (3.4%). Reduced vision in at least one eye to 20/30 or worse was found in 257 (30.7%) of those with measured visual acuity at the initial exam and in 157 (17.2%) at the final exam. During a median follow-up of 1.1 years, 47 (4.2%) underwent at least one ocular procedure.

Conclusion/Relevance: Anterior segment disease is a relatively common diagnosis in children, frequently related to trauma, contact lens wear, keratitis, and cataract. Such disorders can have a significant impact on the vision of children.

References: 1. Nirmalan PK, Vijayalakshmi P, Sheeladevi S, et al. The Kariapatti pediatric eye evaluation project: baseline ophthalmic data of children aged 15 years or younger in Southern India. Am J Ophthalmol 2003;136:703-9.

Poster #A22
Friday, April 9, 2021
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Ophthalmic Involvement in Pediatric Eczema Herpeticum

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Introduction: We sought to determine the prevalence and risk factors of ophthalmologic involvement in children with Eczema Herpeticum (EH).

Methods: Retrospective cohort study of children under age 18 years with facial EH examined by pediatric ophthalmologists over a six-year period. Outcomes included prevalence, risk factors, and recurrence of ocular involvement.

Results: We studied 166 children with EH (mean age 5.2 years (SD 4.5)). All children had facial involvement and 116 (69.9%) had eyelid involvement. Overall, 39 children had ocular involvement (prevalence 23.5%, 95% CI 17.0 to 29.9%). Thirty-two (19.3%) children had conjunctivitis only; 7 (4.2%) had both conjunctivitis and corneal epithelial ulcers. Seven of the 32 children with conjunctivitis only and 3 of the 7 children with corneal involvement did not have lesions on the eyelids. In multivariable analysis, increasing age was associated with higher risk of ocular involvement, but eyelid lesions, gender, race, and chronic medical conditions were not. Among 120 children with follow-up (mean length 44.5 months, range 2-134), 62 (51.7%) had recurrence of EH. Only 3 of these had ocular involvement at recurrence, and all 3 had ocular involvement at the initial episode.

Conclusion/Relevance: Ophthalmologic consultation should be obtained for children with facial EH, as about one quarter will have concurrent herpetic eye disease, whether or not there are lesions on the eyelids. Corneal epithelial involvement is unlikely to be present in the absence of conjunctival injection, but it is not clear if pediatrician identification of injection is sufficiently reliable to be a criterion for referral.

References: Margolis TP, Ostler HB. Treatment of ocular disease in eczema herpeticum. Am J Ophthalmol. 1990 Sep 15;110(3):274-9.
Novelli, V. M., Atherton, D. J., & Marshall, W. C. (1988). Eczema herpeticum: clinical and laboratory features. Clinical pediatrics, 27(5), 231-233.
Popov, Y., Nikolov, R., & Lalova, A. (2010). Localized eczema herpeticum with unilateral ocular involvement. Acta Dermatoven APA, 19(3).

Poster #A23
Friday, April 9, 2021
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Indications and Long-Term Outcomes of Pediatric Penetrating Keratoplasty in a Hispanic Population

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Introduction: To analyze the main indications for penetrating keratoplasty (PKP), risk factors for graft survival, and visual outcome in a pediatric population.

Methods: Ambispective, descriptive, and longitudinal study including patients under 18 years who had undergone PKP for multiple causes between November 2000 and October 2018 in Northern Mexico.

Results: Forty-five PKPs were performed in 40 eyes (32 patients); in 8 patients, PKP was bilateral, and 5 procedures were regrafts. Mean age at the time of surgery was 9.9±6.5 years (range: 2 months to 18 years). Mean follow-up time was 56.6±53.1 months. Indications for PKP were acquired non-traumatic corneal opacity in 19 eyes (42.2%), congenital corneal opacity in 18 eyes (40.0%), and acquired traumatic corneal opacity in 8 eyes (17.8%). Visual improvement was reported in 77.3% of eyes, remained unchanged in 20.45%, and worsened in 2.3%. Wide variations in graft survival rates have been reported (35-80%) at 12 months.(1–3) In this study, 76.32% and 71.43% of grafts were clear after one and two years, respectively. 13 PKP (28.9%) experienced graft rejection, of which 69.2% were successfully reversed and 30.8% ended in graft failure. Mean time between PKP and first graft rejection was 56.5±32.4 weeks. Secondary graft failure occurred in 28.9% (13 PKP), with ocular hypertension being the leading cause (38.5%).

Conclusion/Relevance: Excellent clinical outcomes and adequate graft survival rates can be obtained following pediatric corneal transplantation. Prompt identification of risk factors associated with graft rejection and secondary graft failure, as well as appropriate medical and amblyopia treatment may enhance visual outcomes in children.

References: 1. Karadag R, Chan TCY, Azari AA, Nagra PK, Hammersmith KM, Rapuano CJ. Survival of Primary Penetrating Keratoplasty in Children. Am J Ophthalmol. 2016;171:95-100. doi:10.1016/j.ajo.2016.08.031
2. Al-Ghamdi A, Al-Rajhi A, Wagoner MD. Primary Pediatric Keratoplasty: Indications, Graft Survival, and Visual Outcome. J AAPOS. 2007;11(1):41-47. doi:10.1016/j.jaapos.2006.09.012
3. Dana MR, Moyes AL, Gomes JAP, et al. The Indications for and Outcome in Pediatric Keratoplasty: A Multicenter Study. Ophthalmology. 1995;102(8):1129-1138. doi:10.1016/S0161-6420(95)30900-1

Poster #A24
Friday, April 9, 2021
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Timing of Systemic Immunosuppressive Initiation and its Impact on Complications of Pediatric Noninfectious Anterior Uveitis using Claims Data

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Introduction: To assess the timing of immunosuppressive initiation in noninfectious anterior uveitis and its impact on uveitis-related complications.

Methods: Population-based retrospective cohort study including patients diagnosed with noninfectious anterior uveitis at ≤18 years of age who received methotrexate, with or without adalimumab or infliximab from the IBM® MarketScan® Databases (2007-2016). Age, sex, timing of immunosuppressive initiation and impact of treatment timing on ocular complication rates were assessed.

Results: Of 971 patients (603 females; mean age 10.2 ± 4.4 years) who received immunosuppressive treatment following anterior uveitis diagnosis, 727 were started on methotrexate, 132 on methotrexate with the addition of adalimumab and 112 on methotrexate with infliximab. Time to initiation of methotrexate was 366 ± 465 days, with no significant difference in timing when it was given with biologics. Mean time to infliximab addition was 461 ± 462 days and mean time to adalimumab addition was 617 ± 623 days (p=0.025). When methotrexate was started within 3 months versus after 3 months of diagnosis, the cataract surgery rate was 3.7% versus 4.7% (p=0.69). When methotrexate and infliximab were started within 3 months versus after 3 months, the cataract surgery rate was 0% versus 7.8%, which did not reach statistical significance due to the small rate of complication observed (p=0.85).

Conclusion/Relevance: On average, methotrexate was initiated >1 year after diagnosis, with infliximab added earlier than adalimumab. Timing of immunosuppressive initiation before or after 3 months of diagnosis was not found to affect the rate of cataract, glaucoma, or cataract or glaucoma surgery.

References: 1. Angeles-Han S, Ringold S, Beukelman T, et al. 2018 American College of Rheumatology/Arthritis Foundation Guideline for the Screening, Monitoring, and Treatment of Juvenile Idiopathic Arthritis-Associated Uveitis. Arthritis Care Res. 2019;71(6):703-716.
2. Maccora I, Sen E, Ramanan AV. Update on noninfectious uveitis in children and its treatment. Curr Opin Rheumatol. 2020;32(5):395-402.

Poster #A25
Friday, April 9, 2021
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Treatment of Infantile Conjunctival Hemangiomas with Topical Timolol

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Introduction: Infantile conjunctival hemangiomas are a rare clinical entity(1). It is well-known that oral and topical beta blockers are successful treatment options for orbital and cutaneous hemangiomas; however, there is a paucity of literature reviewing treatment options for conjunctival hemangiomas because of their infrequent clinical presentation. We present a case series of two conjunctival hemangiomas that are successfully treated with topical timolol.

Methods: Case series of pediatric patients with conjunctival hemangioma treated with topical timolol.

Results: Case 1 is a 10 month old male (age 3 months at presentation) with a red elevated lesion of the bulbar conjunctiva of the right eye, consistent with conjunctival hemangioma. Topical timolol 0.5% was initiated twice daily in the right eye. The patient has shown significant improvement after 4 months of treatment.||Case 2 is a 14 month old female (age 7 months at presentation) with a flat area of increased vascularity of the bulbar conjunctiva of the left eye, consistent with a sessile conjunctival hemangioma. Topical timolol 0.25% was initiated twice daily in the left eye. The patient has shown significant improvement after 8 months of treatment.

Conclusion/Relevance: This is the first known published conjunctival hemangioma case series in which all included patients are treated with topical timolol. This is also the first known case series that includes an infantile sessile hemangioma(2).
Topical timolol has been shown to be an effective treatment for conjunctival hemangiomas (both traditional and sessile) in this case series. Resolution typically occurs within a few months(3).

References: 1 Chang, T. C., & Estes, R.. Beta blocker treatment of infantile conjunctival hemangiomas—observations from 2 cases. Journal of American Association for Pediatric Ophthalmology and Strabismus. 2014; 18(1): 80-82.

2 Lubahn, J. G., Lee, R. K., & Karp, C. L.. Resolution of conjunctival sessile hemangioma with topical timolol. Cornea. 2014; 33(1): 99.

3 Theiler, M., Baselga, E., Gerth-Kahlert, C., Mathes, E. F., Schwieger-Briel, A., Chaloupka, K., ... & Frieden, I. J.. Infantile hemangiomas with conjunctival involvement: An underreported occurrence. Pediatric dermatology. 2017; 34(6): 681-685.

Poster #A26
Friday, April 9, 2021
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Ultrasound Biomicroscopy to Detect Iris Structural Changes following Pediatric Cataract Surgery

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Introduction: Postoperative anterior segment changes following pediatric cataract extraction (CE) may contribute to clinical pathology, such as glaucoma after CE. The purpose of this study is to describe postoperative iris structural changes using ultrasound biomicroscopy (UBM).

Methods: UBM images were collected in children under 5 years with congenital cataract (N=42 eyes), post-lensectomy aphakia (N=16), and pseudophakia (N=10). Ten iris structural parameters were analyzed: iris area (IA), angle opening distance (AOD500), irido-trabecular angle (Theta1), trabeculo-ciliary process distance (TCPD), iris thickness at 500um and 2mm from angle, as well as maximal iris thickness (ID 1, 2, 3), iris convexity, iris concavity, and iris insertion. Statistical analysis was conducted using a mixed effect model after adjusting for age.

Results: Analysis of pseudophakic versus phakic eyes revealed greater AOD500 ($p<0.05$), Theta1 ($p<0.05$), ID 1 ($p<0.05$), iris convexity ($p<0.005$) and iris concavity ($p<0.005$). Aphakic eyes demonstrated greater AOD500 ($p<0.005$), Theta1 ($p<0.005$), iris convexity ($p<0.005$), and iris concavity ($p<0.005$) compared to the phakic state. Analysis of pseudophakic versus aphakic eyes demonstrated a greater iris area ($p<0.05$), iris concavity ($p<0.005$), and smaller ID1 in aphakic eyes. Lastly, no phakic eyes were found to have a high iris insertion. Postoperatively, high iris insertion was detected in pseudophakic eyes but no aphakic eyes.

Conclusion/Relevance: This study allowed for a preliminary global understanding of iris structural trends among and between three types of pediatric eyes: native lens with cataract, post-lensectomy pseudophakic eyes, and post-lensectomy aphakic eyes. Future studies are needed to examine the correlation between such characteristics and clinical pathology, especially glaucoma after CE.

References:

1. Freedman SF, Lynn MJ, Beck AD, et al. Glaucoma-related adverse events in the first 5 years after unilateral cataract removal in The Infant Aphakia Treatment Study. JAMA Ophthalmol 2015;133(8):907-14.
2. Chen D, Gong X, Xie H et al. The long-term anterior segment configuration after pediatric cataract surgery and the association with secondary glaucoma. Sci Rep 2017;7:43015.
3. Nishijima K, Takahashi K, Yamakawa R. Ultrasound biomicroscoy of the anterior segment after congenital cataract surgery. Am J Ophthalmol 2000;130(4)483-9.

Poster #A27
Friday, April 9, 2021
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Systemic Evaluation of Children with Cataract

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Introduction: Systemic investigations are often performed for children presenting with cataract, with the aim of identifying an underlying condition, such as congenital infection or metabolic disease. However, the yield of routine investigation is uncertain and some suggest more targeted testing instead. The aim of this study was to determine the diagnostic yield of systemic investigations in otherwise well children with cataract.

Methods: Retrospective review of patients aged 0-15 who underwent cataract surgery between 2013 and 2017 at a tertiary eye hospital.

Results: 111 patients were included. The median age of surgery was 1.62 years. 57 had unilateral cataract and 54 had bilateral cataract. All children were reviewed by a pediatrician. 9 were already under the care of pediatricians elsewhere for a known or suspected systemic condition at the time of cataract diagnosis. These included Cockayne syndrome, Down syndrome, Senger syndrome, type 1 diabetes mellitus and galactosemia. Among those with normal initial evaluation by the pediatrician, 54 underwent at least one systemic investigation. 38 were screened for metabolic conditions and 39 were screened for congenital infections. Screening for metabolic disease or congenital infection did not lead to a diagnosis of an underlying etiology in any of the well children investigated. 20/54 patients investigated encountered at least one problem with testing, the most common of which was insufficient sample.

Conclusion/Relevance: Routine screening of well children presenting with unilateral or bilateral cataracts for congenital infection or metabolic conditions have a low diagnostic yield. More targeted testing based on clinical presentation is recommended.

References: Rahi JS, Dezateux C. Congenital and infantile cataract in the United Kingdom: underlying or associated factors. British Congenital Cataract Interest Group. Invest Ophthalmol Vis Sci. 2000;41(8):2108-2114.
Traboulsi EI, Vanderveen D, Morrison D, Drews-Botsch CD, Lambert SR; Infant Aphakia Treatment Study Group. Associated systemic and ocular disorders in patients with congenital unilateral cataracts: the Infant Aphakia Treatment Study experience. Eye (Lond). 2016;30(9):1170-1174. doi:10.1038/eye.2016.124
Musleh M, Hall G, Lloyd IC, et al. Diagnosing the cause of bilateral paediatric cataracts: comparison of standard testing with a next-generation sequencing approach. Eye (Lond). 2016;30(9):1175-1181. doi:10.1038/eye.2016.105

Poster #A28
Friday, April 9, 2021
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Serum Cortisol and Adrenocorticotrophic Hormone (ACTH) in Infants Receiving Topical Ocular Corticosteroids Following Cataract Surgery

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Introduction: Cushingoid features are occasionally encountered in infants after paediatric cataract surgery The aim of this study is to evaluate whether the use of topical glucocorticoids (GCs) following congenital cataract surgery can result in endogenous adrenal suppression and/or systemic side effects similar to those seen with systemic steroids.

Methods: A prospective study was performed on 20 infants with bilateral congenital cataract. All infants received a single subconjunctival betamethasone injection 1mg at the end of surgery in addition to topical dexamethasone eyedrops 1mg/ml. for 6 weeks. All infants had anthropometric measurements, and blood pressure measurements, serum cortisol and ACTH levels measurements before surgery and 2 months after. In addition, the total administered glucocorticoids adjusted per weight was calculated.

Results: The mean age of the infants was 4.93 ± 2.58 months. Thirteen were males (65%). The total administered glucorticoid dose was 18.7 mg and the mean cumulative dexamethasone equivalent dose administered was 2.75 ± 1.31 mg/Kg. There was statistically significant increase in the adjusted weight percentile for age (P =0.009). Both the systolic and diastolic blood pressure were significantly elevated (P =0.005 and P = 0.025 respectively). There was a statistically significant reduction in both the morning and afternoon serum ACTH levels (P = 0.023 and P = 0.014). The reduction in serum cortisol levels was statistically non-significant

Conclusion/Relevance: Topical steroids following paediatric cataract surgery can result in both subclinical and clinical changes in the hypothalamic-pituitary-adrenal axis that can be easily overlooked and need careful attention and follow-up.

References: Afandi B, Toumeh MS, Saadi HF. Cushing's syndrome caused by unsupervised use of ocular glucocorticoids. Endocr Pract. 2003; 9:526-529.

Fukuhara D, Takiura T, Keino H, Okada AA, Yan K. Iatrogenic Cushing's syndrome due to topical ocular glucocorticoid treatment. Paediatrics. 2017; 139(2):e20161233.

Kröger L, Kotaniemi K, Jääskeläinen J . Topical treatment of uveitis resulting in adrenal insufficiency. Acta Paediatr 2009; 98 (3):584–585.

Poster #A29
Friday, April 9, 2021
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Accuracy of A Universal Theoretical Formula for Lens Power Calculation in Pediatric Intraocular Lens Implantation

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Introduction: To compare the accuracy of Barrett Universal II to other formulas (Holladay II, Hoffer Q, and SRK-T) in the prediction of post-operative refraction for pediatric intraocular lens implantation.

Methods: Retrospective case series of children </=16 years of age who underwent cataract extraction and IOL implantation (2012-2019) and had a refraction at 3-16 weeks post-operatively. Prediction error (PE) was calculated as post-operative mean spherical equivalent minus the target refraction. Mean, median and standard deviation was calculated for PE and absolute PE. Performance across co-variables (axial length, age, biometry type, keratometry, etc.) was studied and a multivariable regression analysis was performed using a single prediction model for each formula.

Results: 64 eyes of 64 patients, ages 1.5 to 15.5 years, were included. Barrett had the lowest mean PE (-0.22D), SD (1.18D), median PE (-0.26D) and median APE (0.71) compared to the other formulas. Holladay II performed similarly to Barrett, and SRK-T had the greatest mean PE (-0.50D) and SD (1.22D). Barrett predictions were stable across all variables.

Conclusion/Relevance: Barrett demonstrated similar or superior performance when compared to other formulas in this pediatric study, including at the extremes of variables like axial length and IOL power. Holladay II performed similarly to Barrett, and SRK-T had the least reliable performance, across several key biometric characteristics. While prediction errors can be highly variable in pediatric populations, this study supports Barrett Universal II as a reasonable and reliable option for lens power calculation in children, including those with extreme biometric measurements.

References: 1. Hoffer KJ, Aramberri J, Haigis W, et al. Protocols for Studies of Intraocular Lens Formula Accuracy. Am J Ophthalmol. 2015;164(3):149-150. doi:10.1016/j.ajo.2016.01.010
2. Melles RB, Holladay JT, Chang WJ. Accuracy of Intraocular Lens Calculation Formulas. Ophthalmology. 2018;125:169-178. doi:10.1016/j.ophtha.2017.08.027

Poster #A30
Friday, April 9, 2021
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Incidence of Retinal Detachment following Lens Surgery in Children and Young Adults with Non-Traumatic Ectopia Lentis

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Introduction: To determine the incidence of retinal detachment following lens surgery in children and young adults with non-traumatic ectopia lentis.

Methods: A total of 210 patients (298 eyes) with non-traumatic ectopia lentis aged ≤ 30 years who had undergone lens surgery with or without intraocular lens (IOL) implantation and had ≥ 1 year of continuous enrollment after lens surgery were identified from the Optum deidentified Clinformatics Data Mart Database (2003-2019) and IBM® MarketScan® Databases (2007-2016). We assessed sex, age, etiology of ectopia lentis, IOL implantation and postoperative retinal detachment in both databases, separately. Univariate and multivariate analyses were conducted to identify the risk factors for postoperative retinal detachment.

Results: IOL implantation was coupled with lens surgery in 151 (49.8%) eyes that underwent lens surgery for non-traumatic ectopia lentis. Median follow-up was 32 months for aphakic eyes and 29 months for pseudophakic eyes. Patients undergoing IOL implantation were older at the time of lens surgery (median age: no IOL, 6 years; IOL, 16 years; $P < 0.001$). Retinal detachment occurred in 14 eyes (4.7%) (no IOL, 5 (3.4%); IOL, 9 (6.0%); $P = 0.30$). Older age was the baseline characteristic that correlated most closely with the risk of retinal detachment ($P = 0.05$).

Conclusion/Relevance: The rate of retinal detachment was similar with or without IOL implantation after lens surgery for non-traumatic ectopia lentis in children and young adults.

References: 1. Shen JF, Deng S, Hammersmith KM, et al. Intraocular Lens Implantation in the Absence of Zonular Support: An Outcomes and Safety Update: A Report by the American Academy of Ophthalmology. Ophthalmology 2020;127:1234-58

2. Miraldi Utz V, Coussa RG, Traboulsi EI. Surgical management of lens subluxation in Marfan syndrome. J AAPOS 2014;18:140-6.

3. Hirashima DE, Soriano ES, Meirelles RL, Alberti GN, Nosé W. Outcomes of iris-claw anterior chamber versus iris-fixated foldable intraocular lens in subluxated lens secondary to Marfan syndrome. Ophthalmology 2010;117:1479-85.

Poster #A31
Friday, April 9, 2021
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Assessment Of Macular Edema After Pediatric Cataract And Intraocular Lens Implantation Surgery Using Handheld Spectral Domain Optical Coherence Tomography

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Introduction: This prospective study aims to assess the incidence of macular edema after pediatric cataract and intraocular lens surgery using the handheld spectral domain optical coherence tomography (SD-OCT).

Methods: 59 eyes of 34 children aged 1 to 5 years, scheduled for irrigation/aspiration (I/A) and intraocular lens(IOL)implantation between April 2018 and December 2019 were included and randomly divided into 2 groups: Group A (28 eyes), underwent posterior capsulotomy and anterior vitrectomy via the anterior/limbal approach and Group B (31 eyes), underwent posterior capsulotomy and anterior vitrectomy via a pars plicata/pars plana approach. Handheld SD-OCT examinations were done for all eyes at 2, 6 weeks, 3 and 6 months postoperatively. SD-OCT was performed on 180 eyes of normal children less than 5 years to be used as control. The mean central foveal thickness (CFT) and central subfield thickness (CST) of both groups were compared with the control.

Results: The mean CFT and CST in the control group were 176.70 microns ± 17.30 and 230.82 microns ± 21.46 respectively. The CFT in group B was significantly higher than group A at 1st, 2nd and 3rd FU visits. (P value 0.015, 0.015 and 0.027 respectively). The CST of Group B was significantly higher than CST of normal controls in all FU visits. (P value 0.016, 0.006, 0.024, 0.041 respectively). However, the difference did not exceed 9% and was, therefore, not considered clinically relevant.

Conclusion/Relevance: The incidence of macular edema after pediatric cataract surgery is negligible in both limbal and pars plicata techniques.

References: Lim Z, Rubab S, Chan YH, Levin AV. Management and outcomes of cataract in children: the Toronto experience. J AAPOS. 2012, 6(3):249-54.
Sacchi M, Serafino M, Trivedi RH, et al. Spectral-domain optical coherencetomography measurements of central foveal thickness before and aftercataract surgery in children. J Cataract Refract Surg 2015; 41:382-386.
Rotruck JC, House RJ, Freedman SF, Kelly MP, Enyedi LB, Prakalapakorn SG, et al. Optical Coherence Tomography Normative Peripapillary Retinal Nerve Fiber Layer and Macular Data in Children 0-5 Years of Age. American Journal of Ophthalmology .; 2019 ;208:323-30

Poster #A32
Friday, April 9, 2021
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Pediatric Cataract Surgery following Treatment for Retinoblastoma

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Introduction: To determine the visual and refractive outcomes, ocular and systemic complications of cataract surgery in eyes treated for retinoblastoma (RB).

Methods: Retrospective consecutive case series of children <18 years with retinoblastoma who underwent surgery for secondary cataract between 2000 and 2020, with minimum 6-month follow-up.

Results: Fifteen eyes of 15 children were included. Median age at RB diagnosis was 14 months (range, 0-30). Cataract developed at median age 31 months (range, 6-92), secondary to multiple treatments (n=7), pars-plana vitrectomy (PPV, n=3), external-beam radiotherapy (EBRT, n=2), laser (n=2), and retinal detachment (RD, n=1). Mean interval between last RB treatment and cataract surgery was 44±41 months. Primary intraocular lens implantation was performed in 14 eyes (93%), posterior capsulotomy in 6 eyes (40%) and anterior vitrectomy in 5 eyes (33%). Intraoperative findings included synechiae, anterior capsule fibrosis, posterior capsular plaque, retrolental membrane, and subconjunctival fibrosis. Postoperatively, 100% had improved fundus visibility and 73% (11/15) improved vision. Mean prediction error was -1.2±1.6 D. Complications included visual axis opacification (11/15) requiring a secondary procedure in 8 eyes, capsular phimosis (5/15), zonulopathy (4/15; 2 intraoperative, 2 postoperative), lens decentration/tilt (2/14), and macular edema (1/15). One child had intraocular recurrence treated by PPV/tumor endoresection. No child developed extraocular extension or metastases at mean 70±46 months follow-up.

Conclusion/Relevance: Modern retinoblastoma therapies, including intravitreal chemotherapy and vitrectomy, cause secondary cataract. While surgery improves tumor visualization, macular tumors, RD, optic neuropathy and keratopathy limit visual prognosis. Challenges include biometry limitations and higher incidence of zonulopathy.

References: 1. Osman IM, Abouzeid H, Balmer A, et al. Modern cataract surgery for radiation-induced cataracts in retinoblastoma. Br J Ophthalmol 2011;95:227-30.

Poster #A33
Friday, April 9, 2021
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Refractive Growth of the Crystalline Lens

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Introduction: The refractive development of the normal lens is the change in its power with age. Gordon and Donzis [1] calculated the lens powers of children's eyes in several age range groups, based on cross-sectional data. We analyzed the longitudinal power and rate of refractive growth (RRG3) of the crystalline lenses of fellow eyes in the Infant Aphakia Treatment Study (IATS) cohort.

Methods: Infants randomized to unilateral cataract extraction had crystalline lens power calculated from axial length, keratometry, and refraction at 1 and 10 years of age, using the Holladay 1 formula. Subjects were included if complete data from both eyes was available; RRG3 for each eye was calculated from these values. RRG3 is defined as slope of the line in a plot of crystalline lens power vs. log of age, adjusted for gestational age at birth.

Results: Longitudinal biometric data was available for 110 of the 114 patients enrolled. The power of the normal lens was 29.60 (2.22) D at age 1, and 21.47 (1.83) D at age 10, reported as mean (standard deviation). The RRG3 for normal lenses in this age range was -9.30 (2.56) D, vs. the normal eyes (based solely on axial length and corneal power) -11.34 (3.19) (p[different means] < 0.001, T-test two-sample assuming unequal variances; p[different variances] = 0.0292 F-test two-sample for variances). The refraction of the normal eyes was +1.30 (2.42) D at age 1, and +0.01 (2.84) D at age 10.

Conclusion/Relevance: The normal lens has a smaller rate of refractive growth and a smaller variance in RRG3 than the normal eye. This explains the myopic shift of the eye and the greater range of refractive error at age 10 than age 1.

References: [1] Gordon RA, Donzis PB. Refractive development of the human eye. Arch Ophthalmol. 1985; 103(6):785-789

Poster #A34
Friday, April 9, 2021
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Ultrasound Biomicroscopy Characterization of Pediatric Cataract Morphology and Posterior Capsular Abnormalities

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Introduction: Ultrasound biomicroscopy (UBM) provides high resolution imaging of the anterior segment of the eye. UBM may be able to assist in the pre-operative planning and surgical technique of cataract extraction in children by providing information about the morphology of the cataractous lens. In particular, we examined whether UBM can reveal previously undiagnosed posterior capsular abnormalities.

Methods: We performed a retrospective study of 7 children with cataracts who underwent UBM of the anterior segment during examination under anesthesia (EUA) immediately prior to cataract extraction. UBM images were analyzed for anterior and posterior capsular appearance, lens morphology, and location of opacity. Pre-operative slit lamp examination and intra-operative findings were reviewed.

Results: Average subject age was 2.4 years (range 3 months to 8 years). Cataract morphologies included nuclear (2), posterior lenticonus (2), total white cataract (1), membranous (1), and posterior fetal vasculature (1). UBM characterization of the cataract corresponded with EUA and intra-operative findings in five subjects. In the other two, the location of lenticular opacity was indeterminate on UBM. In two subjects ultimately diagnosed with posterior lenticonus, slit lamp visualization of the posterior capsule was impossible, but UBM demonstrated posterior bulging of the posterior capsule, and posterior capsular incompetence was noted intraoperatively.

Conclusion/Relevance: In children undergoing cataract extraction, pre-operative UBM findings correspond well with examination and intra-operative findings. UBM can identify posterior capsular abnormalities not otherwise visualized pre-operatively, thereby helping guide pre-operative planning and intra-operative technique, potentially reducing the risk of retained lens fragments or unintended vitreous loss.

References: El Shakankiri NM, Bayoumi NH, Abdallah AH, El Sahn MMF. 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.
Khokhar SK, Pillay G, Agarwal E, Mahabir M. Innovations in pediatric cataract surgery. Indian J Ophthalmol. 2017;65:210-6.
Xiang D, Chen L, Hu L, et al. Image features of lens opacity in pediatric cataracts using ultrasound biomicroscopy. J AAPOS. 2016;20:519-22.e4

Poster #A35
Friday, April 9, 2021
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Aqueous Humor Proteomics of Subjects Undergoing Cataract Surgery

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Introduction: Pediatric intraocular surgery is often affected by postoperative fibrosis and inflammation, leading to complications that can affect visual outcomes. Few studies have investigated the proteomic composition of aqueous humor in ocular conditions that affect the pediatric population. To elucidate potential mechanisms by which these events occur, we used mass spectrometry to analyze differences in the protein composition of the aqueous humor of subjects undergoing planned cataract surgery.

Methods: This study was approved by the Medical College of Wisconsin Institutional Review Board. Subjects were consented and enrolled if they were scheduled for cataract surgery. After the first incision was made, a sample of aqueous humor was acquired with a blunt canula on a syringe. Discovery-based liquid chromatography tandem mass spectrometry (LC-MS/MS) was performed on aqueous humor samples from 5 subjects and data were analyzed using Proteome Discoverer™ and Skyline. A separate cohort from five adult subjects with no history other than cataract was used as a control for comparison.

Results: Analysis of the aqueous humor from several pediatric subjects revealed a variety of aqueous humor protein alterations. Compared to adult controls, pediatric samples had different protein abundances observed in immunosuppressive, inflammatory and coagulation-related proteins. In addition, one subject with a traumatic cataract had an increased abundance of crystalline and fibrotic proteins.

Conclusion/Relevance: Mass spectrometry techniques reveal differences in protein abundances in the aqueous humor. Further knowledge of the overall protein composition may further the understanding of different ocular conditions and allow for targeted therapy to improve surgical outcomes.

References: 1. Zheng et al. Age-related Pro-Inflammatory and Pro-Angiogenic Changes in Human Aqueous Humor. Int J Ophthalmol. Feb 2018; 11(2): 196-200.

2. Haasnoot et al. Ocular Fluid Analysis in Children Reveals Interleukin-29/Interferon-?1 as a Biomarker for Juvenile Idiopathic Arthritis-Associated Uveitis. Arthritis Rheumatol. July 2016;68(7): 1769-79.

3. Young et al. Quantitative Proteomic Analysis of Aqueous Humor After Rabbit Lensectomy Reveals Differences in Coagulation and Immunomodulatory Proteins. Mol Omics. Apr 2020;16(2): 126-137.

Poster #A36
Friday, April 9, 2021
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Incidence of Early Retinal Detachment after Pediatric Cataract Surgery using Optum® Dataset

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Introduction: The rate of retinal detachment (RD) after cataract surgery in children is not well known but is believed to occur most commonly many years after surgery.1 We describe the characteristics and incidence of RD within the first 90 days following pediatric cataract surgery using a large-scale, administrative claims dataset.

Methods: In a retrospective review of approximately 58 million charts in the Optum® dataset, we identified patients <13 years of age who underwent cataract surgery between 2003 and 2017. Associations of RD with age, sex, presence of intraocular lens (IOL) implant, and persistent fetal vasculature (PFV) were assessed using univariate and multivariate logistic regression.

Results: Cataract surgery was performed on 731 eyes (49% female) with a median age of 5 (interquartile range 1 to 8) years at time of cataract surgery. The rate of primary IOL implantation was 70.3%. RD was diagnosed in 9 eyes (1.2%); the median time to diagnosis of RD was 28 days (IQR 28 to 65 days). Multivariate regression showed that PFV (OR 8.9, P <0.01) was associated with greater risk of developing RD after controlling for demographic and intraoperative factors.

Conclusion/Relevance: In this large insurance claims dataset representing all regions of the United States, we report a higher rate of RD following pediatric cataract surgery in the immediate postoperative period than previously reported.2,3 We found nearly 9-fold higher odds of developing RD in patients with PFV. Our study informs about the risk of pediatric cataract surgery and emphasizes the need for dilated fundus examinations early in the postoperative period.

References: 1. Yorston D, Yang YF, Sullivan PM. Retinal detachment following surgery for congenital cataract: presentation and outcomes. Eye (Lond). 2005;19:317-321.

2. Agarkar S, Gokhale VV, Raman R, Bhende M, Swaminathan G, Jain M. Incidence, Risk Factors, and Outcomes of Retinal Detachment after Pediatric Cataract Surgery. Ophthalmology. 2018;125(1):36-42.

3. Rabiah PK, Du H, Hahn EA. Frequency and predictors of retinal detachment after pediatric cataract surgery without primary intraocular lens implantation. J AAPOS. 2005;9(2):152-159.

Poster #A37
Friday, April 9, 2021
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Systemic Diagnoses in Pediatric Patients undergoing Cataract Surgery

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Introduction: Many causes of cataract have been described; but there are few reports specifying associated systemic diagnoses in large cohorts of children undergoing surgery.

Methods: Chart review of patients <18 years of age undergoing cataract surgery at a tertiary referral center between 1995-2018. Associated systemic diagnoses and ocular abnormalities were recorded.

Results: 713 patients were identified (394 bilateral, 319 unilateral). An underlying syndrome or genetic diagnosis was found in 19% bilateral (75/394) and 1.3% (4/319) unilateral patients. Of these, about 2/3 were identifiable in early infancy to have a systemic condition by distinct phenotypic features (such as Down syndrome), because of multiple congenital anomalies, or early neurologic abnormality. Cataracts were the result of treatment for cancer or acquired systemic condition in 57/394 bilateral (14.5%) and 22/319 (6.9%) unilateral patients. Cataracts were associated with underlying ocular abnormalities or treatment for an ocular condition in 22/394 (5.6%) bilateral and 22/319 (6.9%) unilateral patients. Familial cataract accounted for 22.3% of the bilateral cataract group. Trauma was the cause of cataract in 20% unilateral cataracts.

Conclusion/Relevance: Clinicians should be aware of systemic diagnoses among children with non-familial idiopathic congenital cataract, and referral for genetic evaluation should be considered for select cases. Majority of patients with unilateral cataract do not have a systemic diagnosis, the most common identifiable cause was PFV.

References: 1. Lim Z, Rubab S, Chan YH, Levin AV. Pediatric cataract: the Toronto experience-etiology. Am J phthalmol. 2010 Jun;149(6):887-92. doi: 10.1016/j.ajo.2010.01.012. Epub 2010 Apr 28.
2. Haargaard B, Wohlfahrt J, Fledelius HC, Rosenberg T, Melbye M. A nationwide Danish study of 1027 cases of congenital/infantile cataracts: etiological and clinical classifications. Ophthalmology. 2004 Dec;111(12):2292-8.
3. Traboulsi EI, Vanderveen D, Morrison D, Drews-Botsch CD, Lambert SR; Infant Aphakia Treatment Study Group. Associated systemic and ocular disorders in patients with congenital unilateral cataracts: the Infant Aphakia Treatment Study experience. Eye (Lond). 2016 Sep;30(9):1170-4. doi: 10.1038/eye.2016.124. Epub 2016 Jun 17.

Poster #A38
Friday, April 9, 2021
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Management of Cataracts in Pediatric Patients with Developmental Delay

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Introduction: We report the presentation and challenges associated with cataract management in children with developmental delay (DD).

Methods: Retrospective review of patients presenting with cataracts and DD from February 2014 to December 2017.

Results: 100 patients (173 eyes) were included. 27 patients had unilateral cataracts and 73 bilateral. The average age was 120.55 months; average follow up period was 58.9 months. 50% of patients (54% eyes) did not receive cataract surgery. Reasons for medical management: visually insignificant cataract (68% eyes), parent deferred surgery (9% eyes), self-abusive behavior (14% eyes), and medical conditions that limited visual recovery (10% eyes). 25% of patients were unable to perform objective visual acuity by age 5. Patients with self-abusive behavior were more likely to present with or develop retinal detachment (RD) (35%) compared to those without self-abusive behavior (6%) ($p = 0.0028$). A statistically significant difference in difficulty of examination ($p< 0.0001$) and poor compliance of glasses wear ($p< 0.0001$) was found in nonverbal patients. Patching was recommended in 22% of patients; 59% of these had poor compliance. Surgical complications occurred in 39% of eyes. Those with intraocular lens placement after cataract extraction were more likely to develop visual axis opacification (27% eyes) than those who remained aphakic (9%) ($p = 0.0313$).

Conclusion/Relevance: Cataract extraction in pediatric patients with DD can be associated with success, however, providers should prepare for limitations in managing these patients. Difficulty assessing vision, poor treatment compliance, and increased risk of RD from self-abusive behavior are potential challenges when managing cataracts in patients with DD.

References: Khanna R, Krishnaiah S, Mehta M, Foster A, Gogate P. Visual outcomes of bilateral congenital and developmental cataracts in young children in south India and causes of poor outcome. Indian Journal of Ophthalmology. 2013;61(2):65. doi:10.4103/0301-4738.107194.
Lee Y-H, Lenhart PD, Lambert SR. Cataract secondary to self-inflicted blunt trauma in children with autism spectrum disorder. Journal of American Association for Pediatric Ophthalmology and Strabismus. 2016;20(4):361-362. doi:10.1016/j.jaapos.2016.02.013.
Santoro SL, Atoum D, Hufnagel RB, Motley WW. Surgical, medical and developmental outcomes in patients with Down syndrome and cataracts. SAGE Open Medicine. 2017;5:205031211771558. doi:10.1177/2050312117715583.

Poster #A39
Friday, April 9, 2021
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Fixation Instability during Binocular Viewing in Children following Dense Unilateral Cataract Extraction

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Introduction: Previous research has focused on the qualitative aspects of fixation instability in children with deprivation amblyopia following dense unilateral cataract extraction, such as the presence of fusion maldevelopment nystagmus (FMNS).[1,2] Here, we quantify fixation instability and vergence instability (unstable eye alignment) using the bivariate contour ellipse area (BCEA; log deg^2) during binocular viewing in children following cataract extraction.

Methods: Seventeen children (aged 4-13 years) with a history of dense unilateral cataract were compared to 46 age-similar controls. Children fixated a stationary 0.3 deg dot for 20 seconds with both eyes open. Eye positions were recorded using a 500 Hz remote video binocular eye tracker (EyeLink 1000; SR Research). BCEA was calculated per eye for fixation instability and for vergence instability (left eye position - right eye position). Visual acuity, stereoacuity, and Worth 4-Dot suppression were also obtained.

Results: Compared with controls, children with a history of cataract had larger affected eye fixation instability (mean±SD=0.52±0.37 vs -0.35±0.23 log deg^2; $p<0.001$), larger fellow eye fixation instability (-0.19±0.21 vs -0.39±0.29, $p=0.011$), and larger vergence instability (0.50±0.32 vs -0.38±0.29, $p<0.001$). No relationship was found between fixation or vergence instability and affected eye visual acuity, stereoacuity, or suppression.

Conclusion/Relevance: Fixation instability and vergence instability during binocular viewing in children following dense unilateral cataract extraction is significantly more unstable than peers for their age. Vergence instability may limit potential for recovery of binocular vision in children with deprivation amblyopia.

References: 1. Abadi RV, Forster JE, Lloyd IC. Ocular motor outcomes after bilateral and unilateral infantile cataracts. Vision Res. 2006;46:940-952.
2. Birch EE, Wang J, Felius J, Stager DR Jr, Hertle RW. Fixation control and eye alignment in children treated for dense congenital or developmental cataracts. J AAPOS. 2012;16(2):156-160.

Poster #A40
Friday, April 9, 2021
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Characteristics and Outcomes of Cataract Surgery in Children with a Cataract at Uveitis Presentation

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Introduction: Immunosuppressive medications have reduced the need for intraocular surgery in pediatric non-infectious uveitis[1]. However, some children present with a cataract at the time of uveitis diagnosis. The purpose of this study was to describe the outcomes of cataract surgery in those patients.

Methods: We retrospectively reviewed all patients diagnosed with a cataract with their first presentation of uveitis and undergoing cataract extraction between 2005 and 2019. The outcome measures were the visual acuity, the number of uveitis flare-ups (cells ≥1+), incidence of new ocular hypertension (OHT) (intraocular pressure ≥ 25 mmHg for ≥2 visits) and intraocular surgeries, at one year after cataract extraction.

Results: Sixteen eyes of 13 patients (idiopathic uveitis: 8, juvenile idiopathic arthritis: 5) were identified. Cataract extraction was performed after a median time of 8.5 months. Methotrexate was initiated in 9 patients and adalimumab in two. An intraocular lens was implanted in 4 eyes. Visual acuity improved from 1.2 log MAR ± 0.5 before surgery, to 0.7 log MAR ± 0.4 at 1 year (p=0.002). Four eyes had 1 flare-up during the first post-operative year (2 to 8 months after surgery). New OHT required medical treatment in 2 eyes, 1 eye with previous glaucoma needed treatment escalation. One eye underwent a posterior vitrectomy and intravitreal triamcinolone for pre-existing, refractory macular oedema. New macular oedema and/or disc swelling occurred in 3 eyes.

Conclusion/Relevance: Cataract surgery significantly improved visual acuity with little number of flare-ups and secondary intraocular surgeries. However, new ocular hypertension, CME and disc swelling can occur.

References: 1. Cheung CSY, Mireskandari K, Ali A, Silverman E, Tehrani N. Earlier use of systemic immunosuppression is associated with fewer ophthalmic surgeries in paediatric non-infectious uveitis. Br J Ophthalmol. 2020 Jul;104(7):938-942. doi: 10.1136/bjophthalmol-2019-314875.

Poster #A41
Friday, April 9, 2021
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Results of Genetic, Infectious, and Metabolic Testing in the Work-Up of Bilateral Pediatric Cataracts at a Tertiary Pediatric Hospital

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Introduction: Children with unexplained bilateral cataracts routinely undergo testing for genetic, infectious, or metabolic etiologies. However, PEDIG has recently recommended reevaluation of this standard work-up.(1) In this study, we evaluate whether such testing was useful in identifying the cause of bilateral pediatric cataracts at our institution.

Methods: Medical records were reviewed for all children who underwent cataract surgery at Children's Hospital Colorado from May 2009 to November 2020. We recorded the results of any genetic, infectious, or metabolic testing ordered by ophthalmology.

Results: A total of 381 cataracts were extracted from 264 children. Fifty-one children had bilateral idiopathic cataracts. Genetic testing was ordered for 28 patients, TORCH titers in 30, galactosemia testing in 32, and urine reducing substances (URS) in 14. Genetic tests demonstrated cataract-associated mutations in 10 (36%) of the children tested. Fourteen children (47%) were IgG-positive for a TORCH infection, but no child was IgM-positive for any TORCH infection. All galactosemia tests and URS were negative.

Conclusion/Relevance: Genetic testing often identified the cause of cataracts, while no child tested positive for a metabolic disorder. TORCH titers were not considered diagnostic in any of these children since maternally transmitted IgG persists for 6-12 months and because no child was IgM-positive.2,3 While genetic testing is very useful for determining the etiology of bilateral pediatric cataracts, our study supports further consideration of eliminating TORCH titers and metabolic testing in otherwise healthy children and instead ordering these studies only in patients with clinical suspicion.

References: 1) Repka, Michael X et al. 'Cataract Surgery in Children from Birth to Less than 13 Years of |Age: Baseline Characteristics of the Cohort.' Ophthalmology vol. 123,12 (2016): 2462-2473.
2) Del Pizzo J. 'Congenital Infections (TORCH).' Pediatrics in Review vol. 32,12 (2011): 537-542.
3) Niewiesk S. 'Maternal Antibodies: Clinical Significance, Mechanism of Interference with |Immune Responses, and Possible Vaccination Strategies.' Frontiers in Immunology vol. 5 (2014): 446.

Poster #A42
Friday, April 9, 2021
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Preoperative Central Corneal Thickness in Eyes with Pediatric Cataract versus Normal Fellow Eyes

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Introduction: In this study we compare the preoperative central corneal thickness (CCT) in eyes with unilateral cataract with their normal fellow eyes in the pediatric population.

Methods: A retrospective chart review was conducted using the pediatric cataract database for eyes that were operated at a single site by a single surgeon. Eyes with traumatic cataract, previous surgery, or age greater than 18 were excluded. Only eyes with a normal fellow eye were included. The intraocular pressure, age at time of surgery, race, sex, and type of cataract were also examined.

Results: A total of 140 eyes of 70 patients were found to meet these criteria. The mean age at time of surgery was 3.35 years (range 0.08 to 15.05). The mean CCT in the operated eyes (n=70) was 576.9 micrometers (standard deviation 57.6, range 464-898). The mean CCT in the fellow eyes (n=70) was 569.6 micrometers (standard deviation 34.6, range 485-643). While the CCT in cataract eyes was greater, there was no statistical significance found between the preoperative CCT in cataract eyes vs unaffected fellow eyes (p=0.183). When stratified by age, the difference in the CCT in cataract eyes vs fellow eyes was greatest in the <1 year age group compared with older children, but was not statistically significant (P= 0.236). The mean preoperative corneal diameter was 10.76 mm (range 5.5-12.5, n=66). The mean preoperative IOP was 15.13 mmHg (n=66).

Conclusion/Relevance: There is no significant difference in the mean preoperative CCT in unilateral pediatric cataract eyes versus unaffected fellow eyes.

References: 1) Kun L, Szigeti A, Bausz M, Nagy ZZ, Maka E. Preoperative biometry data of eyes with unilateral congenital cataract. Journal of Cataract & Refractive Surgery. 2018;44(10):1198-1202. doi:10.1016/j.jcrs.2018.06.054
2) Muir K, Duncan L, Enyedi L, Wallace D, Freedman S. Central Corneal Thickness: Congenital Cataracts and Aphakia. American Journal of Ophthalmology. 2007;144(4): 502-506.e2. https://doi.org/10.1016/j.ajo.2007.06.004.

Poster #A43
Friday, April 9, 2021
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Ocular Manifestations in Turner Syndrome

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Introduction: Turner syndrome is a chromosomal abnormality, affecting about 1 in 2000 live female births. Although it is associated with significant ophthalmic morbidity, this is usually underestimated and often goes unrecognized

Methods: A retrospective chart review of 288 patients diagnosed with Turner syndrome at a tertiary center was performed. 188 patients were included in the study. Descriptive statistical analysis using SAS and FREQ procedure was done

Results: Refractive error was the most common eye manifestation (43.31%,) with myopia being more common than hyperopia. Astigmatism was notable among these patients. There was higher risk of amblyopia. Strabismus was seen in 12.3% of Turner patients with equal pre-ponderance of intermittent exotropia and esotropia. Ptosis, nasolacrimal duct obstruction, and nystagmus were other ocular findings. Posterior segment findings were notable for chorio retinal scar, disc edema and hamartoma.
Discussion: Ocular abnormalities are more common in Turner syndrome than in the general population and may be underestimated and neglected. Very few case series have been published in the Ophthalmic literature. There is a danger that parents and community doctors may concentrate exclusively on the 'medical' features of Turner syndrome, resulting in delayed recognition of refractive errors, strabismus and developing amblyopia which are more treatable when caught earlier

Conclusion/Relevance: The high prevalence of ocular conditions would favor for early systematic screening of children with Turner syndrome. This could initially be by Orthoptists or Optometrists with appropriate onward referral to an Ophthalmologist to prevent ocular morbidity in these patients.

References: 1.Hsu LYF. Prenatal diagnosis of chromosomal abnormalities through amniocentesis. In: Mulinsky A (ed). Genetic Disorders and the Fetus. Johns Hopkins University Press: Baltimore, MD, 1998, pp 179-248
2.Chrousos GA, Ross JL, Chrousos G, Chu FC, Kenigsberg D, Cutler Jr G et al. Ocular findings in Turner syndrome. A prospective study. Ophthalmology 1984; 91(8): 926-928.
3. Adhikary HP. Ocular manifestation of Turner's syndrome. Trans Ophtalmol Soc UK 1981; 101 (Part 4): 395-396

Poster #A44
Friday, April 9, 2021
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Stargardt Misdiagnosis: How Ocular Genetics Helps

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Introduction: Ocular Genetics specialists see a wide range of rare disorders for accurate diagnosis. To demonstrate how focused consultation and DNA testing results in precise diagnoses, we investigated false diagnosis rates for patients referred for Stargardt disease.

Methods: Retrospective review of patients referred with Stargardt disease over three years. Results of diagnostic testing and DNA sequencing were compared to standard definition of Stargardt.

Results: Of 40 patients, 14 (35%) had been misdiagnosed. Four had non-Stargardt Phenotype, of which 3 had ABCA4 mutation with a non-Stargardt phenotype, and 9 had different gene diagnosis confirmed.

Conclusion/Relevance: Our study highlights the essential role of the subspecialty field of ocular|genetics in obtaining accurate diagnoses for the delivery of correct counseling and|interventional trial eligibility assessment.

References: 1. Al-Mujaini, A., & Ganesh, A. Ocular Genetics: A Sub-specialty Service for Genetic Eye Diseases. Oman Medical Journal. 2013; 28(1), 1-2
2. Fishman, G. A. Variation of Clinical Expression in Patients With Stargardt Dystrophy and Sequence Variants in the ABCRGene. Archives of Ophthalmology. 1999; 117(4), 504
3. Genead, M. A., Fishman, G. A., Stone, E. M., & Allikmets, R. The Natural History of Stargardt Disease with Specific Sequence Mutation in theABCA4Gene. Investigative Opthalmology & Visual Science. 2009; 50(12), 5867

Poster #A45
Friday, April 9, 2021
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Ocular Phenotype of Genetically Confirmed Kabuki Patients

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Introduction: Ocular involvement has been the focus of few short reports in Kabuki syndrome[1], a rare multisystem disorder with distinctive facial features, skeletal abnormalities and intellectual disability.

Methods: A comprehensive examination was performed in fifteen (age: 0.75 to 27 years; median: 8.8) genetically confirmed kabuki patients (13 KMT2D and two KDM6A).

Results: Visual acuity was reduced for age in both eyes of ten patients, but normal in others. The range was from excellent (20/15) to poor (20/190). Ten patients had refractive errors within normal for age and five needed glasses. Spherical equivalent ranged from -4.25 to +5.50 (median: +0.50). Typical but non-specific phenotypic facial features were arched and broad eyebrows with or without lateral third notching or sparseness (11), long palpebral fissure (7), long eyelashes (6) and everted lateral one-third of lower eyelids (6). Other non-specific abnormalities were nystagmus (1), amblyopia (2), ophthalmoplegia (2), esotropia (8), exotropia (2), vertical deviations (1), epicanthal fold (1), ptosis (4), blepharophimosis syndrome (1), lagophthalmos (1), blepharitis (2) and recurrent chalazia (1). Corneal opacities were found in two patients, abnormal retinal pigmentation with indistinct fovea in one and tortuous arterioles with peripheral avascular retina in another. No ocular abnormality was specific to Kabuki syndrome, but all patients had at least one, warranting long-term follow-up.

Conclusion/Relevance: Careful ocular evaluation including peripheral retinal examination and long-term follow-up for potentially developing abnormalities are essential in all patients with Kabuki syndrome. While not all abnormalities are vision threatening, peripheral retinal avascularity, a previously unreported sight threatening condition, requires immediate attention and long-term management.

References: [1]Kluijt I, van Dorp DB, Kwee ML, Toutain A, Keppler-Noreuil K, Warburg M, Bitoun P. Kabuki syndrome - report of six cases and review of the literature with emphasis on ocular features. Ophthalmic Genet. 2000 Mar;21(1):51-61. PMID: 10779849.

Poster #A46
Friday, April 9, 2021
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Ophthalmic Features in Hereditary Sensory Neuropathy Type 1A: A Case Report and Systematic Review

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Introduction: Hereditary sensory neuropathy type 1A (HSN1A) is an autosomal dominant condition resulting from *SPTLC1* variants, characterized by paresthesias, peripheral neuropathies, and muscular atrophy [1-2]. We report a 13-year-old female with a heterozygous p.S331Y variant with amyotrophia, pes cavus, ataxia, cataracts, and upslanting palpebral fissures. Isolated reports of ocular abnormalities in patients with HSN1A have been reported, but this association has not been well characterized. Consequently, we performed a systematic review aimed at identifying the ocular manifestations of HSN1A.

Methods: A Pubmed search for HSN1A revealed 540 articles, which were reviewed for cases with confirmed pathogenic variants of *SPTLC1* and their untested relatives with the HSN1A phenotype. 182 individuals were identified (26 with ophthalmic findings). Details of these 26 individuals were included in the report, in addition to our case.

Results: The cases included 13 males and 13 females (1 unreported). Five variants were reported: p.C133Y (48%), p.C133W (22%), p.S331F (11%), p.S331Y (11%), and p.S384F (7%). Associated eye findings include cataracts (n=9, 7 congenital), macular telangiectasia type 2 (n=8), horner syndrome (n=3), macular abnormalities (n=2), diminished corneal reflex (n=1), corneal ulceration (n=1), retinal detachment (n=1), retinal coloboma (n=1), photophobia (n=1), exotropia (n=1), ptosis (n=1), and upslanting palpebral fissures (n=1).

Conclusion/Relevance: The results of our review elucidate the common ophthalmic findings present in HSN1A, providing a basis for expectant ophthalmologic management of HSN1A patients and provide incentive to further investigate the phenotype. Additionally, the sparse reports of eye features necessitate further attention towards examining and reporting ocular findings to better guide clinical care.

References: 1. Auer-Grumbach M, Bode H, Pieber TR, et al. Mutations at Ser331 in the HSN type I gene SPTLC1 are associated with a distinct syndromic phenotype. Eur J Med Gen. 2013;56(5):266-269. doi:10.1016/j.ejmg.2013.02.002. 2. Rotthier A, Baets J, Vriendt ED, et al. Genes for hereditary sensory and autonomic neuropathies: a genotype-phenotype correlation. Brain. 2009;132(10):2699-2711. doi:10.1093/brain/awp198.

Poster #A47
Friday, April 9, 2021
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A Syndrome of Hearing Loss and FEVR in a Girl with Biallelic FZD4 Mutations

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Introduction: Familial exudative vitreoretinopathy-1 (FEVR-1) is a non syndromic autosomal dominant retinal disorder caused by heterozygous mutations in the frizzled-4 gene (FZD4) [1]. We report a case of FEVR with hearing loss, associated with a biallelic FZD4 mutation. Previous cases have not reported hearing loss and developmental delay.

Methods: Case report. History, ocular examination, fluorescein angiography (IVFA), and genetic testing with interpretation were performed in the setting of patient care. Review of the medical literature was done.

Results: By 4 months old, the patient had stage 5 FEVR bilaterally. Sensorineural hearing problems were first noted at 2 years. The patient has developmental delays in walking and language, and wears hearing aids. IVFA of the parents revealed stage 1 and stage 2 FEVR. Genetic testing revealed two heterozygous variants in the FZD4 gene in the patient. Segregation in each parent confirmed one allele in each. Full sequencing of the NDP gene was negative.

Conclusion/Relevance: We present the first report of syndromic FEVR due to a biallelic FZD4 mutation with hearing deficit, developmental delay and more severe retinal phenotype. Qin et al (2008) showed that missense, double missense, and nonsense mutations (abolished activity) had increasingly worse signaling activity, which correlated roughly with clinical phenotypes [2]. Homozygous Fzd4 knockouts in mice feature abnormal vascular development of both the inner ear and retina [3]. A biallelic mutation could severely lack signaling activity to cause incomplete vascular development of the ear and retina.

References: 1. Rao FQ, Cai XB, Cheng FF, et al. Mutations in LRP5,FZD4, TSPAN12, NDP, ZNF408, or KIF11 Genes Account for 38.7% of Chinese Patients With Familial Exudative Vitreoretinopathy. Invest Ophthalmol Vis Sci. 2017;58(5):2623-2629. doi:10.1167/iovs.16-21324
2. Qin M, Kondo H, Tahira T, Hayashi K. Moderate reduction of Norrin signaling activity associated with the causative missense mutations identified in patients with familial exudative vitreoretinopathy. Hum Genet. 2008;122(6):615-623. doi:10.1007/s00439-007-0438-8
3. Wang Y, Huso D, Cahill H, Ryugo D, Nathans J. Progressive cerebellar, auditory, and esophageal dysfunction caused by targeted disruption of the frizzled-4 gene. J Neurosci. 2001;21(13):4761-4771. doi:10.1523/JNEUROSCI.21-13-04761.2001 , JAX stock #012823 B6;129-Fzd4tm1Nat

Poster #A48
Friday, April 9, 2021
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Interpretation of Electroretinograms in Children – Know your Equipment

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Introduction: Electroretinograms (ERGs) are useful for diagnosis of congenital retinal dystrophies. However, the ERG is challenging to perform in children. There are several instruments and types of electrodes available for testing in children including stationary versus hand-held devices and corneal fiber or skin electrodes. The purpose of our study was to determine potential causes of misinterpretation by comparing results from a hand-held system with skin electrodes to a stationary system with corneal fiber electrodes.

Methods: Retrospective chart review of 5 pediatric patients referred for possible retinal dystrophies who had both handheld/skin electrode (HH/Skin) and stationary/corneal fiber (S/Corneal) ERGs.

Results: Average age of 5 patients (4M, 1F) was 3 and 9/12years (range 3 months to 11 and 9/12 years). Final diagnosis was retinal dystrophy in 2 patients, normal retinal function in 3. HH/Skin vs S/Corneal ERGs: Amplitudes obtained with HH/Skin were significantly lower than with S/Corneal. Both patients with retinal dystrophy had abnormal HH/Skin and S/Corneal ERG. However 3/3 normal patients had abnormal HH/Skin ERG but normal S/Corneal ERG. These 3/3 normal children had essentially nonrecordable dark adapted dim flash waveforms with HH/Skin ERG.

Conclusion/Relevance: ERG amplitudes in the same patient are different depending on the instrumentation used. Amplitudes were lower with a handheld/skin electrode system than with a stationary/corneal fiber electrode. The largest disparity was in the Dark Adapted dim flash waveforms which were essentially nonrecordable in three normal children. Clinicians should be wary of interpreting pediatric handheld/skin electrode ERGs as abnormal.

References: 1. McCulloch, D. L. et al. ISCEV Standard for full-field clinical electroretinography (2015 update). Documenta Ophthalmologica. 2014;130:1-12.
2. Lui H et al. Evaluation of light-and dark-adapted ERG's using a mydriasis-free, portable system: clinical classification and normative data. Documenta Ophthalmologica. 2018;137(3):169-181.
3. Grace S et al. Nonsedated handheld electroretinogram as a screening test of retinal dysfunction in pediatric patients with nystagmus. J AAPOS. 2017;21(5);384-388.

Poster #A49
Friday, April 9, 2021
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Phenotypic and Genetic Differences of Autosomal Recessive Bestrophinopathy and Best Vitelliform Macular Dystrophy

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Introduction: Bestrophinopathy encompasses a wide range of overlapping phenotypes with potential onset in adolescence. Correct diagnosis is challenging but important for treatment with emerging genetic therapies.1,2 This study compares autosomal recessive bestrophinopathy (ARB), autosomal dominant Vitelliform Macular Dystrophy (adVMD), and recessive Vitelliform Macular Dystrophy (arVMD) to identify distinguishing clinical and genetic features to aid diagnosis and treatment.

Methods: One pediatric arVMD patient and nine ARB patients underwent full ophthalmic examination and genetic assessment. A meta-analysis of reported BEST1 variants was compiled and clinical parameters were analyzed with regard to inheritance and phenotype.

Results: Three novel ARB variants (p.Asp118Ala, p.Leu224Gln, p.Val273del) were observed. Homozygous p.Glu35Lys (arVMD) had a clinically unique presentation showing extension of hyperautofluorescence well beyond the limits of the vitelliform lesion, peripheral punctate lesions, and shortened axial-length reminiscent of ARB. Recessive disease typically presented earlier (mean: ARB=21.4 years, arVMD=19.0 years, adVMD=28.7 years). Tritan-axis color vision deficit was seen in 3/6 (50%) ARB patients. Attempts to distinguish ARB and VMD based on variant frequency and residue location demonstrated a spectrum of disease with analytical confirmation by principle component analysis where arVMD fell between the adVMD and ARB extremes.

Conclusion/Relevance: This study suggests that arVMD represents a subgroup of disease distinct from ARB and adVMD based on the clinical ophthalmic and genetic assessment of disease and as corroborated by unsupervised analysis. Heterogeneity prevented algorithmic separation of each phenotype; this may indicate a contiguous phenotypic spectrum. Tritan-axis color vision deficit was a previously unreported finding associated with ARB cases that may help distinguish from other bestrophinopathies.

References: 1. Sinha D, Steyer B, Shahi PK, et al. Human IPSC modeling reveals mutation-specific responses to gene therapy in a genotypically diverse dominant maculopathy. Am J Hum Genet. 2020; 170: 278-292. https://doi.org/10.1016/j.ajhg.2020.06.011. Accessed Sep. 1, 2020.
2. Nakanishi A, Ueno S, Hayashi T, et al. Clinical and genetic findings of autosomal recessive bestrophinopathy in Japanese cohort. Am J Ophthalmol. 2016; 168: 86-94. https://pubmed.ncbi.nlm.nih.gov/27163236/. Accessed Sep. 1, 2020.

Poster #A50
Friday, April 9, 2021
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The Demographics, Clinical and Molecular Features of Pediatric Patients with Retinitis Pigmentosa due to Variants in the EYS Gene

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Introduction: Retinitis pigmentosa is a genetic disorder of the retina causing degeneration of rod and cone photoreceptors. Mutations of the eyes shut homolog (EYS) gene account for 5% of autosomal recessive retinitis pigmentosa (arRP) cases worldwide. Clinical presentation often involves nyctalopia, peripheral vision loss, retinal pigmented deposits, waxy optic disc pallor, vessel attenuation, and posterior subcapsular cataracts. Clinical and genetic findings of RP due to EYS mutations in the pediatric population has not been widely studied.

Methods: The Medline database was used to conduct a literature review for all case reports and published reviews on arRP EYS variants up to March 2020. The search terms 'RP EYS' and 'RP-25' were used to find reports of patients with RP due to mutations in the EYS gene.

Results: Out of 192 RP EYS patients identified, 26 patients (13.5%) were first diagnosed at a pediatric age (<18 years old). The average age of onset of vision problems for these pediatric patients was 12.6 +/- 4.7 years old. The most common ethnicities reported were White (50.0%) and Asian (34.6%). Cataract descriptions were reported in 34.6% of patients, with posterior subscapular cataracts as the most common type. The most common disease-causing variants were c.4957dupA (p.Ser1653Lysfs*2), c.4350_4356del7 (p.K1450KfsX3), and c.6799_6800delCA (p.Q2267EfsX15) each found in 7.7% of pediatric patients.

Conclusion/Relevance: We highlight key clinical and molecular features in 192 patients with arRP caused by EYS variants, of which 26 patients were first diagnosed at a pediatric age. Our report provides incentive to further investigate EYS variants and the association with arRP in the pediatric population.

References: 1. Ferrari, S., Di Iorio, E., Barbaro, V., Ponzin, D., S Sorrentino, F., & Parmeggiani, F. (2011). Retinitis pigmentosa: genes and disease mechanisms. Current genomics, 12(4), 238-249.
2. Littink, K. W., van den Born, L. I., Koenekoop, R. K., Collin, R. W., Zonneveld, M. N., Blokland, E. A., ... & den Hollander, A. I. (2010). Mutations in the EYS gene account for approximately 5% of autosomal recessive retinitis pigmentosa and cause a fairly homogeneous phenotype. Ophthalmology, 117(10), 2026-2033.
3. Sengillo, J. D., Lee, W., Nagasaki, T., Schuerch, K., Yannuzzi, L. A., Freund, K. B., ... & Tsang, S. H. (2018). A distinct phenotype of eyes shut homolog (EYS)-retinitis pigmentosa is associated with variants near the C-terminus. American journal of ophthalmology, 190, 99-112.

Poster #A51
Friday, April 9, 2021
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Hereditary Motor and Sensory Neuropathy Type VIA with Optic Atrophy in Two Sisters with Pathologic Myopia: A Case Series and Review

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Introduction: Hereditary Motor Sensory Neuropathy Type VIA with Optic Atrophy (HMSN6A) is a rare variant subtype of mitofusion 2 (MFN2) associated Charcot-Marie-Tooth disease, with ophthalmic manifestations largely limited to optic atrophy. We report a case series of four individuals with HMSN6A with known variants in the *MFN2* gene. The series highlights two sisters that demonstrated this phenotype, but also manifested pathologic myopia and other ocular abnormalities.

Methods: The clinical presentation of these index siblings and other affected family members are reviewed. We also performed a systematic review of the literature to identify previous reports of HMSN6A and detailed the clinical manifestations and ocular findings in such cases.

Results: HMSN6A is a neurologic disorder characterized by a motor sensory axonal neuropathy and optic atrophy. Additional ophthalmic manifestations have not been well characterized in the literature. We highlight two sisters with a personal and family history of HMSN6A that demonstrate the wide range of clinical sequalae and symptom severity associated with HMSN6A. In addition to optic atrophy, both sisters also possessed ophthalmic features of bilateral pathologic myopia, limited vision, nystagmus, and strabismus.

Conclusion/Relevance: This case series and review helps to elucidate the ophthalmologic findings of HMSN6A and provides incentive to further investigate the phenotype.

References: 1. Del Bo RD, Moggio M, Rango M, et al. Mutated mitofusin 2 presents with intrafamilial variability and brain mitochondrial dysfunction. Neurology. 2008;71(24):1959-1966. doi:10.1212/01.wnl.0000327095.32005.a4
2. Voo I, Allf BE, Udar N, Silva-Garcia R, Vance J, Small KW. Hereditary motor and sensory neuropathy type VI with optic atrophy. Am J Ophthalmol. 2003;136(4):670-677. doi:10.1016/S0002-9394(03)00390-8
3. Züchner S, De Jonghe P, Jordanova A, et al. Axonal neuropathy with optic atrophy is caused by mutations in mitofusin 2. Ann Neurol. 2006;59(2):276-281. doi:10.1002/ana.20797

Poster #A52
Friday, April 9, 2021
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A Retrospective Analysis of the Multi-Disciplinary Approach to Ocular Genetics: First Year Clinical Results.

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Introduction: In the pediatric population, inherited disorders are a common cause of ocular defects.1 The ability to identify the genetic sequence opens up targeted gene therapy treatment options. A multi-disciplinary clinic at Riley Hospital for Children was created in 2018 to improve communication and success rates of confirmed genetic diagnosis.

Methods: IRB approval was obtained from Indiana University for a retrospective review of patients seen in the Ocular Genetics Clinic between 12/2018 and 4/2020. Demographics, referring diagnosis, additional testing, clinical phenotype as well as genotype were recorded.

Results: Sixty-eight patients were evaluated during a 15-month period. The average age was 9 years old (0-51 years). Referral indications included: suspected inherited retinal disease (21), no primary ocular diagnosis (13), nystagmus (7), Leber's hereditary optic neuropathy (6), retinitis pigmentosa (5), night blindness (3), aniridia (3), glaucoma (3), albinism (2), macular dystrophy (2), low vision (2), and Leber congenital amaurosis (1). Sixty-four of sixty-eight patients received a genetic test. Thirty-three (51%) patients had a confirmed genetic diagnosis. Forty patients (62%) had a large panel test with seventeen (43%) receiving a genetic diagnosis. Thirteen patients (20%) had a small panel test with eleven (85%) receiving a genetic diagnosis. Twelve patients (18%) had a single gene test with four (33%) receiving a genetic diagnosis.

Conclusion/Relevance: The suspected ocular pathology for this new multi-disciplinary clinic was wide. While the clinic allowed improved communication between providers, our success rate was lower than expected likely due to referral bias and learning curve.

References: 1: Solebo AL, Teoh L, Rahi J. Epidemiology of blindness in children. Archives of disease in childhood. 2017 Sep 1;102(9):853-7.

Poster #A53
Friday, April 9, 2021
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Structural Changes of the Anterior Segment Measured by Ultrasound Biomicroscopy Following Pediatric Glaucoma Surgery

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Introduction: Pediatric glaucoma is associated with anterior segment anatomical abnormalities, but little is known about the structural changes associated with glaucoma surgery. Using ultrasound biomicroscopy (UBM), the anterior segment can be imaged to identify structural differences before and after glaucoma surgery.

Methods: This is a multicenter longitudinal prospective study conducted at Children's National Medical Center and the University of Maryland. Patients undergoing goniotomy or aqueous tube shunt placement were assessed. Anterior segment structural differences were assessed preoperatively, early post-operatively and late post-operatively. UBM images were measured according to a standardized protocol. ImageJ software was used to measure the following parameters: angle to angle distance (AA), central corneal thickness (CCT), endothelial cross sectional length (ECSL), anterior chamber depth (ACD), paracentral corneal thickness (ParaCT), pupil size, angle opening distance (AOD500), sulcus to sulcus distance (SS) and trabecular iris angle (TIA).

Results: Six patients (12 eyes) underwent imaging using UBM. Among these patients, three patients (5 images) were controls, four patients (6 images) underwent goniotomy, and four patients (7 images) had tube shunt placement. Two of the included patients (3 eyes) underwent both goniotomy and aqueous tube shunt placement in the same eye. AA and SS increased in both groups while the TIA and AOD500 decreased in both groups.

Conclusion/Relevance: A decrease in TIA and AOD500 indicates surgical effect of glaucoma surgery in children. AA and SS increased in both groups, consistent with normal growth curves.

References: Azuara-Blanco A, Spaeth GL, Araujo SV, et al. Ultrasound biomicroscopy in infantile glaucoma. Ophthalmology. 1997;104(7):1116-1119

Poster #A54
Friday, April 9, 2021
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Clinical Outcomes in Children and Adolescents Referred for Increased Cup-Disc Ratio at a Tertiary Referral Center over 9 Years

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Introduction: The term glaucoma suspect is typically described in adults with risk factors including increased cup-disc ratio (CDR). Literature on the clinical outcomes of pediatric patients is lacking. We aim to report clinical outcomes for glaucoma in children and adolescents referred for increased CDR to a tertiary referral center.

Methods: After IRB approval, patients under 18 years of age referred for increased CDR were included retrospectively. Demographic data including gender, age, and race/ethnicity were recorded. Baseline and follow-up exam findings including IOP, CDR, diurnal curve, gonioscopy findings, and refractive error were also collected. The chi-square and/or Fisher's Exact tests were used to determine differences between groups for categorical variables, while the Rank Sum and T-tests were used for continuous variables.

Results: 167 patients were studied, of which 6 patients were found to have juvenile open angle glaucoma (JOAG), and 8 patients were found to have anterior segment dysgenesis. Despite more than two years of follow-up on 58 patients, all JOAG patients were identified within three months of evaluation. Baseline IOP and maximal IOP on diurnal curve were found to be statistically significant for diagnosis. Glaucoma diagnosis was also associated with wider range of IOP during the diurnal curve, abnormal gonioscopy findings, and positive family history of glaucoma.

Conclusion/Relevance: Patients referred for increased CDR are evaluated with gonioscopy, IOP, optical coherence tomography, visual fields, and diurnal curves. The diagnosis of JOAG is usually apparent in the first three months of evaluation. High IOP and maximal IOP on diurnal curve were found to be statistically significant for diagnosis of JOAG in patients referred for increased CDR.

References: 1. Bouhenni RA, Ricker I, Hertle RW. Prevalence and Clinical Characteristics of Childhood Glaucoma at a Tertiary Care Children's Hospital. J Glaucoma 2019 Jul;28(7):655-659.
2. Dias DT, Ushida M, Sousa MC, Dorairaj S, Biteli LG, Leite MT, Paranhos A Jr, Prata TS. Eyes with Suspicious Appearance of the Optic Disc and Normal Intraocular Pressure: Using Clinical and Epidemiological Characteristics to Differentiate Those with and without Glaucoma. PLoS One 2016 Jul 19;11(7):e0158983.
3. Shaffer R. Glaucoma suspect or ocular hypertension. Arch Ophthalmol 1977:95(4): 588.

Poster #A55
Friday, April 9, 2021
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Fusional Amplitudes in Glaucoma Patients with Variable Visual Field Loss Compared to Controls

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Introduction: Fusional amplitudes (FA) are integral in maintaining single binocular vision [1]. FA may be affected by patient's visual acuity, visual fields, ocular alignment, stereopsis, and fixation target size [2]. In this study, we examined FA in subjects with various degrees of glaucomatous visual field (VF) loss.

Methods: Prospective cross-sectional study of horizontal and vertical FA in subjects with glaucomatous VF defects and controls. The VF of glaucoma patients were classified as mild, moderate or severe loss based on the modified Hodapp-Parrish-Anderson Classification System. Visual acuity, alignment, Worth four dot, stereopsis and FA measurements were obtained and analyzed using one-way ANOVA and Mann-Whitney t tests.

Results: 39 subjects were enrolled, 25 control (mean age 35 ± 10.2 years) and 14 glaucoma (mean age 67.8 ± 8.5 years) patients. Divergence FA at distance and stereopsis were both significantly lower for glaucoma patients compared to the control group ($p<0.05$ and $p<0.0001$ respectively). There was no significant difference for divergence at near, convergence or vertical FA. Glaucoma patients were more likely to have intermittent tropias at near (6/14) while no control patient had intermittent tropias (statistically significant, $p<0.05$).

Conclusion/Relevance: In our study we only found a difference in divergence FA at distance as well as reduced stereopsis in patients with glaucoma in contrary to a prior study, where glaucoma was associated with decreased FA for distance and near [3]. Larger studies are needed to assess the impact of varying degrees of VF loss on FA.

References: 1. Fray KJ. Fusional Amplitudes: Developing Testing Standards. Strabismus. 2017 Sep;25(3):145-155. doi: 10.1080/09273972.2017.1349814. Epub 2017 Jul 31.
2.Kertesz Andrew. Effect of stimulus size on fusion and vergence. J Opt Soc Am. 1981 Mar;71(3):289-93. doi:10.1364/josa.71.00028989
3.Reche-Sainz JA., Gomez de Liaño R., Toledano-Fernandez N., García Sanchez J. Binocular vision in glaucoma. Arch Soc Esp Oftalmol. 2013 May;88(5):174-8. doi: 10.1016/j.oftal.2012.07.015. Epub 2012 Oct 8.

Poster #A56
Friday, April 9, 2021
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Childhood Glaucoma in Down Syndrome

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Introduction: The clinical characteristics of children with glaucoma and Down syndrome are described.

Methods: Retrospective review of 18,084 pediatric patients at a major US academic practice over 10 years with 11 providers.

Results: 54 (0.3%) patients had primary congenital glaucoma (PCG). 225 (1.24%) patients had Down syndrome. 6 (2.7%) of Down patients had glaucoma, all bilateral: 1 (0.4%) 'aphakic glaucoma' (AG) at 10 years-old; 5 (2.2%) 'congenital glaucoma' (DCG) in infancy. DCG cases presented with: 5 (100%) corneal haze, 3 (60%) Haab's striae, 5 (100%) axial buphthalmos. DCG cases required: 5 (100%) angle surgery, 3 (60%) supplementary ocular hypotensive drops, and 1 (20%) susequent endoscopic cyclophotocoagulation. Only partial cannulation of the canal of Schlemm was possible in 4 (80%) patients. Axial lengths (mm) at 4-7 months-old in 5 DCG patients vs 25 Primary Congenital Glaucoma (PCG) patients were not significantly different on presentation for the longest eyes: 23.03 vs 22.14 ($p=0.33$).

Conclusion/Relevance: 2.2% [95% CI = (0.8%, 5.4%)] rate of DCG is larger than rates of PCG: 0.3% in our practice, 0.00146% in a nearby regional population study, 1/10,000 - 1/30,000 in Western countries ($p < 0.0001$). DCG and PCG patients had similar axial lengths at presentation. Angle surgery was more challenging and likely less successful for DCG compared to PCG. This largest case series of DCG in the US supports that DCG is a distinct entity from PCG and is the first to describe axial lengths and modern angle surgery techniques in these patients.

References: Aponte EP, Diehl N, Mohney BG. Incidence and clinical characteristics of childhood glaucoma: a population-based study. Arch Ophthalmol. 2010;128(4):478-482.
Traboulsi EI, Levine E, Mets MB, Parelhoff ES, O'Neill JF, Gaasterland DE. Infantile glaucoma in Down's syndrome. Am J Ophthalmol. 1988 Apr 15;105(4):389-94.
Roizen NJ, Mets MB, Blondis TA. Dev Med Child Neurol. Ophthalmic disorders in children with Down syndrome. 1994 Jul;36(7):594-600.

Poster #A57
Friday, April 9, 2021
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Examining the Association of Prostaglandin Analogs with Uveitis in Pediatric Patients with Glaucoma

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Introduction: Prostaglandin analogs (PGAs) can lower intraocular pressure in pediatric patients with glaucoma. Studies in adults have suggested that their use is associated with anterior uveitis, which is reflected in current guidelines.[1-2] Other studies suggest that they may be used in non-surgical patients without concern of causing uveitis.[3] There is little data on this topic in children.

Methods: Pediatric patients with glaucoma who were prescribed PGAs were identified retrospectively through a search of electronic medical records from 2009-2018. We included patients both with and without prior uveitis. Records were reviewed to identify if patients experienced new or worsened uveitis during the first year of PGA therapy. Other etiologies of intraocular inflammation, such as surgery or uveitis secondary to systemic associations, were documented.

Results: 70 patients (88 eyes) were identified to have been prescribed a PGA. 59 patients (75 eyes) had no known history of uveitis, and 11 patients (13 eyes) had a documented history of uveitis. Among the former group, 0 patients experienced an episode of uveitis during the first year of PGA therapy. Among the latter group, 4 patients (4 eyes) experienced an episode of worsened uveitis during the first year of therapy. In all 4 of these patients, other factors were identified that likely caused or exacerbated the uveitis. These factors included medication changes (50%) and medication compliance (50%).

Conclusion/Relevance: In this population of pediatric patients with glaucoma, PGAs were not associated with new or worsened uveitis.

References: 1. Warwar RE, Bullock JD, Ballal D. Cystoid macular edema and anterior uveitis associated with latanoprost use. Experience and incidence in a retrospective review of 94 patients. Ophthalmology. 1998;105(2):263-268. doi:10.1016/s0161-6420(98)92977-3
2. Prum BE Jr, Rosenberg LF, Gedde SJ, et al. Primary Open-Angle Glaucoma Preferred Practice Pattern(®) Guidelines [published correction appears in Ophthalmology. 2018 Jun;125(6):949]. Ophthalmology. 2016;123(1):P41-P111. doi:10.1016/j.ophtha.2015.10.053
3. Hu J, Vu JT, Hong B, Gottlieb C. Uveitis and cystoid macular oedema secondary to topical prostaglandin analogue use in ocular hypertension and open angle glaucoma. Br J Ophthalmol. 2020;104(8):1040-1044. doi:10.1136/bjophthalmol-2019-315280

Poster #A58
Friday, April 9, 2021
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Subconjunctival versus Combined Subconjunctival and Subscleral Flap Mitomycin C in Pediatric Trabeculectomy: A Randomized Clinical Study

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Introduction: To compare the safety and efficacy of trabeculectomy augmented by subconjunctival application of Mitomycin C (MMC) versus combined subconjunctival and subscleral flap MMC application in primary congenital glaucoma (PCG).

Methods: This prospective, randomized, interventional study included children aged </= 6 years, requiring a trabeculectomy for PCG. Fifty eyes were randomly assigned to undergo trabeculectomy with subconjunctival MMC application (Group A, 25 eyes), or trabeculectomy with combined subconjunctival and subscleral flap MMC application (Group B, 25 eyes). Success was defined as achieving an intraocular pressure (IOP) </= 18 mmHg at 12 months, without medications (complete success) or with/without antiglaucoma medications (qualified success). Postoperative results were compared at 1,3,6,9,12 months and the final follow-up. The main outcome measures were: IOP, number of glaucoma medications, surgical success, postoperative interventions and complications in both groups.

Results: At 12 months, the percent IOP reduction for group A was 45.6% and for group B 46.8%. Qualified success was achieved in 68% and 72% of eyes in groups A and B, respectively. Failure tended to occur earlier in group B. Kaplan-Meier analysis for complete success showed cumulative probability of survival of 53% for group A and 40% for group B (P-value=0.38). Needling was more successful in group B with 60 % total success compared to 33.3% in group A (P-value=0.39).

Conclusion/Relevance: The subscleral flap application of MMC in conjunction with subconjunctival MMC application in pediatric trabeculectomy does not appear to result in additional benefit regarding safety or efficacy, when compared to subconjunctival application alone.

References: Yazdani S, Rezai S, Pakravan M, Afrouzifar M, Ghahari E. Mitomycin-C application before versus after scleral flap dissection in trabeculectomy; a randomized clinical trial. J Ophthalmic Vis Res 2015;10:391.
Jayaram H, Scawn R, Pooley F, Chiang M, Bunce C, Strouthidis NG, Khaw PT, Papadopoulos M. Long-term outcomes of trabeculectomy augmented with mitomycin C undertaken within the first 2 years of life. Ophthalmology 2015;122:2216-22.
Freedman SF, McCormick K, Cox TA. Mitomycin C augmented trabeculectomy with post-operative wound modulation in pediatric glaucoma. J AAPOS 1999;3:117–124.

Poster #A59
Friday, April 9, 2021
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Outcomes and Associations in Children with Sturge-Weber Syndrome and Glaucoma

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Introduction: Sturge-Weber Syndrome (SWS) is a rare, neurocutaneous syndrome associated with port-wine stains of the face, glaucoma, leptomeningeal angiomas, seizures, and intellectual disability. Few studies report an overall description of findings and treatment for children with Sturge-Weber glaucoma (SWG), which can be challenging to manage.

Methods: Retrospective chart review was performed for all patients presenting to the Department of Ophthalmology between January 2014 to September 2020 diagnosed with SWS. Systemic conditions and treatments, ocular findings, and visual and surgical outcomes for those with SWG were collected.

Results: 25/47 SWS patients had SWG (10 males; 7 bilateral cases, 32 eyes). 18/25 patients (72%) had significant neurologic findings (seizures, hemiparesis, developmental delay). At the final visit, IOP was successfully controlled (< 21 mmHg) in 22/32 eyes (69%) with either surgery or topical medication. Surgical procedures were needed in 18/32 eyes, and included trabeculotomy, goniotomy, trabeculectomy +/- Mitomycin-C, and/or glaucoma drainage device. Poor vision (<20/200) was found in 11 eyes of 9 patients, in most cases due to neurologic/cortical visual impairment, but 2 eyes had LP/NLP vision due to ocular complications. There was a significant rate of strabismus (40%), high refractive error (53% of eyes), and amblyopia (43% of eyes). 12/17 patients with seizures (48%) were treated with medication alone, while 5 patients (20%) needed neurosurgical intervention.

Conclusion/Relevance: Most eyes with SWG had normalization of IOP but need for surgery. Many patients have associated ocular and/or neurological findings that affect their overall visual functioning. A multi-disciplined approach is necessary to address the needs of these patients.

References: Mantelli F, et al. Ocular manifestations of Sturge-Weber syndrome: pathogenesis, diagnosis, and management. Clin Ophthalmol. 2016 May 13;10:871-8. doi: 10.2147/OPTH.S101963

Javaid U, et al. Pathophysiology, diagnosis, and management of glaucoma associated with Sturge-Weber syndrome. Int Ophthalmol. 2018 Feb;38(1):409-416. doi: 10.1007/s10792-016-0412-3

Silverstein M, Salvin J. Ocular manifestations of Sturge-Weber syndrome. Curr Opin Ophthalmol. 2019 Sep;30(5):301-305. doi: 10.1097/ICU.0000000000000597

Poster #A60
Friday, April 9, 2021
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Evaluation of Macular Abnormalities in Childhood Glaucoma by Mounted Optical Coherence Tomography

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Introduction: Previously reported outer retinal changes in children with glaucoma have been attributed to uveitis or prior intraocular surgery. Here we identify and characterize novel macular abnormalities seen on mounted optical coherence tomography (OCT) in childhood glaucoma patients, including those without a history of uveitis or major surgical intervention.

Methods: Childhood glaucoma patients undergoing examination under anesthesia and/or surgical intervention who were unable to be imaged with standard tabletop OCT due to young age, limited cooperation, or technical factors, were imaged with mounted OCT under general anesthesia. Macular scans were reviewed by two masked graders for vitreous, retinal, and choroidal abnormalities.

Results: One hundred four eyes of 70 subjects with childhood glaucoma (mean age 5.5±5.7 years, range 0.17-24.5) were imaged. Abnormal macular findings, present in 68 of 104 scans (65.4%), included inner retinal thinning (29), foveal hypoplasia (13), staphyloma and/or myopic changes (11), inner nuclear cysts (10), outer retinal changes (8), epiretinal membrane (6), retinal thickening or edema (5), fovea plana (4), and pre-retinal tissue (1). Choroidal findings included thin choroid (15) and choroidal mass (7). Retinal and choroidal abnormalities were attributable to glaucoma (55,50%), non-glaucoma (53,48.2%), and combined (2,1.8%) etiologies. Twenty-three of 110 (20.9%) abnormalities were unexpected based on the primary diagnoses and clinical context.

Conclusion/Relevance: Mounted OCT allowed identification of expected and unexpected macular abnormalities, some of which have not been reported in association with childhood glaucoma. OCT-identified macular pathology in childhood glaucoma aids study of pathophysiology, and may affect visual prognosis and management of these patients.

References:

1. Jiramongkolchai, K., Freedman, S., & El-Dairi, M. (2016). Retinal Changes in Pediatric Glaucoma and Nonglaucomatous Optic Atrophy. Am J Ophthalmol, 161:188-95
2. Nork, T., Ver Hoeve, J., Poulsen, G. et al. (2000). Swelling and loss of photoreceptors in chronic human and experimental glaucomas. Arch Ophthalmol, 118(2):235-45
3. Moramarco A, Miraglia E, Mallone F. et al. (2019). Retinal microvascular abnormalities in neurofibromatosis type 1. Br J Ophthalmol. 103(11):1590-1594

Poster #A61
Friday, April 9, 2021
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Pediatric Glaucoma Suspects: Characteristics and Outcomes

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Introduction: We sought to determine the characteristics, outcomes, and glaucoma risk factors of pediatric glaucoma suspects (GS).

Methods: Retrospective sequential cohort study of children <18 years diagnosed as GS between 9/2013-7/2019. Children with penetrating ocular trauma, steroid-response, and treated ocular hypertension or glaucoma were excluded. Outcomes included glaucoma, treated ocular hypertension, non-glaucomatous cupping (pseudoglaucomatous or physiologic) or remained a GS. Multiple risk factors for glaucoma were assessed.

Results: 887 children (mean age 9.3 years, SD 4.7) were diagnosed as GS, due to optic nerve appearance (83%), family history (25%), ocular hypertension (15%), periocular lesion (e.g. Sturge-Weber) (4%), blunt-trauma history (3%), ocular anomaly (2%), and systemic/genetic syndrome (1.5%). Outcomes among 487 children with one or more follow-up visits (mean 1.7 years, SD 1.6) included 14 (3%) glaucoma, 98 (20%) physiologic cupping, 50 (10%) prematurity-associated pseudoglaucomatous cupping, and 1 (0.2%) treated ocular hypertension; 324 (67%) remained GS. Of children lost to follow-up, 116 (29%) were suspected physiologic or pseudoglaucomatous. Glaucoma diagnosis occurred at mean age 8.4 years, SD 5.5; diagnosis was based on elevated IOP (79%), OCT changes (43%), disc change (21%), and field defect (14%). Mean pachymetry was 598 µm (SD 45) in glaucoma, 574 µm (SD 48) in GS. Risk factors for glaucoma were baseline IOP>24 (p=0.01) and periocular lesion (p=0.008).

Conclusion/Relevance: Risk of conversion to glaucoma diagnosis among pediatric glaucoma suspects appears low. Baseline C/D ratio and family history of glaucoma were not predictive of glaucoma diagnosis. Baseline IOP>24 and presence of a periocular lesion carry higher risk.

References: 1. Kooner K, Harrison M, Prasla Z et al. Pediatric glaucoma suspects. Clin Ophthalmol 2014;16(8):1139-45.

Poster #A62
Friday, April 9, 2021
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Falsely High Rebound Tonometry

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Introduction: Rebound tonometry (RBT) can be used to measure intraocular pressure (IOP) in children unable to tolerate measurement with applanation tonometry (AT) while awake. RBT readings are often 2-3 mmHg higher than AT. We have experienced children with a repeatedly higher difference between RBT versus AT measurements (>/=6 mmHg). We sought to identify demographic and ocular characteristics which contribute to this discrepancy.

Methods: Retrospective cross-sectional study of pediatric patients with IOP measured by RBT followed by AT within 6 months without intervening surgery or change in medical management. Patient data was analyzed to discover predictors of greater difference between RBT and AT readings.

Results: We studied 123 eyes of 65 patients. In patients with normal IOP (</=24 mmHg), 18.5% had a >/=6 mmHg difference between RBT and AT with RBT being higher. Risk factors for this included presence of persistent fetal vasculature (PFV), increased corneal diameter, and higher initial RBT value (>20). In patients with elevated IOP (>24 mmHg), 77% had >/=6 mmHg difference with larger corneal diameter being the sole predictor. Eyes were less likely to have significant RBT-AT difference if there was corneal opacity or iris abnormalities in eyes with elevated IOP (>24 mmHg).

Conclusion/Relevance: There are children in which RBT readings are >/= 6 mmHg higher by RBT. Caution should be taken when interpreting RBT values in patients with PFV, increased corneal diameter and higher initial RBT values.

References: N/A

Poster #A63
Friday, April 9, 2021
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Quantitative Assessment of the Ciliary Body following Transscleral Cyclophotocoagulation using 3D Ultrasound Biomicroscopy

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Introduction: Transscleral cyclophotocoagulation (TSCPC) is a safe treatment alternative for advanced pediatric glaucoma refractory to other medical and surgical treatments. This study assesses the feasibility of visualization and quantification of the ciliary body volume before and after TSCPC using a novel three-dimensional ultrasound biomicroscopy (3D-UBM) imaging system.

Methods: Two cadaver eyes were scanned by automated high-resolution (50-MHz) UBM before and after 180º overlapping applications with G probe at 2000 mW power for 2.5 seconds. Sequential two-dimensional UBM frames were translated into 3D volumes. Trained image analysts segmented the ciliary body manually. Pre- and post- TSCPC volumes of the ciliary body were calculated for lasered and control sides.

Results: Baseline ciliary body volumes were 99.84 mm3 in eye 1 and 93.23 mm3 in eye 2. Following TSCPC application, ciliary body volumes decreased to 89.32 mm3 and 82.24 mm3 respectively. Sides receiving laser showed a decrease in ciliary volume of 13.3% and 15.8% compared to 6.6% and 6.4% decrease in control sides.

Conclusion/Relevance: 3D visualization and quantification of the ciliary body was feasible using 3D-UBM system. This novel imaging modality and analysis technique has potential to assess treatment response and characterize diagnostic and prognostic role of ciliary body biomarkers for personalized glaucoma management.

References: 1. Orge FH, Helms R. Automated volumetric measurement of anterior chamber and other structures and iridocorneal angle based on 3D reconstruction of UBM images. J AAPOS. 2018; 22 (4).
2. Minhaz AT, Wu H, Sevgi DD, Kim A, Kwak S, Randhawa J, Helms R, Orge F, Wilson DL; Comparison of manual and automated 3D measurements of ciliary body in three dimensional ultrasound biomicroscopy (3D-UBM) images. Invest. Ophthalmol. Vis. Sci. 2020;61(9):PB0051

Poster #A64
Friday, April 9, 2021
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Survey of Childhood Glaucoma at a Tertiary Referral Center: Etiology and Outcomes

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Introduction: We describe the etiology, treatments, and outcomes for a large contemporary cohort of children presenting for glaucoma management.

Methods: Survey of clinic visits between January 2014 to July 2019 at Boston Children's Hospital, to identify patients ≤ 18 years with a glaucoma diagnosis. Data regarding etiology, treatment, and visual/anatomic outcomes was collected.

Results: 302 patients (470 eyes) with childhood glaucoma were identified. Mean follow-up was 9.3±6.5 years; 134 cases were unilateral. The mean age at diagnosis was 7.0 ±5.4 years; 154 patients (51%) were male. The most common diagnoses were glaucoma following cataract surgery (GFCS, 34.7%) and primary congenital glaucoma (PCG, 30.7%). Overall, 196/470 eyes underwent at least one glaucoma surgery. IOP was ≤21 mmHg with or without glaucoma medications in 377/470 eyes at the last follow-up. Poor best corrected visual acuity (BCVA, = 20/200) was found in 181/470 eyes. Mean BCVA in PCG (0.4±0.3) was significantly better than eyes with GFCS (0.3±0.2) (p=0.002). There was no significant difference in mean BCVA for the group of eyes with IOP ≤21 mmHg compared to the group with higher IOP. Not surprisingly, the most common reason for poor vision was amblyopia (70%), whether refractive (44.2%) or due to a corneal opacity (acquired IOP induced corneal haze or congenital corneal opacity). Advanced glaucomatous optic neuropathy was the cause of poor vision in 9/470 eyes (7 patients).

Conclusion/Relevance: Childhood glaucoma remains a challenging vision threatening condition; poor vision usually results from amblyopia or presence of other ocular abnormalities rather than inadequate IOP control.

References: 1. Papadopoulos M, Edmunds B, Fenerty C, Khaw PT. Childhood glaucoma surgery in the 21st century. Eye (Lond). 2014;28(8):931-43.
2. Kipp MA. Childhood glaucoma. Pediatr Clin North Am. 2003;50(1):89-104.
3. Bouhenni RA, Ricker I, Hertle RW. Prevalence and Clinical Characteristics of Childhood Glaucoma at a Tertiary Care Children's Hospital. J Glaucoma. 2019;28(7):655-659.

Poster #A65
Friday, April 9, 2021
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Rebound vs. Applanation Tonometry Comparison in Supine Patients under Anesthesia

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Introduction: Tonometry guides surgical decision-making in anesthetized patients with known or suspected glaucoma. iCare IC200 - a recently FDA-approved rebound tonometer - can measure intraocular pressure (IOP) in both supine and upright patients.1, 2 Purpose: to compare tonometry in anesthetized patients by IC200 vs. Tono-Pen, across a wide range of IOP and pachymetry.

Methods: This ongoing prospective study included supine patients having EUA with/without surgery. Demographics, diagnoses, corneal status, and pachymetry were recorded. IOP was measured twice (OD then OS, repeat) with both Tono-Pen and IC200 (randomized order, reliable readings).

Results: Included thus far are 37 patients (74 eyes): clear cornea/nonglaucoma (30 eyes), clear cornea/glaucoma (25), corneal edema/glaucoma (10), corneal opacity (9). Tonometry was unobtainable in 3 eyes (band keratopathy/phthisis), excluded from comparison. Mean patient age was 6.2 years (range 0.17-28).

Mean measured IOP (Tono-Pen vs. IC200) was 17.2 vs. 19.3mmHg (range 7-51 vs. 6-61.6mmHg), respectively. IOP measured by Tono-Pen and IC200 were highly correlated ($r=0.91$, $p<0.001$), with no statistically significant difference for all eyes or those with corneal edema. ?IOP[Tonopen-IC200] ranged from -15.5 to 10.5mmHg, within 3mmHg in 48% of eyes. Bland-Altman analysis demonstrated bias=-2.08mmHg (Tono-Pen lower than IC200, 95% agreement limits [-11.7,7.5mmHg]). There was no correlation of ?IOP[Tonopen-IC200] with corneal edema ($p=0.2$).

Mean pachymetry was 570.2µm(range 496-814), with no significant correlation between ?IOP[Tonopen-IC200] and measured corneal pachymetry ($r=-0.15$).

Conclusion/Relevance: IC200 correlates well overall with Tono-Pen tonometry in supine, anesthetized patients, but additional study will determine the range of IOP and pathologies for which IC200 is most accurate.

References: 1. McKee EC, Ely AL, Duncan JE, Dosunmu EO, Freedman SF. A comparison of Icare PRO and Tono-Pen XL tonometers in anesthetized children. J AAPOS 2015;19:332-7.
2. Badakere SV, Chary R, Choudhari NS, Rao HL, Garudadri C, Senthil S. Agreement of Intraocular Pressure Measurement of Icare ic200 with Goldmann Applanation Tonometer in Adult Eyes with Normal Cornea. Ophthalmol Glaucoma 2020. In Press.

Poster #A66
Friday, April 9, 2021
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Micropulse Transscleral Cyclophotocoagulation for the Management of Refractory Pediatric Glaucoma

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Introduction: Micropulse (MP) transscleral cyclophotocoagulation (TSCPC) offers a favorable post-operative safety profile compared to traditional continuous wave TSCPC in management of refractory glaucoma in adults. There is limited data on the efficacy of MP-TSCPC in the management of pediatric glaucoma.

Methods: IRB approved retrospective review of patients with pediatric glaucoma that underwent MP-TSCPC at two institutions. 17 eyes of 16 patients (8 male, 8 female) were included in the study.

Results: Mean age at surgery was 54 months, all with refractory glaucoma that failed primary surgical intervention. Average duration of follow up was 6.9 months. Pre-operative IOP was 33.2±13.0mmHg, with an average post-operative IOP of 25.0±9.9mmHg, and a final follow up IOP of 24.2±11.0mmHg. MP-TSCPC resulted in an average IOP decrease of 8.3mmHg (95% CI: 3.0 – 13.6, $p<0.01$) compared to pre-operative IOP. This reduction was sustained at the last follow up at 9.1mmHg (95% CI: 3.2 – 14.9, $p <0.01$). There was no significant difference (95% CI: -0.4 – 0.6, $p=0.63$) in the number of glaucoma medications pre-op (2.3±1.4 drops) compared to post-op (2.4±1.1 drops).

Conclusion/Relevance: MP-TSCPC delivered sustained IOP lowering during study follow up, offering a viable alternative to continuous wave TSCPC in pediatric patients with refractory glaucoma. Long term studies are necessary to identify the persistence of this IOP lowering effect as well as the long-term safety profile in children.

References: 1. Emanuel ME, Grover DS, Fellman RL, et al. Micropulse Cyclophotocoagulation: Initial Results in Refractory Glaucoma. J Glaucoma. 2017;26(8):726-729.
2. Lee JH, Shi Y, Amoozgar B, et al. Outcome of Micropulse Laser Transscleral Cyclophotocoagulation on Pediatric Versus Adult Glaucoma Patients. J Glaucoma. 2017;26(10):936-939.
3. Aquino MCD, Barton K, Tan AMW, et al. Micropulse versus continuous wave transscleral diode cyclophotocoagulation in refractory glaucoma: a randomized exploratory study. Clin Experiment Ophthalmol. 2015;43(1):40-46.

Poster #A67
Friday, April 9, 2021
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Evaluation of Efficacy of Botulinum Toxin Injection In the Treatment of Infantile Esotropia

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Introduction: Surgery is the gold standard for the treatment of Infantile Esotropia (IET). Our objective is to investigate the outcomes and complications of botulinum toxin injection (BTX) as primary treatment of IET.

Methods: We included all patients with IET who underwent BTX from 2009 till 2019 at our institution. We defined success as post-operative angle of 0-10PD.Total number of Subjects included in the study were 63. We excluded patients older than 30 months and those with neurological abnormalities.

Results: During the study period, 63 patients met our inclusion criteria(38 (60.3%) Male patients). The mean for age 18±8 months (range 10-26), onset 6±4months (range2-10), and follow-up of 29±25months(range 4-54). Amblyopia was present in 45 (71.4%). Number of injections, 1 in 42(66.7%), 2 in 17(27%), 3 in 3(4.8%) and 4 in 1(1.6%). The 1st BTX mean dose was 7±3 (range4-10) IU and duration of 4±1(3-5)minutes. Mean pre-operative angle of deviation 42.30±13.73. Mean post-operative angle of deviation 16.07±16.15 (P-value 0.000). At the final follow-up, BTX was successful in 32(51%) (Cumelative success after 1st 33.3%, 2nd 46.03% and 3rd 50.79%). Twelve patients (19%) had undergone surgery due to failure of BTX. The following complications were observed: transient ptosis 29(49.2%), transient exotropia 36(57.14%), Inferior oblique overaction (IOOA) 13(20.6%), Vertical deviation 8(12.7%) and persistent ptosis 1(1.6%)

Conclusion/Relevance: The success rate of BTX for IET is moderate. The most common observations include IOOA and vertical deviation. Surgery remains the gold standard for treatment.

References: 1. Scott AB. Botulinum toxin injection into extra-ocular muscles as an alternative to strabismus surgery. Ophthalmology. 1980; 87; 1044-1049
2. de Alba Campomanes AG, Binenbaum G, Eguiarte GC. Comparison of botulinum toxin with surgery as primary treatment for infantile esotropia. J AAPOS. 2010: 14: 111-116
3. Campos EC, Schiavi C, Bellusci C. Critical age of botulinum toxin treatment in essential infantile esotropia. J Pediatr Ophthalmol Strabismus. 2000: 37: 214-219

Poster #A68
Friday, April 9, 2021
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Surgery Versus Botulinum Toxin for the Treatment of Partially Accommodative Esotropia

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Introduction: To compare the effect of a botulinum injection (BTX) to surgery (BMR) for the treatment of the nonaccommodative component in partially accommodative esotropia (PAET).

Methods: Retrospective case-control study of BTX versus BMR for PAET age 1-14 years old between 2006 and 2020. PAET was defined as residual ET >14 PD after 6 weeks of continuous wear of full cycloplegic refraction (> +2.5 D). Success was defined as 0- 10 PD of ET after one surgery or 1 to 3 BTX injections.

Results: Of 224 patients, 121 received BTX (1 injection 82.6%; 2 injections 16.5%); 103 BMR. Success rate was significantly higher in BMR (70.9% Vs overall success of BTX 53.7%; P-value= 0.006). There was no difference in pre-operative deviation or refraction among the groups. However, age was significantly younger among BTX group. Surgery was more successful in deviation </= 25 PD (80.6%), age > 5 years (74.3%), male (79.2%), and spherical equivalent= +5 (67.5%) (P-values < 0.05). The mean follow-up was shorter in BMR group (16.7±14.7 months Vs 31.4±29.5 months, P-value= 0.00). However, the mean duration was significantly shorter in BTX group (5.2±4.27 min Vs 70.5±31.44 min, P-value= 0.00). The followings were more common in BTX group, included; Vertical deviation (6.6%), Inferior oblique overaction (7.4%), and ptosis (0.8%). However, consecutive exotropia (0.2%) was more common in BMR group.

Conclusion/Relevance: Although BTX has a shorter procedure time, surgery has a higher success rate, shorter duration of follow up and less complications than BTX in the treatment of PAET.

References: 1-K. O. Society, 'Department of Ophthalmology, Kyungpook National University, School of Medicine, Daegu, Korea Purpose:,' J. Aapos, vol. 3, no. 5, 2007.

2- F. J. Rowe and C. P. Noonan, 'Botulinum toxin for the treatment of strabismus,' Cochrane Database Syst. Rev., no. 3, Mar. 2017, doi: 10.1002/14651858.CD006499.pub4.

3- A. C. Clark,' Leonard B Nelson,', J. W. Simon, R. Wagner, and S. E. Rubin4, 'Acute acquired comitant esotropia,' Br. J. Ophthalmol., vol. 73, pp. 636–638, 1989, doi: 10.1136/bjo.73.8.636.

Poster #A69
Friday, April 9, 2021
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Habitual Fixation in Monocular Esotropia (ET) Does Not Alter Properties of the Horizontal Rectus Extraocular Muscles (EOMs)

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Introduction: Chronic eye misalignments have been supposed to induce morphologic changes in rectus EOMs. We used orbital magnetic resonace imaging (MRI) to quantify horizontal EOM morphology in patients with long-standing monocular ET.

Methods: Orbital magnetic resonance imaging (MRI) was obtained in quasi-coronal 2-mm slices (313-micron resolution) in target-controlled central gaze and ~30° adduction and ~20° abduction in 11 patients (average age 41±18 yrs SD) with 41±16Δ monocular ET. A masked investigator measured medial rectus (MR) and lateral rectus (LR) cross-sectional areas, corrected for oblique path, for seven contiguous image planes from the globe-optic nerve junction posteriorly. Maximum cross-sectional area (MaxCA) and partial volumes for the four most posterior planes (PostPV) and the total EOM segment (TotalPV) were compared in each gaze position.

Results: Globe diameters were similar in fixating and crossed eyes (25.6±0.8mm vs 25.5±0.6mm, p=0.53). In central gaze, MR MaxCA (33±4mm2 vs 32±5mm2, p=0.81) and TotalPV (427±63mm3 vs 416±54mm3, p=0.50) and LR MaxCA (38±7mm2 vs 36±6mm2, p=0.21) and TotalPV (455±80mm3 vs 443±72mm3, p=0.36) were similar, suggesting no hypertrophy. From abduction to adduction, the change in MR MaxCA (17±3mm2 vs 16±5mm2, p=0.35) and PostPV (155±33mm3 vs 149±33mm3, p=0.61) and in LR MaxCA (-14±6mm2 vs -12±5mm2, p=0.32) and PostPV (-134±55mm3 vs -122±29mm3, p=0.38) were similar, suggesting no excess contractilty.

Conclusion/Relevance: In longstanding ET, horizontal EOM size and contractility do not differ between preferred and habitually esotropic eyes. Apparent MR 'overaction' or LR 'underaction' are probably secondary to Hering's law superimposed on an esotropic vergence bias, rather than abnormal innervation or EOM hypertrophy in either orbit.

References: 1. Clark RA, Demer JL. Functional morphometry of horizontal rectus extraocular muscles during ocular duction. Invest Ophthalmol Vis Sci. 2012;53:7375.
2. Kushner BJ. Incomitant strabismus: does extraocular muscle form denote function? Arch Ophthalmol. 2010;128:1604-9.
3. Clark, R. A. and Demer, J. L. Enhanced vertical rectus contractility by magnetic resonance imaging in superior oblique palsy. Arch. Ophthalmol. 129: 904-908, 2011.

Poster #A70
Friday, April 9, 2021
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Stereopsis in Children with Intermittent Exotropia and DVD

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Introduction: Dissociated vertical deviation (DVD) is generally associated with early-onset strabismus and poor stereopsis, and infrequently observed among patients with intermittent exotropia. The purpose of this study is to describe the clinical features of stereopsis among children with intermittent exotropia and DVD.

Methods: The medical records of all children examined for intermittent exotropia at our institution from January 1, 2002, through December 31, 2018, were retrospectively reviewed.

Results: Among 242 children examined over the 17-year study, 25 (10.3%) were found to have DVD. Thirteen (52%) of the 25 children had normal stereopsis (60 arc secs or better). The median age at diagnosis of IXT in13 children with normal stereopsis was 24 months (range, 9 to 72 months) compared to 13 months (range, 1 to 36 months) in the 12 children with subnormal stereopsis (p=0.1). Children with normal stereopsis had a lower mean distance control score (2.6 (range, 1 to 5) vs. 3.1(range 2 to 5), p=0.23). Other characteristics including gender, amblyopia, angle of deviation, and age at surgery were similar between the two groups.

Conclusion/Relevance: Normal stereopsis appears to be a relatively common feature in children with both IXT and DVD unlike other forms of childhood strabismus.

References: 1. Brodsky MC. Dissociated vertical divergence. A righting reflex gone wrong. Arch Ophthalmol 1999; 117: 1216-1222.
2. Lim HT, Smith DR, et al. Dissociated vertical deviation in patients with intermittent exotropia. J AAPOS 2008; 12:390-395.
3. Mohney BG, Holmes JM. An office-based scale for assessing control in intermittent exotropia. Strabismus 2006; 14(3): 147-150

Poster #A71
Friday, April 9, 2021
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Characteristics of Childhood Intermittent Exotropia with and without DVD

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Introduction: Although dissociated vertical deviation (DVD) is reported to occur rarely in children with intermittent exotropia (IXT), little is known regarding the clinical features of these children. The purpose of this study was to compare the demographic and clinical characteristics of children with intermittent exotropia and DVD to exotropic children without DVD.

Methods: The medical records of all children diagnosed with intermittent exotropia at our institution from January 1, 2002, through December 31, 2018, who had 2 or more exams with 3 or more assessments of control, were retrospectively reviewed. Exotropic children with DVD were compared to those without DVD.

Results: During the 17-year study period, 115 children met the inclusion criteria, of which 25 (21.7%) were found to have DVD. Compared to the 90 exotropic children without DVD, children with IXT and DVD were more likely to have a motility disorder (p=0.003), a worse mean distance control score (2.8 vs 2.4; p=0.08), a larger mean angle of deviation (27.8 prism diopters [PD] vs 25.1 PD; p=0.04), and a lower median stereopsis (200 secs vs 100 secs; p=0.08). The children with DVD were more likely to have undergone surgery (p=0.16) although there was no difference in the mean age at initial surgery between the two groups.

Conclusion/Relevance: The presence of dissociated vertical deviation in children with intermittent exotropia is associated with more motility disorders and worse binocular function compared to those without DVD. These children may require closer observation and earlier intervention.

References: 1. Lim HT, Smith DR, Kraft SP, Buncic JR. Dissociated vertical deviation in patients with intermittent exotropia J AAPOS 2008;12:390-95
2. Mohney BG, Holmes JM. An Office-based Scale for Assessing Control in Intermittent Exotropia. 2006. Strabismus Sept. 14(3): 147-150
3. Govindan M, Mohney BG, Diehl NN, Burke JP: Incidence and types of childhood exotropia: A population-based study. Ophthalmology 2005; 112:104-108

Poster #A72
Friday, April 9, 2021
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Correlates of Consecutive Exotropia

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Introduction: Do the larger bilateral medial rectus recessions performed for infantile esotropes within more recent dose-response curve guidelines produce a higher incidence of late consecutive exotropia (CXT) than the smaller recessions performed within these same guidelines? Also, studies of traditional correlates of late CXT in the context of more recent dose-response guidelines are lacking.

Methods: Retrospective chart review of 103 infantile esotropes who previously provided data for a dose-response curve study published in JAAPOS.

Results: The mean follow-up for 60 who did not develop late CXT was 9 yrs 3 mos, 95% C.I. 93.1 to 130 mos. The mean age at which for CXT developed for 43 with CXT was 6 yrs 9 mos, 95% C.I. 66.4 to 94.8 mos. Recessions smaller than the median 5.6 mm, 19/51 CXT; recessions larger than 5.6 mm, 24/52 CXT, $p = 0.360$. Among those with no CXT, 13/60 had a second surgery for recurrent ET, among those developing CXT, 11/43 had a second surgery for recurrent ET, $p = 0.643$. Among those with no CXT, 11/60 had oblique overaction. Among those with CXT, 20/43 had oblique overaction, $p = 0.0021$.

Conclusion/Relevance: The 95% C.I. ranges for follow-up indicated that the follow-up was adequate for these comparison studies. Late CXT was not associated with larger (vs. smaller) MROU performed according to dose-response curve guidelines. A second surgery for recurrent ET was not associated with a higher incidence of CXT. Late CXT was highly correlated with oblique overaction.

References: Tran, HM et al A new dose-response curve for bilateral medial rectus recessions for infantile estropia. JAAPOS 2002;6:112-119.

Poster #A73
Friday, April 9, 2021
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Medium-Term Observation of Children with Untreated Intermittent Exotropia

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Introduction: The purpose of this paper is to report changes in control, stereopsis, and the angle of deviation among children with intermittent exotropia followed for a minimum of three years.

Methods: The medical records of all children examined for intermittent exotropia at our institution from January 1, 2002, through December 31, 2018, were retrospectively reviewed. Children with 3 or more control scores assessed over 2 or more exams followed for a minimum of 3 years prior to or without any form of treatment were included in this study.

Results: Among 242 children examined during the 17-year study, 57 (23.6%) met the study criteria. During a mean follow-up of 5.7 years (range, 36 months to 14 years), there was a mean worsening of control of 0.5 ($p=0.02$) for distance and 0.7 ($p=<0.001$) for near, a mean increase in the angle of deviation of 4 prism diopters (PD) at distance ($p<0.001$) and 5 PD at near ($p=0.001$), and a median improvement of 60 arcsecs of stereopsis ($p<0.001$). Three (5.3%) of the 57 developed constant exotropia at both distance and near followed for a mean of 35 months (range, 15 months to 70 months).

Conclusion/Relevance: Most children with intermittent exotropia followed for 3 years or more in this study displayed mildly worsening control and an increase in the angle of deviation without adversely affecting stereopsis. Approximately 5% of this cohort developed a constant deviation during the observation period.

References: 1.Buck D, Powell CH, Rahi J, et al. The improving outcomes in intermittent exotropia study: outcomes at 2 years after diagnosis in an observational cohort. BMC Ophthalmol 2010;12:1-7.
2. Mohney BG, Cotter SA, Chandler DL, et al. Three-year observation of children 3 to 10 years of age with untreated intermittent exotropia. Ophthalmol 2019;126:1249-1260.
3. Mohney BG, Holmes JM. An office-based scale for assessing control in intermittent exotropia. Strabismus 2006;14:147-150.

Poster #A74
Friday, April 9, 2021
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Accommodative Esotropia Greater at Near Fixation: Can a Patch Test Differentiate a Novel Subtype?

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Introduction: In some patients with accommodative esotropia (AET) with deviation greater at near than distance, the distance deviation approaches the near after 20 minutes of patching. A patch test may identify a subgroup of patients with AET greater at near that does not outgrow bifocals, and may benefit from earlier strabismus surgery.

Methods: This is an ongoing retrospective and prospective chart review of 65 patients to date with AET who underwent a 20-minute monocular patch test. We compared prism measurements at distance and near before and after the patch test for experimental (AET with high distance/near disparity) and control (Basic AET) groups. Primary outcome is 'patch test response,' defined as post-test measurements reducing the distance/near disparity to 10PD or less. Secondary analysis compares characteristics and clinical course.

Results: Of 68 subjects, 26 are experimental, 42 are control. 46% of the experimental group are 'test-responders,' having an average net change in distance/near disparity of -8.9PD (distance increased 7.4PD and near decreased 1.5PD). Conversely, both the 'non-responders' and control group have small increases in distance and near deviations. Analyzed over time, 'responders' trend towards having better control and maintaining fusion at near without bifocals; 'non-responders' have poorer control and some required surgery.

Conclusion/Relevance: A 20-minute monocular patch test results in collapse of distance/near disparity for a subgroup of patients with AET greater at near. This novel subgroup may represent those who outgrow their bifocals, whereas 'non-responders' may benefit from earlier surgery.

References: Kushner, Burton J. 'Diagnosis and Treatment of Exotropia With a High Accommodation Convergence–Accommodation Ratio.' Archives of Ophthalmology, vol. 117, no. 2, 1999, pp. 221–224., doi:10.1001/archopht.117.2.221.

Poster #A75
Friday, April 9, 2021
12:30 PM – 1:30 PM

Demographic Characteristics of Duane Syndrome Patients with Synergistic Divergence and Accessory Fibrotic Extraocular Muscles

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Introduction: Imaging studies report accessory fibrotic muscles in approximately 2.5% of patients with strabismus. Synergistic divergence is a rare form of ocular motility characterized by simultaneous divergence in attempted adduction. This study describes demographic predilections of Duane syndrome patients diagnosed with accessory fibrotic muscles or synergistic divergence.

Methods: Case series of consecutive patients diagnosed with Duane syndrome and synergistic divergence or accessory fibrotic muscles.

Results: Six consecutive patients were identified. All patients were males. One Hispanic and two black patients presented with exotropia and synergistic divergence. None of the two white patients had synergistic divergence. Right eye was affected in 50% of the patients. Bilateral disease was seen in two non-white patients. Five (83%) of six patients had exotropia. Five patients underwent surgery, and all had accessory fibrotic muscles.

Conclusion/Relevance: In contrast to the typical female, unilateral, and left eye predispositions of Duane syndrome patients, we found a predominance of male gender, and non-white ethnicity in Duane patients with synergistic divergence, exotropia and bilateral disease. ||Unusual Duane syndrome patterns may have particular gender and race predispositions. Some studies suggest mutations in the COL25A1 gene may be associated with extraocular muscle fibrosis and Duane Syndrome; however, further studies are needed to determine an association. Surgeons must be aware of abnormal accessory fibrotic extraocular muscles in male Duane syndrome patients presenting with exotropia, severe restriction to forced duction test, severe misinnervation, and synergistic divergence.

References: 1. Narasimhan A, Tychsen L, Poukens V, Demer JL. Horizontal rectus muscle anatomy in naturally and artificially strabismic monkeys. Invest Ophthalmol Vis Sci. 2007 Jun;48(6):2576-88.
2. Awadein A, Zedan RH. Synergistic divergence: case series and literature review. Br J Ophthalmol. 2018 Jul;102(7):892-901
3. Khan AO, Al-Mesfer S. Recessive COL25A1 mutations cause isolated congenital ptosis or exotropic Duane syndrome with synergistic divergence AAPOS. 2015 Oct;19(5):463-5.

Poster Session B
(B1 – B75)

Poster #B1
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Acute-Onset, Comitant Esotropia Outcomes are Optimized by Prompt Intervention: An International Experience

Crystal S. Cheung, MD; Michael J. Wan, MD; Sylvia Kodsi, MD; Ankoor S. Shah, MD, PhD; Linda R. Dagi, MD; David G. Hunter, MD, PhD

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Introduction: Acute-onset, comitant esotropia (ACE) treated with chemodenervation is non-inferior to surgical correction, may be scheduled sooner, and is less expensive than surgery (1). However, the low incidence of ACE makes it difficult for a single center to assess outcomes and to determine optimal management.

Methods: We developed a cloud-based survey asking ophthalmologists who treat ACE to enter individual patient data. Primary outcome measure was success, defined as a horizontal deviation of <10 prism diopters with fusion or stereopsis, 6 months after treatment. Secondary outcome measures were success at 12 months and factors predicting success. A non-inferiority analysis comparing chemodenervation to strabismus surgery was performed.

Results: To date, 167 patients from 10 centers have been entered into the survey, with 61 receiving chemodenervation and 106 receiving surgery. Median age of ACE onset was 4.9 years (IQR 2.8-7.5). Median time from onset to treatment was 5.2 months (IQR 2.7-8.6). Chemodenervation was non-inferior to surgery at 6 months (70% vs. 57%) and at 12 months (63% vs. 66%). Multivariable analysis showed success associated with shorter duration between onset and treatment at 6 months ($p=0.02$) and 12 months ($p=0.04$).

Conclusion/Relevance: Chemodenervation and surgery appear to be effective for ACE, and early intervention gives the best chance for success, regardless of approach.

References: 1. Wan MJ, Mantagos JS, Shah AS, Kazlas M, Hunter DG. Comparison of Botulinum toxin with surgery for treatment of acute-onset comitant esotropia in children. Am J Ophthalmol 2017;176:33-9.

Poster #B2
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Surgical Outcomes of Medial Rectus Plication for Management of Basic Type Intermittent Exotropia

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Introduction: Intermittent exotropia is an exodeviation intermittently controlled by fusional mechanisms, due to the instinctive drive for binocular vision. Intermittent exotropia spontaneously breaks down into a manifest exotropia. (1) Intermittent exotropia is the commonest type of exodeviation and often first observed by parents in early childhood as a spontaneous drifting out of one eye mostly when the child is tired, sick or daydreaming. Adult patients may manifest the deviation after alcohol or sedative intake. (2)

Methods: A prospective study, included 22 patients with basic type intermittent exotropia up to 40PD from 4 years and older, with pure horizontal muscle imbalance. Patients with history of squint surgeries, neurological abnormalities, vertical muscle imbalance >5pd, oblique muscle dysfunction and paralytic or restrictive strabismus were excluded. Patients were managed by bilateral medial rectus plication surgery (fornix based) according to the degree of deviation, and calculated by Kenneth Wright surgical dose table. The study was conducted at aboriesh pediatric hospital, faculty of medicine, Cairo Univeristy. Success is orthotropia or small angle exotrpia <10 pd.

Results: No intraoperative complications were recorded in the study.
1 week postoperative: 13 case (59%) were successful and 2 cases (9%) showed esotropia and 7 cases (32%) exotropia >10 pd
One month: 14 were ortho (64%) one eso case did release of plication suture and 7 (32%) showed xt >10 PD| 6 months postoperative 14(64%) cases were successful and 8 (36%) cases required redo.

Conclusion/Relevance: Bilateral medial rectus plication could be an option for the treatment of basic type intermittent xt, it is relatively a quick, simple and safe procedure with a fair success rate, minimal postoperative side effects and it's a reversible procedure.

References: 1. Intermittent exotropia: When to observe and when to treat. Wilson, M. Edward. 6, s.l. : Journal of American Association for Pediatric Ophthalmology and Strabismus {JAAPOS}, 2011, Vol. 15. 518.
2. Buch, Helena & W. Wright, Kenneth. Principles of Strabismus Surgery for Common Horizontal and Vertical Strabismus Types. Advances in Eye Surgery. s.l. : intech, 2016.
3. Evaluation of Diagnostic Methods for the Classification of Exodeviations. Hermann M. Burian, Albert T. Franceschetti.

Poster #B3
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Weakening Effectiveness of Y Splitting Recession in Lateral Rectus

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Introduction: It has been previously shown that y-splitting reduces the activity of the muscle in the direction of the effect by affecting the torque. With the hypothesis that such an effect may also exist in the lateral rectus weakening procedure, it was thought that Y splitting might be more effective than standard recession surgery in this muscle. In this study,|we evaluated LR recession both by conventional and y splitting technique, and compere their results

Methods: Patients' records who underwent only LR recession which between 7mm and 9mm for exotropia screened retrospectively. Cases, operated with conventional technique, named as Group1. Cases, operated with Y split technique, named as Group2. The effectiveness of the techniques results calculated according to deviation correction per mm recession, in each group for each distance.

Results: Both groups included 92 cases with at least a year follow-up. When 2.7 pd correction noted per mm in 7mm, 2,62pd in 7,5mm, 2,44 pd in 8 mm, 2,38pd in 8.5 mm and 2.22pd in 9 mm recession respectively in group 1; the values are 3,84pd in 7mm, 3.81pd in 7.5 mm, 3.66pd in 8 mm, 3.52pd in 8.5 mm and 3.44pd in 9 mm recession respectively in group 2. Group 2 results were better in all recession distances, and the results are found statistically meaningful. $p<0.05$

Conclusion/Relevance: According to our results, while the amount of recession increase in both series, the deviation treatment effect showed decreases. Y split recession technique was more successful than the conventional recession technique at all recession distances.

References: 1. Haslwanter T., Hoerantner R., Priglinger S. Reduction of ocular muscle power by splitting of the rectus muscle. I: biomechanics British Journal of Ophthalmology. 2004;88(11):1403-1408.
2. Wipf M., Priglimger S., Palmowske-Wolfe A. Y-split recession of the medial rectus muscle as a secondary and/or unilateral procedure in the treatment of esotropia with distance/near disparity. Journal of Ophthalmology. 2017;2017:6.

Poster #B4
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Unilateral Horizontal Muscle Recessions for Pediatric Comitant Strabismus

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Introduction: Outcomes including horizontal incomitance (HI) after unilateral horizontal extraocular muscle recessions (UHR) for pediatric comitant strabismus were reviewed at a major US academic medical center.

Methods: Retrospective chart review of pediatric patients who underwent unilateral medial rectus recession (UMR) for congenital esotropia or partially accommodative esotropia (ET), or unilateral lateral rectus recession (ULR) for intermittent exotropia (XT) with a single surgeon over 7 years. In prism diopters (PD), deviations were noted: negative for ET, positive for XT. Primary successes were defined as maximum distance deviation at post-operative month 3: -12 to +5 for ET, -5 to +12 for XT. Rates of postoperative HI >5 PD and success for small medium, and large (in mm, respectively, ET: <5, 5-6 mm, >6; XT: <8, 8-10, >10) recessions were analyzed.

Results: 17 ETs and 40 XTs were analyzed. Overall primary success was 64.9% (p=0.02). Significantly, 70% (95% CI: 55.8, 84.2) XTs succeeded; 30% (95% CI: 15.8, 44.2) failed. ETs were equally likely to succeed (52.9%) or fail (47.1%) (p=0.22). Subgroup analyses revealed statistically significant success only for small (100%) and medium (68%) ULR. For patients without significant preoperative HI, average postoperative HI was 3.90 PD (95% CI: 0.20, 7.60) for ETs; 5.48 PD (95% CI: 3.65, 7.32) for XTs.

Conclusion/Relevance: UHR was 64.9% successful in treating pediatric comitant strabismus. ULR for XT, particularly small to medium deviations, was most likely to succeed. In contrast to prior reports, large UMR and ULR were less likely to succeed and post-operative incomitance was frequent but rarely clinically significant.

References:

Deacon BS, Fray KJ, Grigorian AP, Qureshi HM, Spencer HJ, Lowery RS, Phillips PH. Unilateral strabismus surgery in patients with exotropia results in postoperative lateral incomitance. J AAPOS. 2014 Dec;18(6):572-5.
Cogen M, Roberts B. Graded unilateral supramaximal medial rectus recession for moderate angle esotropia. Binocul Vis Strabismus Q 2006;21:147-153.
Olitsky S. Early and late postoperative alignment following unilateral lateral rectus recession for intermittent exotropia. J Pediatr Ophthalmol Strabismus 1998;35:146-148.

Poster #B5
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Routine Use of Non-absorbable Sutures in Bi-medial Rectus Recession as a Measure to Reduce the Incidence of Consecutive Exotropia

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Introduction: To evaluate the incidence of consecutive exotropia following BMR surgery for esotropia using non-absorbable compared with absorbable sutures in children undergoing strabismus surgery.

Methods: A retrospective cohort study of all children with esotropia who underwent BMR by a single surgeon in a tertiary public hospital between January 2016 to January 2020. As of February 2018, only non-absorbable sutures were used. Primary outcome was the incidence of consecutive exotropia in both groups.

Results: A total of 157 children were included in the analysis, mean age was 3.75±2.76 years, 45% were female. In 80 children (51%) non-absorbable sutures were used (non-absorbable group) and in 77 (49%) children absorbable sutures were used (absorbable group). Consecutive exotropia (of = 8 prism diopters) occurred in 15 children (19%) in the absorbable group and in 3 children (4%) in the non-absorbable group (Odds Ratio=6.21, 95% CI=1.72-22.42, P=0.002). This difference between groups remained significant after adjustment for follow-up time, age, gender and amount of recession (Hazard Ratio=4.15, 95% CI=1.19-14.54, P=0.026). Mean follow-up time was 19.01 and 12.68 months in the absorbable and non-absorbable groups, respectively (95% CI=3.38-9.29, P<0.001). Two children in the non-absorbable group had pyogenic granuloma that resolved after 3 months. In one patient in each group a suture break was noted which required revision under anesthesia in both cases.

Conclusion/Relevance: Routine use of non-absorbable sutures in BMR surgery for esotropia may be a preferable alternative to absorbable sutures in terms of consecutive exotropia.

References: Rectus Muscle Recession in Children with Developmental Delay. Strabismus. 2016;24(1):7–11.
2. Repka MX, Guyton DL. Comparison of hang-back medial rectus recession with conventional recession. Ophthalmology. 1988 Jun;95(6):782–7.
3. Spierer O, Spierer A. Comparison of hang-back and conventional bimedial rectus recession in infantile esotropia. Graefes Arch Clin Exp Ophthalmol. 2010 Jun 1;248(6):901–5.

Poster #B6
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Favorable Long Term Surgical Outcome of Rectus Muscle Plication

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Introduction: After 2010, rectus muscle plication was re-introduced into the surgical armamentarium in the Western hemisphere as a less traumatic, potentially-reversible, technically easy alternative to resection that preserves ciliary circulation. While most studies have suggested comparable efficacy to resection1. However, long term studies remain sparse with what we believe the longest study by Lee et al[2] having only 27 months mean follow-up . Since a surgeon at our institution was one of the earliest to abandon resection for rectus plication in 2012, particularly long follow-up is available for our cases.

Methods: Charts were reviewed from 2013 to 2020 of a single surgeon's experience with horizontal rectus plication at a tertiary academic center. Strabismus measurements were recorded before strabismus surgeries that included medial or lateral rectus plication, and post-operatively for up to 8 years.

Results: Long-term alignment was satisfactory and did not deteriorate more than would be expected in the long term. Detailed quantitative data are in progress.

Conclusion/Relevance: Horizontal rectus plication maintains effectiveness in the long term. Plication has many advantages over resection and should be considered by surgeons who still practice rectus extraocular muscle resection.

References: Chaudhuri Z, Demer JL. Surgical outcomes following rectus muscle plication: A potentially reversible, vessel-sparing alternative to resection. JAMA Ophthalmol 2014;132:5:579-85.
Lee H. J., Kim S. J. Long-term outcomes following resection-recession versus plication-recession in children with intermittent exotropia. British Journal of Ophthalmology. 2019;104(3):350-356. doi: 10.1136/bjophthalmol-2018-313711.

Poster #B7
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Patterns of Esotropia in Down Syndrome Patients

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Introduction: We aim to identify types and surgical outcomes of esotropia in Down syndrome (DS) patients.

Methods: We performed a twelve year (2007-2019) retrospective review of all patients with DS who underwent initial surgery for esotropia at our institution. Preoperative and postoperative sensorimotor exam and surgical intervention were recorded. Surgical success, defined as postoperative orthotropia, intermittent tropia, or constant esotropia of less than 9 prism diopters in primary position, was evaluated at first postoperative visit beyond one month but no later than eight months.

Results: Of 74 patients identified, 30 (40.5%) demonstrated A-pattern esotropia versus 4 (5.4%) with V-pattern esotropia. Twenty-four patients demonstrated no pattern and 16 had no pattern assessment. Mean postoperative follow-up was 78 days (range:29-220). Three patients with A-pattern and 2 with no pattern were excluded when determining surgical success given insufficient follow up. Surgical success was achieved in 19/27 (70.4%) patients with A-pattern esotropia. When the A-pattern was surgically addressed (tendon supero-placement or superior oblique weakening) 13/15 (86.7%) patients achieved surgical success versus 6/12 (50%) patients when A-pattern was not addressed (p=0.0392). All four patients with V-pattern esotropia treated with inferior oblique weakening achieved success. For all-comers, surgical success was 79.7% (55/69).

Conclusion/Relevance: A-pattern esotropia was observed frequently in our DS population. Patients whose pattern strabismus was identified and treated appeared to have better surgical outcomes. Overall, surgical success for esotropia in the DS population appears consistent with the general population. Recognition of pattern esotropia may help guide surgical planning and lead to increased surgical success in DS patients.

References: Motley WW, Melson AT, Gray ME, Salisbury SR. Outcomes of strabismus surgery for esotropia in children with Down syndrome compared with matched controls. J Pediatr Ophthalmol Strabismus. 2012;49(4):211-4.

Perez CI, Zuazo F, Zanolli MT, Guerra JP, Acuña O, Iturriaga H. Esotropia surgery in children with Down syndrome. JAAPOS. 2013;17(5):477-9.

Yahalom C, Mechoulam H, Cohen E, Anteby I. Strabismus surgery outcome among children and young adults with Down syndrome. J AAPOS. 2010;14(2):117-9.

Poster #B8
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Intermediate-term Outcomes of Horizontal Muscle Plication versus Resection

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Introduction: Muscle strengthening by resection is a common technique in the surgical correction of strabismus. Plication is less common but has been proposed as less invasive. This study examines the effectiveness of muscle plication compared to muscle resection in correction of horizontal deviations in strabismus after a period of up to five years.

Methods: Retrospective chart review of pediatric and adult strabismus patients who underwent either resection or plication of one or two horizontal muscles between January 1, 2011 to October 1, 2018 and had at least 1 year of follow up. Variables recorded include demographics, pre-operative and post-operative measurement in primary gaze, need for re-operation, and length of follow up. Surgical success was defined as a deviation of 10PD or less (distance measurement). Post-operative drift was examined by comparing deviation at 5 time points over 3 years between groups.

Results: 41 plication and 24 resection patients were identified. The average preoperative deviation was 28.5 PD in the plication group and 32.9 PD in the resection group. The success rate at the 1 week postoperative visit was 95% and 84% and at most recent visit were 59% and 56% for plication and resection, respectively. Average length of follow up was 26.5 months for plication and 43.8 months for the resection group. There was no significant difference in re-operation rate between groups. There was no significant difference in surgical drift after 3 years between groups.

Conclusion/Relevance: Plication reveals similar post-operative results when compared to resection both initially and years following surgery. Plication is an effective method of rectus muscle strengthening, with similar long-term outcomes when compared to muscle resection.

References:

1. Wright KW. Rectus strengthening procedures. In: Wright KW, ed. Color Atlas of Ophthalmic Surgery: Strabismus. Philadelphia, PA: Lippincott; 1991.
2. Oltra, E. Z., Pineles, S. L., Demer, J. L., Quan, A. V., & Velez, F. G. The effect of rectus muscle recession, resection and plication on anterior segment circulation in humans. British Journal of Ophthalmology, 2015;99(4), 556-560.
3. Chaudhuri Z, Demer JL. Surgical Outcomes Following Rectus Muscle Plication: A Potentially Reversible, Vessel-Sparing Alternative to Resection. JAMA Ophthalmol. 2014;132(5):579-585.

Poster #B9
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Surgical Outcomes of Strabismus Surgery in Sensory Exotropia

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Introduction: Strabismus surgery can be successful in patients with sensory exotropia but studies to date have involved small numbers of patients with limited follow up. The goal of this study was to determine success rates over time for strabismus surgery for sensory exotropia and to determine factors associated with successful outcomes.

Methods: We retrospectively reviewed medical records of 123 strabismus surgery patients with sensory exotropia [VA≤ 20/200 in affected eye] operated between May 2012 - December 2019. Patients who did not follow up after surgery were excluded. Surgical success was defined as postoperative deviation of ≤ 10 prism diopters of exotropia or ≤ 6 prism diopters of esotropia. Cox-proportional hazard models were used to evaluate covariate relationships with surgical outcome (a = 0.05) using package survival in program R version 3.6.1.

Results: One hundred and one patients (64% female), ranging from 3-80 years old, were included. Mean follow up was 2.22 years. The mean preoperative near deviation was 38.6 ± 15.3 prism diopters of manifest or intermittent exotropia. Alignment success after the procedure was 55.9% (52/93) at 1 month, 54.3% (19/35) at 1 year, and 47.1% (8/17) at 5 years. No preoperative patient characteristic was found to have significant correlation with surgical success by Cox-proportional hazard model.

Conclusion/Relevance: At five years, close to 50% of patients still had satisfactory surgical alignment. This work may aid future preoperative counseling of patients with sensory exotropia.

References:

Hopker LM, Weakley DR. Surgical results after one-muscle recession for correction of horizontal sensory strabismus in children. J AAPOS. 2013;

H. L, A. BY, E.O.A. B, L. EF. Outcomes of surgery in patients with sensory exotropia. J Fr Ophtalmol. 2020;

Jung EH, Kim SJ. Surgical results and factors affecting outcome in adult patients with sensory exotropia. Eye. 2018;

Poster #B10
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Income Disparities in Outcomes of Horizontal Strabismus Surgery in a Pediatric Population

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Introduction: Previous studies have demonstrated lower socioeconomic status (SES) to be associated with worse ophthalmologic and non-ophthalmological outcomes. The impact of SES on strabismus surgical outcomes is not well understood and is therefore examined in this study of pediatric patients undergoing strabismus surgery.

Methods: This study included 284 children undergoing horizontal strabismus surgery at a tertiary institution with at least 11 months of follow-up and no prior strabismus surgery or neurologic or ophthalmologic comorbidities. Demographics, insurance, operative parameters, and appointments scheduled/attended were collected via chart review. Medicaid was used as a surrogate for SES. Ocular alignment was recorded preoperatively and postoperatively at 3, 12 and 24 months. Failure was defined as under-correction with misalignment of >10 prism diopters (PD); or over-correction with misalignment of >6 PD; or undergoing a re-operation for horizontal strabismus.

Results: There was no difference in failure rates between Medicaid and privately-insured groups by 24 months (45.9% vs. 48.9%, $p=0.63$). Medicaid patients were more likely to not follow-up postoperatively (28.2% vs. 9.6%, $p<0.01$) while privately-insured patients were more likely to complete over three appointments in 24 months (21.5% vs. 39.0%, $p<0.01$). Post-operative attendance was linked to Medicaid status ($p<0.01$) but not travel time, neighborhood income levels or social deprivation indices.

Conclusion/Relevance: There was no difference in strabismus surgery failure rates between Medicaid and privately-insured groups. Medicaid status was significantly predictive of loss to follow-up, placing these patients at risk for poor outcomes if they had residual strabismus. Further research is needed to understand and address barriers to follow-up.

References: Dembinski RL, Collins ME, Kraus CL. Outcomes following surgery for horizontal strabismus in children of lower socioeconomic backgrounds. Strabismus. 2019;27(2):47-53. doi:10.1080/09273972.2019.1626451
Lee YH, Chen AX, Varadaraj V, Hong GH, Chen Y, Friedman DS, et al. Comparison of access to eye care appointments between patients with medicaid and those with private health care insurance. JAMA Ophthalmol. 2018;136(6):622-9.
Wisnicki HJ, Repka MX, Raab E, et al. A comparison of the success rates of resident and attending strabismus surgery. J Pediatr Ophthalmol Strabismus. 1993;30(2):118-121.

Poster #B11
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Prevalence of Cerebral Visual Impairment (CVI) Education During Ophthalmology and Optometry Training Programs

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Introduction: CVI is the most common cause of visual impairment in the US. Early identification by eye care professionals is critical to provide timely intervention. Anecdotal evidence suggests a paucity of didactic and clinical CVI education. This study aims to identify current CVI instruction during training of ophthalmologists and optometrists.

Methods: An electronic survey was distributed nationally to all ophthalmology and pediatric optometry residency directors, optometry clinical education directors, and Pediatric Ophthalmology and Neuro-Ophthalmology fellowship program directors. This study's 48 respondents were recruited by direct emails and by posting on listservs.

Results: Less than half of the programs, 48% (23/48), provide formal didactic CVI lectures. Of those with classroom instruction, 83% (19/23) of programs offer a minimum 1-2 hours and 17% (4/23) provide less than 1 hour of lecture. The majority of respondents 81% (39/48) state that CVI clinical instruction is only rarely or sometimes provided. The settings in which trainees are exposed to CVI include; pediatric eye care clinics 65% (31/48) and Low Vision clinics 46% (22/48).

Conclusion/Relevance: Early identification of children with CVI is critical for entry into intervention programs to improve function and access to education. Referral to these programs can only occur after a diagnosis of CVI is made. Therefore, eye care providers must have the knowledge and tools to diagnose and refer these children in a timely manner. Without adequate exposure to CVI during training programs, practitioners may not be able to identify CVI, delaying needed intervention. This study suggests training programs are not providing adequate instruction on CVI.

References: 1. Ortibus E, Fazzi E, Dale N. Cerebral visual impairment and clinical assessment: the European perspective. Semin Pediatr Neurol, 2019; 31: 15- 24.
2.Chang MY, Borchert MS. Advances in the evaluation and management of cortical/cerebral visual impairment in children. Surv Ophthalmol, 2020; 65(6): 708-724.

Poster #B12
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Cerebral Visual Impairment (CVI) Education and Practice Reported by Practicing Ophthalmologists and Optometrists

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Introduction: CVI is the most common cause of visual impairment in developed countries, with an increasing prevalence in developing countries. It is challenging to diagnose; however, early identification is critical to providing intervention. Proper CVI instruction and training is vital to providing a timely diagnosis. This study surveys the current level of training and diagnostic practices of practicing ophthalmologists and optometrists.

Methods: An electronic survey was distributed internationally to practicing ophthalmologists and optometrists by listserv, professional organization mailing lists, and professional Facebook groups. There were 334 respondents.

Results: Of respondents, DO (2%, n=6), MD (42%, n=141), and OD (56%, n=187). Respondents have practiced for a median of 20 - 30 years. Professional training and practice was reported in North America, Europe, Oceania, and Asia. 59% (197/334) were, at least, moderately familiar with CVI. 38% (126/334) received CVI clinical instruction. 25% (83/334) reported a minimum of 1-2 hours of formal CVI didactic instruction. 65% (218/334) diagnosed CVI in their practices. Diagnoses were made using a combination of medical history, screening questionnaires, complete eye exams, and neuroimaging. Of those who diagnosed CVI, 47% (103/218) reported new cases at least monthly. 67% (145/218) conduct follow up evaluations every 6 months.

Conclusion/Relevance: This survey suggests a paucity of formal and clinical training in CVI. Many participants had been in practice before CVI was routinely identified in children therefore it is possible that selection bias was present as many respondents in specialty practices are more familiar with CVI. Never the less, this survey demonstrates the need for more CVI instruction.

References: 1. Ortibus E, Fazzi E, Dale N. Cerebral visual impairment and clinical assessment: the European perspective. Semin Pediatr Neurol, 2019; 31: 15- 24.
2. Chang MY, Borchert MS. Advances in the evaluation and management of cortical/cerebral visual impairment in children. Surv Ophthalmol, 2020; 65(6): 708-724.

Poster #B13
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Telemedicine-Based Approach in Children with Cerebral Visual Impairment (CVI)

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Introduction: CVI is the leading cause of visual impairment in the United States. Access to services for early diagnosis and intervention to optimize visual development can be limited by access to a center with professionals trained in CVI. Telemedicine allows therapy in the home environment providing guidance on structured task and environmental adaptations to match a child's visual needs. Study aims were to determine efficacy, feasibility, and acceptability of in-home telehealth-based intervention.

Methods: Seventeen children (mean age 32 months, range 13 - 77) were recruited. CVI diagnosis was confirmed by history and ophthalmologic exam. Initial evaluation included; parent interview, functional vision exam (CVI Range), PreVias and Caregiver Questionnaires, and Canadian Occupational Performance Measure (COPM). Using a crossover paradigm, subjects were randomized to intervention or waitlist control group. Subjects were re-evaluated at 4, 8, and 12 months of age. Subjects in waitlist group participated in intervention after the 4 month evaluation. Two-tailed paired t-test was used to compare pre-intervention and post-intervention scores.

Results: COPM, the primary outcome measure, exhibited clinical and statistically significant changes in goal performance and satisfaction following intervention in both groups. Persistent change was measured after discontinuation of formal intervention. No significant changes in visual function (CVI Range, Previas) were found.

Conclusion/Relevance: Therapy delivered through the use of telehealth is feasible, effective and accepted by the caregivers. Children with CVI who participate in occupational therapy intervention make improvements in functional tasks. Telemedicine increases access to meaningful intervention, producing significant improvements in functional skills in children with CVI.

References: Dedding, Christine, et al. 'Validity of the Canadian Occupational Performance Measure: a client-centred outcome measurement.' Clinical rehabilitation 18.6 (2004): 660-667.

García-Ormaechea I, González I, Duplá M, Andres E, Pueyo V. Validation of the Preverbal Visual Assessment (PreViAs) questionnaire. Early human development. 2014;90(10):635-8.

Roman-Lantzy C. Cortical visual impairment: An approach to assessment and intervention: American Foundation for the Blind; 2007.

Poster #B14
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Etiology and Outcomes of Pediatric Sixth Nerve Palsies With and Without Underlying Neurologic Disease

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Introduction: Pediatric sixth nerve (CN6) palsies may be benign or the initial sign of a serious neurologic disorder. Factors associated with an underlying neurologic diagnosis and outcomes are unclear.

Methods: We retrospectively reviewed charts of all children (</=18 years) diagnosed with CN6 palsy from 2010-2020 at our institution. Demographics, neuroimaging, and neurologic and ophthalmic history and exam findings were recorded. Patients were included in outcomes analysis if followed for = 6 months or until resolution. Multiple logistic regression assessed factors associated with spontaneous resolution and amblyopia.

Results: 172 children were diagnosed with CN6 palsy, and 96 met criteria for outcomes analysis. Benign diagnoses (idiopathic, post-vaccination, or post-viral) were identified in 17 (10%). Of 21 cases (12%) with isolated presentation, 16 (76%) were benign. The underlying neurologic diagnosis in the remaining 5 cases were trauma, vincristine toxicity, benign tumors, and presumed radiation-induced CN6 palsy in a patient with a history of a malignant brainstem tumor without evidence of recurrence. Spontaneous resolution occurred in 57 of 96 children (59%) and was significantly associated with older age (p=0.0081) and non-tumor etiology (p=0.0002). Amblyopia developed in eight children (8%) and was associated with younger age (p=0.04), occurring exclusively in infants and children with other amblyogenic risk factors.

Conclusion/Relevance: Overall, most pediatric CN6 palsies were secondary to an underlying neurologic condition, but most isolated cases were benign. None of the isolated cases was associated with a new or recurrent malignant tumor. Amblyopia was uncommon, but occurred in infants and children with secondary amblyogenic risk factors.

References: Lee MS, Galetta SL, Volpe NJ, Liu GT. Sixth nerve palsies in children. Pediatr Neurol. 1999;20(1):49-52.

Merino P, Gómez de Liaño P, Villalobo JM, Franco G, Gómez de Liaño R. Etiology and treatment of pediatric sixth nerve palsy. J AAPOS. 2010;14(6):502-505.

Poster #B15
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Idiopathic Intracranial Hypertension (IIH) in Children: Clinical Features and Long-Term Outcomes

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Introduction: To describe clinical features and outcomes in a cohort of children with idiopathic intracranial hypertension (IIH) and to delineate age-related differences.

Methods: Retrospective study of 96 children with a definite diagnosis of IIH at a single tertiary-care pediatric hospital.

Results: The median age was 12.5 years old and 2/3 were female. The most common presenting symptom was headache (81%), followed by nausea/vomiting (37%) and diplopia (28%). Median opening pressure was 40 cm H2O. At presentation, 6% had visual acuity loss (<20/40) and 28% had visual field loss. In comparison to pubertal children (=13 years old), pre-pubertal children had a lower mean body-mass index (22.9 vs 31.4, p<0.0001) and a greater proportion of males (54% vs 11%, p=0.0001). Treatment with acetazolamide was effective in the majority of patients with only 7% requiring secondary treatment due to ongoing symptoms or intolerable side effects. After a mean follow-up 25 months, 80% had resolution of papilledema and 10% were still active at last follow-up. The remaining 3% were transitioned to community care and 7% were lost to follow-up. Poor visual outcomes were uncommon: no patients had long-term visual acuity loss and 8% had mild visual field loss.

Conclusion/Relevance: The presentation of IIH in children differs based on age, with a preponderance of females and elevated BMI only after the onset of puberty. Most cases are fully treated with acetazolamide monotherapy and poor visual outcomes are uncommon.

References: 1. Friedman DI, Liu GT, Digre KB. Revised diagnostic criteria for the pseudotumor cerebri syndrome in adults and children. Neurology 2013;81(13):1159-1165.
2. Brix N, Ernst A, Lauridsen LLB, et al. Timing of puberty in boys and girls: A population-based study. Paediatr Perinat Epidemiol 2019;33(1):70-78.

Poster #B16
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Pseudotumor Cerebri Syndrome from Secondary Causes

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Introduction: Pediatric ophthalmologists are commonly consulted to "rule out papilledema." While some pediatric patients have idiopathic intracranial hypertension, others have intracranial hypertension (IH) related to secondary causes.[1,2] Patients with this condition are at risk for vision loss if not diagnosed and treated appropriately.[3] We sought to characterize the spectrum of etiologies of secondary pseudotumor cerebri syndrome (PTCS) at a tertiary children's hospital.

Methods: We conducted a retrospective review of pediatric patients diagnosed with secondary PTCS from January 2000 to September 2020. We collected information regarding patient demographics, presentation, etiologies, work-up, treatment course, and outcomes.

Results: 80 patients (59% female) were diagnosed with secondary PTCS. Average age at diagnosis was 11.5 +/- 4.1 years. The most common etiologies were infection (30 patients, 38%), medication-induced (25, 31%), and venous sinus thrombosis (13, 16%). 78 patients developed papilledema. Average opening pressure was 40 +/- 8.7 cm H2O (n= 67). 69 patients (86%) were treated with acetazolamide. Mean time to resolution of papilledema was 113 days (n= 64). Cranial nerve VI palsy was identified in 33 patients (41%) and of the 30 with follow-up, all had resolution with no residual strabismus except for 1 with pre-existing esotropia. 71 patients had follow-up, and all returned to visual acuity of 20/25 or better. 10 patients developed subsequent idiopathic IH.

Conclusion/Relevance: Identification of possible secondary causes of PTCS is crucial to the treatment of this condition. While the prognosis of secondary PTCS is generally favorable, these patients may be susceptible to developing idiopathic IH in the future.

References:

1. Friedman DI, Liu GT, Digre KB. Revised diagnostic criteria for the pseudotumor cerebri syndrome in adults and children. Neurology. 2013;81(13):1159-1165.
2. Hyde, RA, Mocan MC, Sheth U, Kaufman LM, Evaluation of the Underlying Causes of Papilledema in Children. Can J Ophthalmol 2019; 54(6):653-658.
3. 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 #B17
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Incidence and Prognostic Role of the Ocular Manifestations of Neuroblastoma in Children

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Introduction: The purpose of the study was to describe the ocular manifestations of neuroblastoma in a large cohort of pediatric patients.

Methods: The medical records of all patients with neuroblastoma seen between 1989 and 2017 at a tertiary-care pediatric hospital were analyzed. The main outcome measures were the incidence and prognostic role of ocular findings at presentation and during the disease course.

Results: There were 523 patients with neuroblastoma. Median age at diagnosis was 1.9 years and 57.2% were male. After a median follow-up of 4.0 years, there was disease remission in 55.3%, stable disease in 5.0%, active or palliative treatment in 11.7% and 28.1% were deceased. A total of 86 patients (16.4%) were found to have ocular manifestations of neuroblastoma, 58 patients at presentation and 29 during the disease course (1 had both). The most common findings were orbital involvement (43.0%), opsoclonus (23.3%) and Horner syndrome (27.9%). In 16 patients (3.1%), ocular findings were the initial presentation of the tumor. On survival analysis, a favorable prognosis was found with opsoclonus and diagnosis before the age of 12 months, while a worse prognosis was found with orbital involvement.

Conclusion/Relevance: Approximately 1 in 6 children with neuroblastoma have ocular manifestations, either at presentation or during the disease course. Orbital involvement is common and associated with a poor prognosis, while opsoclonus and younger age at diagnosis are associated with a favorable prognosis.

References: 1. Musarella MA, Chan HSL, DeBoer G, Gallie BL. Ocular Involvement in Neuroblastoma: Prognostic Implications. Ophthalmology. 1984;91(8):936-940.
2. Smith SJ, Diehl NN, Smith BD, Mohney BG. Incidence, Ocular Manifestations, and Survival in Children with Neuroblastoma: A Population-Based Study. Am J Ophthalmol. 2010;149(4):677-682.

Poster #B18
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Ophthalmic Complications of Spina Bifida: A 10-year Review of the Irish Experience

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Introduction: Spina bifida (SB), a neural tube defect (NTD), has been described as one of the most complex congenital conditions compatible with life. Ireland has one of the highest rates of SB in the world with a rate of 1.17 per 1000 live births. There is a high incidence of ophthalmic complications in children with SB(1-3).

Methods: This is a retrospective chart review undertaken in the national referral centre for neural tube defects in Ireland from 2009-2019. Patients with open SB defects and complicated closed defects were included. There were 241 patients eligible for inclusion.

Results: Patients ranged in age from 1 month to 16 years. Sixty-six percent of these patients had a VP shunt in situ. The average age of patients' first referral to ophthalmology was 10.65 (+/- 13.73) months. Thirty percent of children had subnormal visual acuity. Five percent of patients had papilloedema at referral. Thirteen percent of patients developed optic atrophy. Visual field defects were present in 4% of patients. Strabismus was present in 14% of patients, with esotropia accounting for over 80% of cases. Twenty-two percent of children in this cohort had a refractive error. Cerebral visual impairment was present in 2% of patients.

Conclusion/Relevance: This is the first contemporary study of its kind reviewing a large population-based SB cohort. It demonstrates the high incidence of ophthalmic complications in SB patients and highlights the importance of the ophthalmologist's role managing these patients.

References: 1. Gaston, H., 1991. Ophthalmic complications of spina bifida and hydrocephalus. Eye, 5(3), pp.279-290.
2. Nguyen, T.H., 2005. Visual findings in spina bifida patients. Invest. Ophthalmol. Vis. Sci. 2005;46(13):3598.
3. Caines E., 2008. Longterm oculomotor and visual function in spina bifida cystica: A population-based study. Acta Ophthalmol Scand. 2007; 85: 662-666

Poster #B19
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Three Cases of Ocular Neuromyotonia Associated with Proton Beam Therapy

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Introduction: We report three cases of pediatric ocular neuromyotonia (ONM) following proton beam therapy (PBT) for craniopharyngioma. This complication has not been reported following PBT.

Methods: Case series of three patients at St Jude Children's Research Hospital with ONM following PBT.

Results: Three cases of ONM were identified following PBT for craniopharyngioma. None were treated with other forms of radiation or chemotherapy. All had partial resection or cyst drainage prior to PBT. ONM onset ranged from 5 to 34 months after PBT. The abducens nerve/lateral rectus was affected in two cases, and the trochlear nerve/superior oblique was affected in one case. Ages at symptom presentation were 4 years (intermittent head tilt), 10 years (intermittent blurry vision progressing to intermittent diplopia), and 15 years (intermittent diplopia). One patient improved on Gabapentin. One patient experienced spontaneous resolution within one year, and one patient declined treatment.

Conclusion/Relevance: ONM occurs most commonly following radiation to the brain and skull base1,2, but has not previously been reported following PBT. PBT is commonly employed to treat pediatric brain tumors due to the favorable safety profile3, and these cases should not dissuade its use. Membrane stabilizers can be used effectively, but spontaneous resolution may also occur. One child never reported diplopia, only intermittent head tilt. Practitioners need to be aware of the possibility of ONM following PBT. Children may not report diplopia. ONM requires a high index of suspicion to diagnose, especially in children.

References: 1. Stockman AC, et al. Ocular neuromyotonia: case reports and literature review. Strabismus. 2018 Sep; 26(3):133-141.
2. Shults WT, et al. Ocular neuromyotonia. A clinical description of six patients. Arch Ophthalmol. 1986 Jul; 104(7):1028-34
3. Mizumoto M, et al. Proton beam therapy for pediatric brain tumor. Neurol Med Chir (Tokyo). 2017 Jul 15; 57(7):343-355.

Poster #B20
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Birth Parameters that Predict Retinal Nerve Fiber Layer Thickness at 36 Weeks Postmenstrual Age in Preterm Infants

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Introduction: Bedside optical coherence tomography (OCT) enables the measurement of retinal nerve fiber layer (RNFL) thickness in infants,[1,2] but the association between birth parameters and RNFL thickness in preterm infants is unclear.

Methods: In this prospective BabySTEPS study,[3] both eyes of 85 infants were imaged awake at 36±1 weeks postmenstrual age using handheld OCT at the bedside. We were able to capture and extract RNFL in the papillomacular bundle (-15 to +15 degrees relative to the fovea-optic nerve axis) in 159 eyes (94%). RNFL thickness was modeled via univariable and multivariable regressions with: sex, race, ethnicity, gestational age, birth weight, retinopathy of prematurity stage, and presence of pre-plus or plus disease.

Results: From the above characteristics, birth weight was the only independent predictor of RNFL thickness in the multivariable model ($p<0.001$). A 250 gm increase in birth weight was correlated with 5.2 µm (95%CI: 3.3-7.0) increase in RNFL thickness. RNFL was thinner in extremely preterm (<28 weeks gestational age) compared to very preterm (28-32 weeks gestational age) infants (58.0±10.7 µm vs. 63.4±10.7 µm, $p=0.03$), but the significance disappeared after adjustment for birth weight ($p=0.25$). RNFL was 11.2 µm thinner in extremely low (<1000 gm) than in very low (1000-1500 gm) birth weight infants (55.5±8.3 µm vs. 66.7±10.2 µm, $p<0.001$), and this remained significant after adjustment for gestational age.

Conclusion/Relevance: RNFL thickness near birth is strongly associated with birth weight, suggesting intrauterine events may be risk factors for suboptimal optic nerve development.

References: 1. Patel A, Purohit R, Lee H, et al. Optic nerve head development in healthy infants and children using handheld spectral-domain optical coherence tomography. Ophthalmology. 2016;123(10):2147-2157.
2. Rothman AL, Sevilla MB, Freedman SF, et al. Assessment of retinal nerve fiber layer thickness in healthy, full-term neonates. Am J Ophthalmol. 2015;159(4):803-811.
3. Mangalesh S, McGeehan B, Tai V, et al. Macular Optical Coherence Tomography Characteristics at 36 weeks Postmenstrual Age in Infants Examined for Retinopathy of Prematurity. Ophthalmology Retina. 2020.

Poster #B21
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Pediatric Optic Disc Drusen: A Retrospective Study of 63 Children

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Introduction: To analyze clinical characteristics of children with optic disc drusen (ODD).

Methods: After IRB approval, children were identified by searching electronic medical records (EMR) at our institution for ODD and pseudopapilledema billing codes. Exclusion criteria included: presentation predating EMR or after 2019, unconfirmed ODD diagnosis, and age =18 years at presentation. Sixty-three children met criteria.

Results: Of 63 children (57% female, 81% Caucasian, 109 eyes, 73% bilateral ODD) ages 4-17 years (mean 11.35 ± 3.35), 49 (84%) were referred by a medical professional for suspected papilledema; five presented for unrelated diagnoses. At presentation: 18 children (29%) were asymptomatic; 34 (54%) reported headache and 10 (16%) reported blurred vision; 64 eyes (59%) had optic disc elevation and 35 (32%) had blurred disc margins. Three children had comorbid idiopathic intracranial hypertension. Thirty children had magnetic resonance imaging (MRI) performed; 15 were reported as normal. Abnormalities included abnormal optic nerve (five), arachnoid cyst (two), sinusitis (two), pineal cyst (two). Thirty-three eyes (21 children) had at least one reliable Humphrey visual field; 14 (42%) were full. The most common defects were generalized/nonspecific (nine) and paracentral defects (three). B-scan was performed at least once on 80 eyes (48 children, mean age 11.2 ± 3.08 years); all B-scanned eyes were positive for ODD. Fundus autofluorescence (FAF), performed on 41 eyes with positive B-scan, was positive in 15 (37%). Nine of 11 eyes (82%) with enhanced depth imaging optical coherence tomography (EDI-OCT) performed were positive.

Conclusion/Relevance: This is the largest pediatric ODD cohort whose findings have been reported. B-scan was the most sensitive modality and may be preferable in children who cannot cooperate with EDI-OCT or comparable testing.

References: 1. Rotruck J. A Review of Optic Disc Drusen in Children. Int Ophthalmol Clin. 2018 Fall;58(4):67-82. doi: 10.1097/IIO.0000000000000236. PMID: 30239364
2. Chang MY, Pineles SL. Optic disc drusen in children. Surv Ophthalmol. 2016;61(6):745-758. doi:10.1016/j.survophthal.2016.03.007

Poster #B22
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Utility of a Virtual Clinic for Suspected Papilledema

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Introduction: From 2016, hospitals in the UK have seen a sharp rise in suspected papilloedema referrals, following the Honey Rose legal case (1). We have audited the first cohort of paediatric patients coming through a novel virtual clinic, targeted at assessing suspected papilledema and designed to accommodate increased referrals. We report on the patient outcomes and utility of this clinic.

Methods: This is a retrospective analysis of the pediatric papilleedema virtual clinic at University Hospital Wales, between 2016 and 2019. Data collected by orthoptists, included the referral source, age, gender, symptoms, optic nerve function and ocular motility. Imaging of the optic nerve was with colour photography and optical coherence tomography.

Results: Over the 27-month period 65 patients attended. The average age was 10.26 years (SD=3.53, range=4-16) with 36 females. Patients were predominantly referred by community optometrists (84.62%), asymptomatic (70.77%) and because of concerning optic disc appearance (92.31%). On assessment 56.92% had abnormal disc features, but only 12.31% were referred for neuro-imaging. The clinic permitted discharge of 61.54% without follow-up and 13.85% with follow-up. None of the patients had papilledema on final follow up.

Conclusion/Relevance: In our virtual clinic, patients being referred for suspected papilledema are more likely to have pseudopapilledema. This novel clinic has permitted the timely and safe assessment of patients with suspected papilloedema who would have otherwise displaced other urgent referrals to our pediatric eye clinics.

References: 1) Poostchi A, Awad M, Wilde C, Dineen RA, Gruener AM. Spike in neuroimaging requests following the conviction of the optometrist Honey Rose. Eye (Lond). 2018;32(3):489-90.

Poster #B23
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Toxic Epidermal Necrolysis Triggered by COVID-19

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Introduction: Even though the recent outbreak of a novel coronavirus does not severely affect the pediatric population, a previously healthy 15-year-old female, who had started with bilateral conjunctivitis, progressed to toxic epidermal necrolysis (TEN) and multisystem inflammatory syndrome (MIS) in 12 hours. The RT-PCR for SARS-CoV-2 infection was positive with an epidemiologic link 72 hours before onset of symptoms.

Methods: The patient was referred to Gutierrez Children's Hospital intensive care unit (ICU), where she was diagnosed with TEN, bibasal pneumonia and MIS; gammaglobulin and corticosteroids therapy was indicated. She had severe ocular compromise, with bilateral bullous lesions on eyelids and extensive corneal ulcer. We performed amniotic membrane transplantation and placed a symblepharon ring in order to minimize the destructive inflammation and damage of the ocular surface during acute phase.

Results: Patient evolution was favorable. She was transferred to the COVID-19 unit after 10 days. Complete reabsorption of amniotic membrane was confirmed in 15 days, symblepharon ring was removed and continued with preservative-free lubricant, cyclosporine 0.05% and serum tears drops. After 35 days of hospitalization, she was discharged with regulated multidisciplinary controls. The patient achieved best-corrected visual acuity 20/20 in both eyes, with moderate dry eye symptoms and localized trichiasis.

Conclusion/Relevance: In this case, a strong correlation of COVID-19 with TEN was suspected. TEN is a potentially devastating disease that involves permanent painful visual problems. We emphasize early and intensive treatment because the management of the sequelae is extremely challenging, many of the chronic problems are impossible to repair completely.

References: 1. Gregory DG. Treatment of Acute Stevens-Johson Syndrome and Toxic Epidermal Necrolysis Using Amniotic Membrane: A Review of 10 Consecutive Cases. Ophtalmology. 2011; 118:908-914.
2. Feldstein LR, Rose EB, Horwitz SM et al. Multisystem Inflammatory Syndrome in U.S. Children and Adolescents. N Engl J Med. 2020; NEJM.org DOI: 10.1056/NEJMoa2021680
3. O´Brien KF, Maiman RE, Marathe K. Idiopatic toxic epidermal necrolysis in an adolescent. Pediatric Dermatol. 2019;36:550-551.

Poster #B24
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Optimal Dosing of Trimethoprim Sulfamethoxazole in Outpatient Treatment of Pre-Septal Orbital Cellulitis

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Introduction: Many standard references suggest trimethoprim sulfamethoxazole in the dose of 5 mg/kg per day for pre-septal cellulitis. However, authoritative references such as the Johns Hopkins Antibiotic Guide suggest the dosage of 5 mg/kg/dose used every six hours, or a total dose of 20 mg/kg/day for severe cellulitis.

Methods: Twelve patients with significant pre-septal orbital cellulitis were treated as an outpatient with trimethoprim sulfa in the dosage of 20/mg/kg/ day, combined with a beta -lactam antibiotic to ensure coverage of streptococcus (often resistant to trimethoprim sulfa).

Results: Twelve patients were successfully treated with high dose trimethoprim sulfa at a dosage of 20 mg/kg/day combined with a beta lactam antibiotic. One patient required hospitalization with IV antibiotics and had resolution of the cellulitis. Two patients developed transient diarrhea which resolved with a reduction of the dosage of trimethoprim sulfa and/or cessation of the beta- lactam antibiotic. Without proper treatment, orbital cellulitis can lead to visual loss, significant morbidity and death. Both MRSA and streptococcus often have devastating consequences. Inadequate dosage of trimethoprim sulfa (5 mg/kg/day) during outpatient treatment of cellulitis with oral antibiotics often leads to poor results. Optimal selection of proper antibiotics and proper dosage is critical to avoiding ocular and systemic morbidity.

Conclusion/Relevance: The use of high dose trimethoprim sulfa (20 mg/kg/day) combined with a beta -lactam antibiotic is successful in many cases of significant pre-septal orbital cellulitis.

References: 1. American Academy of Ophthalmology. Pediatric Ophthalmology and Strabismus. Basic and Clinical Science Course. 2017; 216-220.
2. Rita Gonçalves, Carlos Menezes, Rute Machado, Isabel Ribeiro & José A. Lemos (2016) Periorbital cellulitis in children: Analysis of outcome of intravenous antibiotic therapy, Orbit. 2016; 35:4, 175-180.
3. FDA.gov. Access Data: Trimethoprim-Sulfamethoxazole. Updated March 2017. Accessed May 2018.

Poster #B25
Saturday, April 10, 2021
11:30 AM – 12:30 PM

The Baltimore Pediatric Ocular Trauma Study: Sensorimotor Outcomes Following Pediatric Open Globe Injuries

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Introduction: Ocular trauma is among the most common causes of visual morbidity in children, with potential for severe visual impairment and blindness. There is a paucity in the medical literature assessing sensory visual function, including the prevalence of strabismus and reduced stereopsis following ocular trauma. This study aims to evaluate sensorimotor outcomes following traumatic open globe injury in the pediatric population of Baltimore, Maryland.

Methods: A retrospective chart review of 80 pediatric patients presenting with a traumatic open globe injury to the Johns Hopkins and University of Maryland Medical Centers was performed. We evaluated the mechanism of injury, length of time of visual deprivation, initial and final visual acuity, associated ocular pathologies, as well as demographic factors such as age and gender.

Results: 50% of children who underwent surgery for traumatic open globe injuries and had follow-up data longer than 6 months developed strabismus. 77.4% of children developed poor stereopsis. Children who developed strabismus had a lower pediatric ocular trauma score (POTS score), indicating greater severity of injury than children who did not develop strabismus ($p=0.006$). A higher POTS score, indicating less severe ocular injury, significantly correlated to a better stereoacuity ($p=0.001$).

Conclusion/Relevance: Our findings indicate that strabismus and poor stereopsis are common outcomes in pediatric open globe injuries, occurring in more than half of children with pediatric open globe trauma. These outcomes are associated with poor presenting visual acuity and more severe ocular trauma.

References: 1. Awidi A, Kraus CL. A comparison of ocular trauma scores in a pediatric population. BMC Res Notes. Published online 2019. doi:10.1186/s13104-019-4602-8
2. Zhu L, Wu Z, Dong F, et al. Two kinds of ocular trauma score for paediatric traumatic cataract in penetrating eye injuries. Injury. 2015;46(9):1828-1833. doi:10.1016/j.injury.2015.04.024
3. Shah MA, Shah SM, Applewar A, Patel C, Patel K. Ocular Trauma Score as a predictor of final visual outcomes in traumatic cataract cases in pediatric patients. J Cataract Refract Surg. Published online 2012. doi:10.1016/j.jcrs.2011.12.032

Poster #B26
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Visual Acuity and Stereoacuity Improvement in Children With and Without Fusion Maldevelopment Nystagmus Syndrome

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Introduction: To evaluate visual acuity and stereoacuity improvement in children with and without associated Fusion Maldevelopment Nystagmus Syndrome (FMNS) treated with part-time patching.

Methods: Forty amblyopic children who had eye movement recordings and at least 12 months of follow-up after initiating part-time patching were included. Patching was continued until amblyopia was resolved or no visual acuity improvement was noted at 2 consecutive visits. FMNS was diagnosed by evaluating Fixation Eye Movement (FEM) recordings. The primary outcomes were the visual acuity and stereoacuity change with patching and secondary outcome was the risk of regression after stopping patching.

Results: Patients were divided per the FEM characteristics (no nystagmus=18, nystagmus without the classic reversal in quick phase per the viewing eye seen in FMNS=14, FMNS=8) and per the amblyopia type (anisometropia=15, strabismic/mixed=25). The visual acuity improvement rate was greater in no nystagmus group (slope=-0.025±0.01 vs. -0.018±0.02 vs -0.01±0.01 LogMAR, p=0.04), while FMNS group had no stereoacuity improvement. Improvement was faster in anisometropic compared to strabismic/mixed amblyopia group, both for visual acuity (slope=-0.025±0.01 vs. -0.012±0.02 LogMAR, p=0.016) and stereoacuity (slope=-0.05±0.08 vs. 0.003±0.04 logarcsec,p=0.005). Regression was seen in 17% of patients. All of them had strabismic/mixed amblyopia. 4/8 of FMNS patients and 3/32 patients without FMNS experienced regression.

Conclusion/Relevance: Children with anisometropic amblyopia and without FMNS have a faster improvement and plateaued sooner. Regression risk is higher in patients with strabismic/mixed amblyopia and those with FMNS. Patients with FMNS required a longer duration of treatment with poor recovery of stereoacuity.

References: Shaikh AG, Otero-Millan J, Kumar P, Ghasia FF. Abnormal Fixational Eye Movements in Amblyopia. PLoS One. 2016;11(3).
Kang SL, Beylergil SB, Otero-Millan J, Shaikh AG, Ghasia F. Fixational eye movement waveforms in amblyopia: Characteristics of fast and slow eye movements. J Eye Mov Res. 2019;in press.
Chen D, Otero-Millan J, Kumar P, Shaikh AG, Ghasia FF. Visual Search in Amblyopia: Abnormal Fixational Eye Movements and Suboptimal Sampling Strategies. Invest Ophthalmol Vis Sci. 2018;59(11):4506-4517. doi:10.1167/iovs.18-24794

Poster #B27
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Telemedicine in the Diagnosis and Management of Pediatric Blepharoptosis

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Introduction: To evaluate the validity of stored video from high-definition, wireless Pivothead® glasses for evaluating blepharoptosis.

Methods: Patients were referred to an oculoplastic surgeon for blepharoptosis. Wearing Pivothead® glasses, a physician assistant obtained video of each patient's face in primary, down, and upgaze with a ruler next to the eyes. The surgeon viewed the stored videos and recorded MRD1, levator function, need for surgery, and choice of surgical procedure. Later the same day, he examined each patient in-person and recorded the same data. Eight months afterward, the surgeon reviewed the stored videos and recorded the same data. We compared results of telemedicine encounters to gold standard in-person exams.

Results: 29 patients were included. MRD1 measurements were within 1.0mm of in-person-exams (IPE) in 94.8% (55/58) eyes for same-day video review (SDVR) and 93.1% (56/58) eyes for the 8 month later video review (LVR). Levator function measurements were within 2.0 mm of IPE in 98.3% (57/58) eyes for SDVR and in 94.8% (55/58) eyes for LVR. The decision to operate was the same as IPE in 96.5% (28/29) patients on SDVR and 86% (25/29) patients on LVR. The remaining patients were deemed non-surgical on IPE. SDVR had a sensitivity of 100% and specificity of 94% in identifying surgical patients. LVR had a sensitivity of 100% and specificity of 76%.

Conclusion/Relevance: Store-and-forward Pivothead® videos of pediatric blepharoptosis patients provide high sensitivity in detecting those requiring surgical intervention. Telemedicine encounters using Pivothead® glasses is a useful screening modality to identify pediatric blepharoptosis patients needing surgical intervention.

References: 1. Rayner S, Beaconsfield M, Kennedy C, et al. Subspecialty adnexal ophthalmological examination using telemedicine. J Telemed Telecare. 2001;7 Suppl 1:29-31.
2. Sreelatha OK, Ramesh SV. Teleophthalmology: improving patient outcomes? Clin Ophthalmol. 2016;10:285-295

Poster #B28
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Efficacy and Cost Comparison of Congenital Dacryocystocele Treatment Options

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Introduction: Treatment options for uninfected dacryocystocele include simple observation, probing/irrigation, silicone intubation and/or marsupialization of associated nasal mucocele. Management of dacryocystocele is debated among pediatric ophthalmologists, oculoplastics surgeons and otolaryngologists and the current literature has not evaluated the costs of various treatment options. We report our dacryocystocele treatment outcomes and a financial analysis.

Methods: A retrospective analysis of the clinical outcomes and the associated charges for all dacryocystocele patients presenting to our institution from 2006 to 2018 was completed. Statistical comparisons were performed using Fisher's exact test for categorical variables and Wilcoxon rank sum test for continuous variables.

Results: In-office probing/irrigation (6 successes of 8 cases) and silicone intubation/marsupialization under general anesthesia (7 successes of 8 cases) yielded similar clinical success rates (p=1). The mean charges for patients undergoing the in-office probing/irrigation procedure were $891 versus $17,482 for those undergoing silicone intubation/marsupialization under general anesthesia (p=0.004).

Conclusion/Relevance: Two treatment options for dacryocystocele management 1) In-office probing/irrigation and 2) silicone intubation/marsupialization under general anesthesia appear to have similar success rates despite a large difference in cost. In addition to a high rate of clinical success and lower cost, the in-office probing and irrigation option avoids medical risks of general anesthesia, potential issues with OR/surgeon availability and inconvenience of pre-anesthesia NPO requirements. Probing/irrigation can be performed at the initial consultation in the office or newborn nursery and provides immediate correction of the newborn facial appearance. In-office probing and irrigation may be the optimal first-line intervention for dacryocystocele correction.

References:

1. Singh S, Ali MJ. Congenital dacryocystocele: a major review. Ophthalmic Plast Reconstr Surg. 2019;35(4):309-17.
2. Becker BB. The treatment of congenital dacryocystocele. Am J Ophthalmol. 2006;142(5):835-8.
3. Lee MJ, Park J, Kim N, Choung HK, Khwarg SI. Conservative management of congenital dacryocystocele: resolution and complications. Can J Ophthalmol. 2019;54(4):421-5.

Poster #B29
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Primary Monocanalicular Stent Intubation for the Treatment of Congenital Nasolacrimal Duct Obstruction in Children with Down Syndrome

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Introduction: Patients with Down syndrome are reported to have a higher incidence of congenital nasolacrimal duct obstruction (CNLDO) with a worse treatment outcomes in surgical procedures when compared to children without Down syndrome. We report the surgical success in a consecutive series of patients treated with monocular stents as a primary procedure by a single surgeon.

Methods: This is a retrospective consecutive case series of children with Down syndrome treated with monocanalicular stent placement as a primary procedure for CNLDO. Patient age, gender, surgical findings including the severity of nasolacrimal duct stenosis, duration of stent intubation and post operative symptoms were recorded and analyzed as risk factors for surgical success.

Results: 19 subjects were included in this study with an average age of 2.47 years (range 0.7-6.23). A total of 35 monocanalicular stents were placed (3 unilateral and 16 bilateral). The average time to follow up was 34.79 months (range: 9.77-66.23). Average time to stent removal was 3.76 months (range: 3.10-3.87). Early stent loss occurred in 6 placed stents (17.1%). The overall surgical success in our series was 57.1% with 15 failures. Age was the only significant risk factor for surgical failure other than Down syndrome itself with a 0% success rate in patients over the age of 4 (0 successes out 5 cases) compared to 66.6% success (20 out of 30 cases) in subjects under the age of 4.

Conclusion/Relevance: Primary monocanicular stenting for the treatment of CNLDO in pediatric Down syndrome is successful but caries a much lower success rate when compared to the surgical outcomes in published series of children without Down syndrome. The causality of surgical failure remains poorly understood and warrants further study.

References: 1. Khatib L, Nazemzadeh M, Revere K, Katowitz WR, Katowitz JA. Use of the Masterka for complex nasolacrimal duct obstruction in children. J AAPOS. 2017;21(5):380-383. doi:10.1016/j.jaapos.2017.05.033
2. Baran F, Kelly JP, Finn LS, Manning S, Herlihy E, Weiss AH. Evaluation and treatment of failed nasolacrimal duct probing in Down syndrome. J AAPOS. 2014;18(3):226-231. doi:10.1016/j.jaapos.2013.12.018
3. Coats DK, McCreery KMB, Plager DA, Bohra L, Kim DS, Paysse EA. Nasolacrimal outflow drainage anomalies in Down's syndrome. Ophthalmology. 2003;110(7):1437-1441. doi:10.1016/S0161-6420(03)00410-X

Poster #B30
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Association between Mitochondrial Myopathy and Isolated Congenital Ptosis

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Introduction: To report the new association of mitochondrial myopathy and isolated congenital ptosis.

Methods: This is a retrospective, single-surgeon observational case series of patients with isolated congenital ptosis who underwent autologous fascia lata frontalis suspension between January 1, 2010 and March 30, 2019. Thirty patients, ranging between 8-22 years old (mean=12.5 years), were included. Eight (26.6%) underwent concurrent vastus lateralis muscle biopsy at the time of fascia lata harvest. One specimen was rejected for analysis due to insufficient myofibers.

Results: Seven patients with anatomic pathology results were included. The average age of presentation was 4.4 years. Follow-up time ranged from 7 to 183 months (mean = 49.7 months). The time between the initial visit and surgery ranged from 3.6 to 49 months (mean = 19 months). Four children (57%) had bilateral ptosis while 3 (43%) had unilateral involvement. All seven (100%) biopsy specimens were positive histopathologically for mitochondrial myopathy. Three patients underwent genetic testing and were found to have gain Xp22.2, 18p11.2 deletion, and COXPD7 respectively.

Conclusion/Relevance: All seven patients with isolated congenital ptosis who underwent concurrent vastus lateralis biopsy were positive for mitochondrial myopathy. New genetic mutations were found in 3 (43%) patients; one patient was found to have a mitochondrial association (COXPD7). This study demonstrates that presumed isolated congenital ptosis may not actually be isolated and may instead be due to mild mitochondrial myopathy. Though no curative medical treatments are available at present for mitochondrial myopathy, recognizing this association is important as therapies may be developed in the future.

References: Furey, C. G., Timberlake, A. T., Nelson-Williams, C., Duran, D., Li, P., Jackson, E. M., & Kahle, K. T. (2017). Xp22.2 Chromosomal Duplication in Familial Intracranial Arachnoid Cyst. JAMA neurology, 74(12), 1503–1504. doi:10.1001/jamaneurol.2017.3399

Maranda, B., Lemieux, N., & Lemyre, E. (2006). Familial deletion 18p syndrome: case report. BMC medical genetics, 7, 60. doi:10.1186/1471-2350-7-60

O'Ferrall, Erin. (2019). Mitochondrial myopathies: Clinical features and diagnosis. In J.F. Dashe (Ed.), UpToDate.

Poster #B31
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Strabismus Associated with Craniosynostosis and Related Craniofacial Surgery

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Introduction: We sought to determine prevalence and types of strabismus in children with craniosynostosis, as well as effects of major and minor cranial suture involvement and craniofacial surgery. Limited published data describe these prevalences.

Methods: Retrospective cohort study of children with craniosynostosis over an 11-year period. Primary outcomes were prevalence and types of strabismus overall, among subtypes of craniosynostosis determined by imaging and intraoperative findings, and pre/post craniofacial surgery.

Results: 726 children with craniosynostosis were studied; mean age 2.9 years (SD 3.7), mean follow-up 3 years (SD 3), 37% syndromic/genetic association. 44% had sagittal fusion, 41% coronal, 31% metopic , 11% lambdoid , 9% minor suture(s). 82% had one major suture fused, 17% had 2-4 sutures. 56% underwent craniofacial surgery. Overall, 261 (36%) children had strabismus, of whom 18% had exotropia, 12% esotropia, 11% vertical, 20% inferior oblique overaction. Considering pre-craniofacial-surgery exams, if one major suture was fused, strabismus risk was 15-18%, except for coronal, which was 47%. Strabismus prevalence increased with number of fused major sutures (30% for 1, to 70% for all 4). Craniofacial surgery increased strabismus (26% versus 33%, p=0.03), but some pre-op strabismus resolved postoperatively. Vertical strabismus was associated with unilateral (36%) versus bilateral coronal synostosis (9%, P<0.001). Exotropia was associated with minor suture fusion (32% vs. 16%, p=0.01).

Conclusion/Relevance: Craniosynostosis carries a 36% risk of strabismus, a 15-fold increase versus the general population, and this risk varies with number and type of sutures involved.

References: 1. Repka MX, Lum F, Burugapalli B. Strabismus, Strabismus Surgery, and Reoperation Rate in the United States: Analysis from the IRIS Registry. Ophthalmology. 2018 Oct;125(10):1646-1653. doi: 10.1016/j.ophtha.2018.04.024. Epub 2018 May 18. PMID: 29779683.
2. Runyan CM, Xu W, Alperovich M, Massie JP, Paek G, Cohen BA, Staffenberg DA, Flores RL, Taylor JA. Minor Suture Fusion in Syndromic Craniosynostosis. Plast Reconstr Surg. 2017 Sep;140(3):434e-445e. doi: 10.1097/PRS.0000000000003586. PMID: 28574949.

Poster #B32
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Predictors of Surgical Necessity in Pediatric Idiopathic Intracranial Hypertension

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Introduction: Pediatric idiopathic intracranial hypertension (IIH) may require invasive decompression procedures to avoid vision loss. Prompt prediction of surgical necessity may help modify initial conservative management to avoid surgery

Methods: Optic nerve sheath fenestration (ONSF) for IIH-related papilledema cases from January 2008, through September 2019, were retrospectively reviewed and compared with 40 eyes from 20 controls with IIH that did not require surgery. Unpaired t-test, Mann-Whitney-U test and Fisher's exact test were used for statistical analysis

Results: A total of 15 eyes from 10 patients underwent optic nerve sheath fenestration (ONSF) for IIH. Mean age for surgery was 14.4 ± 2.6 years. This subset of patients showed higher incidence of visual acuity loss (80% vs. 20%, P <.001), color vision loss (28.5% vs. 3.5%, P<.001) and grade 3-4 papilledema at initial exam (53% vs. 10%, P=0.01), as well as diagnostic imaging findings suggestive of IIH (90% vs. 40%, P=.017), when compared with controls

Conclusion/Relevance: Early visual changes, significant papilledema at initial exam, and initial assessment imaging with findings suggestive of IIH may constitute important early predictors of ONSF necessity in pediatric patients with IIH

References: 1. Bersani TA, Meeker AR, Sismanis DN, Carruth BP. Pediatric and adult vision restoration after optic nerve sheath decompression for idiopathic intracranial hypertension. Orbit. 2016 Jun;35(3):132-9.

2. Lim M, Kurian M, Penn A, Calver D, Lin JP. Visual failure without headache in idiopathic intracranial hypertension. Arch Dis Child. 2005 Feb;90(2):206-10.

Poster #B33
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Optic Nerve Aplasia

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Introduction: Optic nerve aplasia (ONA) is a rare disorder. We report the second largest series including ophthalmologic, systemic, and genetic findings.

Methods: Patients were identified via an International Pediatric Ophthalmology Listserve and from the practice of the senior author (AVL). Participating listserve physicians completed a data collection sheet. Children of all ages were included. Neuroimaging findings were also recorded.

Results: Nine cases of ONA aged 10 days to 2 years old (median 9 months) are reported. Seven cases were bilateral. All patients had absence of the optic nerve and retinal vessels in the affected eye or eyes. Ophthalmologic findings included glaucoma, microcornea, persistent pupillary membrane, iris coloboma, absent iris, retinal dysplasia, retinal atrophy, chorioretinal coloboma, and persistent fetal vasculature. Systemic findings included facial dysmorphism, cardiac, genitourinary, skeletal, and developmental defects. A *BCOR* mutation was found in one patient. One patient had rudimentary optic nerves and chiasm on imaging.

Conclusion/Relevance: ONA is most often bilateral. It may be associated with anomalies of the anterior or posterior segment with or without systemic findings. Rudimentary optic nerve on neuroimaging in one case suggests that ONA is on the continuum of optic nerve hypoplasia.

References: N/A

Poster #B34
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Optic Nerve Size Assessed by Magnetic Resonance Imaging and Visual Acuity in Optic Nerve Hypoplasia

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Introduction: The purpose of this study was to correlate optic nerve (ON) size by magnetic resonance imaging (MRI) and visual acuity (VA) in children with optic nerve hypoplasia (ONH).

Methods: The medical records of all patients < 19 years diagnosed with ONH who underwent high resolution MRI of the brain and VA assessment at > 4 years of age were retrospectively reviewed. ON diameters measured by high resolution MRI at both the cistern and 3mm posterior to the globe (assessed independently by two neuroradiologists, R1 and R2) were correlated to VA via Spearman correlations.

Results: Fourteen (21 eyes) of 431 children reviewed met inclusion criteria, diagnosed at a mean age of 2.2 years. There was close agreement between the measurements of the two neuroradiologists ($p>0.05$ in all cases). Larger mean ON diameter was significantly correlated with better VA in the 12 right eyes (R1 $p=0.002$ orbital, $p=0.013$ cisternal; R2 $p=0.13$ orbital, $p=0.02$ cisternal), and with better VA in the 9 left eyes, but without statistical significance (R1 $p=0.13$ orbital, $p=0.09$ cisternal; R2 $p=0.31$ orbital, $p=0.73$ cisternal). ON diameter (mean of cisternal and orbital) of < 1.9 mm, assessed at a mean age of 64.5 months, was associated with VA of 20/200 or worse ($p=0.004$) while a diameter of $\geq$ 2.0 mm was associated with VA of 20/40 or better ($p=0.06$).

Conclusion/Relevance: Optic nerve size by MRI correlated with VA in this small cohort of children with ONH, suggesting an additional justification for obtaining brain MRI in young patients with ONH.

References: Pilat A, Sibley D, Mclean RJ, Proudlock FA, Gottlob I. High-Resolution Imaging of the Optic Nerve and Retina in Optic Nerve Hypoplasia. Ophthalmology. 2015;122(7):1330-1339.

Kruglyakova J, Garcia-Filion P, Nelson M, Borchert M. Orbital MRI versus fundus photography in the diagnosis of optic nerve hypoplasia and prediction of vision. British Journal of Ophthalmology. 2020:bjophthalmol-2019-315524.

Janthanimi p, Dumrongpisutikul n. Pediatric optic nerve and optic nerve sheath diameter on magnetic resonance imaging. Pediatric radiology. 2019;49(8):1071-1077.

Poster #B35
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Uveitis and Optic Nerve Edema: When is Neuroimaging Necessary?

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Introduction: We sought to determine the frequency and clinical characteristics of optic nerve head edema (ONHE) and uveitis in children, in order to better understand when an urgent neurological workup is needed.

Methods: Retrospective study of children with both uveitis and ONHE over an 11-year period. Primary outcome was presumed cause of ONHE (uveitic papillitis or raised intracranial pressure (ICP)-associated papilledema) based upon neuroimaging, lumbar puncture, and/or response to uveitis treatment seen on clinical examination and optical coherence tomography.

Results: Thirty-five children were studied (mean age 10.7 years, range 2-17). All uveitis types were represented, including 58% anterior uveitis alone. 34/35 children received systemic therapy. 16 had neuroimaging, 8 lumbar puncture (4 elevated opening pressure). In 33 (94%) cases, ONHE improved with uveitis treatment alone. In 31(89%) ONHE improvement was visible within 8 weeks. Overall, 31 had papillitis and 4 papilledema, of which 1 had viral meningitis with neck stiffness, and 3 had elevated ICP secondary to the uveitis-related systemic inflammatory process with 2 requiring acetazolamide. No child had papilledema from an unrelated intracranial process.

Conclusion/Relevance: In children with uveitis and ONHE, neuroimaging can be delayed to see if ONHE improves with systemic uveitis treatment, unless suspicious neurological symptoms are present. Furthermore, we hypothesize the existence of a previously undescribed entity, uveitis-associated papilledema, in which there is both uveitis and raised intracranial pressure due to the same inflammatory process. In this condition, systemic uveitis treatment alone may improve ONHE, but ICP-lowering treatment may be required.

References: Holland GN, Denove CS, Yu F. Chronic anterior uveitis in children: clinical characteristics and complications. Am J Ophthalmol. 2009 Apr;147(4):667-678.e5. doi: 10.1016/j.ajo.2008.11.009. Epub 2009 Feb 4. PMID: 19195641.

Poster #B36
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Rates of Endocrine Disease in Patients with Unilateral versus Bilateral Optic Nerve Hypoplasia

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Introduction: Optic nerve hypoplasia (ONH), a leading causes of childhood blindness, is a congenital abnormality characterized by underdevelopment of one or both optic nerves. While it is often associated with hypothalamic-pituitary axis defects, the exact relationship between these abnormalities and the degree of ONH is not well established. For example, there is no clear consensus regarding further workup with brain imaging or endocrinology evaluation in the setting of unilateral ONH. The goal of this study is to understand the correlation of unilateral ONH with systemic findings.

Methods: The charts of 151 patients diagnosed with optic nerve hypoplasia in 2016-2019 were reviewed retrospectively. Age, ONH laterality, visual acuity, endocrine diagnoses, endocrine workup, and neuroimaging results were collected. The prevalence of endocrine dysfunction in bilateral and unilateral ONH were compared using a chi-squared test. Associations with neuroimaging findings were also evaluated.

Results: Twenty-six out of 92 (28%) patients diagnosed with bilateral ONH and 3 out of 59 (5%) with unilateral ONH were also diagnosed with endocrine disease ($P < 0.001$). The most common endocrine abnormality was hypopituitarism. Analysis of neuroimaging results revealed that although there is some correlation, a negative result does not exclude endocrine abnormalities.

Conclusion/Relevance: Patients with unilateral optic nerve hypoplasia were significantly less likely to have comorbid endocrine abnormalities compared to patients with bilateral optic nerve hypoplasia. This finding suggests that unilateral optic nerve hypoplasia may require a less extensive workup such as brain imaging and endocrinology evaluation when evaluating for comorbid conditions.

References: Ahmad T, Garcia-Filion P, Borchert M, Kaufman F, Burkett L, Geffner M. Endocrinological and auxological abnormalities in young children with optic nerve hypoplasia: A prospective study. J Pediatr. 2006 Jan 1;148(1):78-84. Garcia-Filion P, Epport K, Nelson M, Azen C, Geffner ME, Fink C, et al. Neuroradiographic, endoerinologie, and ophthalmic correlates of adverse developmental outcomes in children with optic nerve hypoplasia: A prospective study. Pediatrics [Internet]. 2008 Mar 1 [cited 2020 Sep 23];121(3):e653-9. Available from: www.pediatrics.org/cgi/doi/10.1542/ Qian X, Fouzdar Jain S, Morgan LA, Kruse T, Cabrera M, Suh DW. Neuroimaging and endocrine disorders in paediatric optic nerve hypoplasia. Br J Ophthalmol [Internet]. 2018 Jul 1 [cited 2020 Sep 23];102(7):906-10. Available from: http://bjo.bmj.com/

Poster #B37
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Scheduling Lag Time for Leukocoria, Cataracts, and Abnormal Red Reflex Referrals

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Introduction: The American Academy of Pediatrics recommends red reflex testing during well-child visits.[1] An abnormal red reflex (ARR) requires an urgent pediatric ophthalmology referral. Scheduling lag time is the time between when an appointment is requested and the appointment date. No research has evaluated scheduling lag time for urgent referrals in pediatric ophthalmology.

Methods: A retrospective chart review was conducted to determine the scheduling lag time for new patients, less than 8 years old, referred by a primary care physician for leukocoria, cataracts, retinoblastoma, or an ARR between January 2016 and March 2020. Patients were excluded if referred for a second opinion, by an optometrist or ophthalmologist, for medication side-effects, or for a genetic evaluation. Lag times were compared using the nonparametric Mann-Whitney U-Test.

Results: There were 108 referrals with 69 (64%) referred for an ARR and 39 (36%) referred for cataracts, leukocoria, or retinoblastoma. 90 (83%) children had a scheduling lag time of less than 7 days. 91 (84%) appointments were completed as initially scheduled, 12 (11%) initial appointments were cancelled, and 5 (5%) were a 'no-show.' 12 (11%) children were never seen. The scheduling lag time was less for the appointments completed as scheduled than for the cancelled appointments (median 1 day (interquartile range 0-4 days) vs median 30 days (interquartile range 3-60 days), $P < 0.001$).

Conclusion/Relevance: Timely scheduling of urgent referrals promotes quality care. Tracking scheduling lag time and cancellations may represent metrics for quality improvement in pediatric ophthalmology.

References: Donahue, S.P., et al., Visual System Assessment in Infants, Children, and Young Adults by Pediatricians. Pediatrics, 2016. 137(1): p. 28-30.

Poster #B38
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Gender Diversity of First Author Posters and Presenters at AAPOS Annual Conferences: 2010-2018

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Introduction: Gender imbalance in academic medicine has been a recent topic of discussion (1). In this study we assess the representation of female physicians presenting research at AAPOS Spring Symposiums from 2010-2018.

Methods: To learn the participation rates of women in AAPOS and other ophthalmic subspecialty meetings, an observational, retrospective, cohort of AAPOS conference presenters from 2010-2018 was reviewed and compared to presenters at AGS, ASRS, ASOPRS and NANOS meetings.

Results: 54% of the 321 podium presentations at AAPOS were delivered by females. 1163 poster presentations were identified with 640 (40.5%) first-authored by women. 1298 workshops were offered with 41.6% led by females. The proportion of female presenters at AAPOS symposia was found to rise from 51.3 to 60.0% from 2010-2018. Currently AAPOS membership includes 975 males and 946 females.
Discussion: With gender disparities prevalent in many facets of medicine, it is encouraging to see female representation at AAPOS is similar to their male counterparts over the past 10 years. Also, the proportion of female presenters at the AAPOS annual conference is higher compared to all other ophthalmology subspecialty conferences reviewed

Conclusion/Relevance: Further research into what has maintained gender equality at AAPOS conferences has the potential to significantly address inequality at other surgical subspecialty conferences. It has been shown that speaking out about gender imbalance in invited speakers can improve diversity (1).

References: Klein, Robyn S, et al. 'Speaking out about Gender Imbalance in Invited Speakers Improves Diversity.' Nature Immunology, vol. 18, no. 5, 2017, pp. 475-478., doi:10.1038/ni.3707.

Poster #B39
Saturday, April 10, 2021
11:30 AM – 12:30 PM

The Strength of Rebound: Patient Care and Financial Consequences of COVID-19 in U.S. Pediatric Ophthalmology

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Introduction: This study evaluates the extent of patient care and revenue losses within Pediatric Ophthalmology (PO) practices as they rebound from the COVID-19 pandemic shutdown.

Methods: Two surveys of active AAPOS members were performed in 2020 at the pandemic peak 'lockdown' phase1 and again in the early recovery phase comparing practice data to the prior year. The authors extrapolated from AAO/ AAPOS 2018 Academetrics to identify specific clinical and financial outcomes.

Results: Median surgical volume in April was 26% of normal, improving to 66% by mid-July; consequently, 76,892 surgeries were not performed. As of July, clinic exams decreased by 27%; accounting for 461 lost exams perprovider or 484,065 exams not performed. Medicaid patients were disproportionately affected with 242,033 clinic exams not performed. Clinical revenue decreased 77% in April and 55% in July. University/hospital and private practice/employed POs whose salary was consistent with the prior year were 69% and 9% respectively in July. As of July, the average doctor lost $85,358 in salary revenue translating into cumulative loss of $233,606,100 for PO physicians. Assuming PO practices continue functioning at current levels, 73% of capacity, through next April, over 1,480,670 exams and 113,360 surgeries will not have occurred over a 1-year period since the initial survey.

Conclusion/Relevance: While there has been healthy economic rebound for many, this historic event continues to jeopardize access to care for patients and threaten the economic viability of many PO practices. Societal and financial costs of morbidity due to past and future missed/delayed exams cannot be measured at this time.

References: Robbins SL, Packwood EA, Siegel LM; AAPOS Socioeconomic Committee. The impact of the COVID-19 shutdown on US pediatric ophthalmologists. J AAPOS. 2020 Jul 27:S1091-8531(20)30151-8. doi: 10.1016/j.jaapos.2020.06.002. Online ahead of print.

Poster #B40
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Publication Rates of Abstracts Submitted to the American Association of Pediatric Ophthalmology and Strabismus Annual Meeting

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Introduction: To determine the publication rate of abstracts presented at the American Association for Pediatric Ophthalmology and Strabismus (AAPOS) annual meetings and to identify factors associated with a higher publication rate, publication in higher impact factor (IF) journals, and a shorter time to publication.

Methods: Abstracts presented at the AAPOS meeting between 2001 and 2014 were identified and categorized by presentation format, affiliation, funding, research scope, methodology, ophthalmic subspecialty, study type, and disease prevalence. We first determined whether the abstract was published as a full-text-manuscript and then categorized the publication.

Results: A total of 1770 AAPOS abstracts were reviewed: 27.7% were oral presentations and 72.3% were poster presentations. The overall publication rate was 52.5%. There was a steady increase in the publication rate from 2001 to 2014. Strabismus and nystagmus studies had the highest publication rates. European affiliated, poster presentation and studies in genetics were published in journals with a significantly higher IF. Oral presentations had a significantly higher publication rate than poster presentations (69.5% vs. 46.1%, respectively) and a significantly shorter publication time. Poster presentation publications had a higher IF. Funded, prospective, and multicenter studies had a significantly higher publication rate and were accepted to publication with a significantly higher IF. Oral presentations and funded studies had a significantly shorter publication time.

Conclusion/Relevance: Various factors of abstracts submitted to the AAPOS meetings bare a significant but different impact on the rate of publication, the chance of being published in a higher impact journal and a shorter time to publication.

References:

Mimouni M, Krauthammer M, Abualhasan H, Badarni H, Imtanis K, Allon G, et al. Publication outcome of abstracts submitted to the American Academy of Ophthalmology meeting. J Med Libr Assoc 2018;106:57.

Carroll AE, Sox CM, Tarini BA, Ringold S, Christakis DA. Does Presentation Format at the Pediatric Academic Societies' Annual Meeting Predict Subsequent Publication? Pediatrics 2003;112:1238-1241.

Udovicich C, Soh B, Law S, Hoe V, Lanfranco D, Perera K, et al. Predictive factors for publication of abstracts at the Royal Australasian College of Surgeons Annual Scientific Congress. ANZ J Surg 2018;88:39-44.

Poster #B41
Saturday, April 10, 2021
11:30 AM – 12:30 PM

The Socioeconomic Burden of Imaging in Pediatric Ophthalmology Private Practices

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Introduction: Imaging tests have become standard of care in pediatric ophthalmology conditions. In academic and multispecialty adult practices, their costs is shared. We performed a cost analysis of utilization to assess cost in a single FTE practice.

Methods: 3-year usage, averaged for ocular coherence tomography (OCT), pachymetry, A-Scan, B-scan, and visual field (VF) in a pediatric ophthalmology office, was adjusted to 4321 exams/practice/year (2017 AAO benchmark for single pediatric ophthalmologist). For reimbursement, we used published Medicare and California Medicaid rates, assuming the practice is 50% Medicaid. Cost/machine was based on sales quotes.

Results:

Modality	Cost	Exams/Year	Revenue/Year	Time to Pay-off (Years)
OCT	$80,000	165	$6,103	13.1
VF	$20,000	62	$3,082	6.5
Pachymetry	$2,500	11	$130	19.2
A-scan	$5,000	2	$126	39.6
B-scan	$5,000	8	$528	9.5

Conclusion/Relevance: Practice utilization patterns can vary widely. Implementing patient diagnoses and novel techniques (e.g. measuring axial length for myopic progression) may be helpful but reimbursement can differ. Machine purchase costs and expenses are substantial. For a single FTE pediatric ophthalmology practice, the cost of imaging is high and possibly prohibitive. The medical necessity of such tests, weighed against the economic costs can be problematic in high Medicaid/low reimbursement populations.

References: References: 2017 AAO benchmark for single pediatric ophthalmologist|Medicare Rates|Medicaid Rates

Poster #B42
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Economic Evaluations in Pediatric Ophthalmology and Strabismus

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Introduction: Economic evaluations in health care quantitatively compare alternative interventions using cost data and expected outcomes. Cost-utility evaluations, typically quantified as cost ($) per quality-adjusted-life-year (QALY) permit comparison of value across the diverse domains of medicine. Economic evaluations inform resource allocation and the adoption of new medical and surgical interventions. This review describes the published English language economic evaluations related to pediatric ophthalmology and strabismus.

Methods: We conducted a literature review of the MEDLINE and Health Economic Evaluations Database without date restriction. Articles were included and evaluated by two independent reviewers if they contained a pediatric ophthalmology or strabismus intervention and an economic evaluation. Extracted information included the domain of pediatric ophthalmology, type of economic analysis, journal of publication, and date of publication.

Results: We identified forty-six articles. Cost-utility studies comprised 37% of evaluations. The most studied domain was amblyopia & vision screening (29%) followed by retinopathy of prematurity (22%) and perioperative & anesthesia care (18%). The Journal of the American Academy of Pediatric Ophthalmology and Strabismus (JAAPOS) published the most economic evaluations (14%) followed by Ophthalmology and Pediatrics. The number of published economic evaluations did not increase over the time.

Conclusion/Relevance: Unlike several other surgical specialties (1,2), economic evaluations in pediatric ophthalmology and strabismus have not increased over time. There are few economic evaluations of strabismus surgery and none regarding pediatric strabismus surgery. Most evaluations (63%) did not include cost-utility data limiting comparability with other domains of medicine.

References: (1) Ziolkowski N, Voineskos S, Ignacy T, Thoma A. Systematic Review of Economic Evaluations in Plastic Surgery. Plastic and Reconstructive Surgery. 2013;132(1):191-203.
(2) Javidan AP, Naji F, Li A, Wu A, Srivatsav V, Rapanos T, Harlock J. A Systematic Review of Economic Evaluations in Vascular Surgery. Ann Vasc Surg. 2020 Aug;67:511-520

Poster #B43
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Evaluation of Pediatric Ophthalmologists' Perspectives of Artificial Intelligence in Ophthalmology: A Pilot Study

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Introduction: The purpose is to survey pediatric ophthalmologists on their perspectives of artificial intelligence (AI) in ophthalmology.

Methods: This study was approved by the Institutional Review Board. This is a subgroup analysis of a study previously reported. In March 2019, members of the American Association for Pediatric Ophthalmology and Strabismus (AAPOS) were recruited via the online AAPOS discussion board to voluntarily complete a web-based survey consisting of 15 items. Survey items assessed the extent participants 'agreed' or 'disagreed' with statements on the perceived benefits and concerns of AI in ophthalmology. Responses were analyzed using descriptive statistics. A total of 80 pediatric ophthalmologists who are AAAPOS members completed the survey.

Results: The mean number of years since graduating residency among participants was 21 years (range was 0-46). Overall, 91% (73/80) reported understanding the concept of AI, 70% (56/80) believed AI will improve the practice of ophthalmology, 68% (54/80) reported willingness to incorporate AI into their clinical practice, 65% (52/80) did not believe AI will replace physicians, and 71% (57/80) believed AI should be incorporated into medical school and residency curricula. However, 15% (12/80) were concerned that AI will replace physicians, 26% (21/80) believed AI will harm the patient-physician relationship, and 46% (37/80) reported concern over the diagnostic accuracy of AI.

Conclusion/Relevance: Most pediatric ophthalmologists in this survey viewed the role of AI in ophthalmology positively. Future work should be aimed at assessing ophthalmologists' understanding of AI and incorporating AI into clinical workflow to improve visual outcomes in pediatric populations.

References: None.

Poster #B44
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Gender Authorship of Articles in Pediatric Ophthalmology and Strabismus between 2002 and 2018

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Introduction: As women have become more involved in scientific publications in medicine and in ophthalmology [1-3], we sought to evaluate the prevalence of gender authorship in pediatric ophthalmology and strabismus (POS) publications.

Methods: A google based program was used to assign the authors' gender. Journals' rankings were assessed according to their quartile ranking. Study Population: Authors listed in 10 leading ophthalmology journals publishing articles on of POS between 2002 and 2018.Main Outcome Measures: The percentage of women in all authorship positions was evaluated.

Results: We analyzed 30,724 authors from 6,617 publications. There was a significant rise in the percentage of women authors in each authorship position over time. The ratio of women to men in 2002, compared to 2018, increased in the first author position by 69.2% and by 79.6% in the last position. Percentage of female authors as well as the increase over time was higher than in general ophthalmology. Percentage of female authors in the first (45.7%) and middle (45.4%) positions was higher than percentage of women authors in the senior position (35.2%). This increase was higher in all the American journals (44.5%) compared to most leading European journals (41.9%). Lower women authorship was significantly correlated to higher journal quartile ranking (Q1-Q2, 42.2%; Q3-Q4, 45.2%; and unrated, 44.7%).

Conclusion/Relevance: Female authorship in POS publications has increased in the past 2 centuries. However, women are still underrepresented, especially as senior authors, in higher ranking journals and in most European journals.

References: 1. Franco-Cardenas V, Rosenberg J, Ramirez A, Lin J, Tsui I. Decade long profile of women in ophthalmic publications. *JAMA Ophthalmol*. 2015;133(3):255-259. doi:10.1001/jamaophthalmol.2014.4447.
2. Mimouni M, Zayit-Soudry S, Segal O, et al. Trends in Authorship of Articles in Major Ophthalmology Journals by Gender, 2002-2014. *Ophthalmology*. 2016;123(8):1824-1828. doi:10.1016/j.ophtha.2016.04.034.
3. Kramer PW, Kohnen T, Groneberg DA, Bendels MHK. Sex disparities in ophthalmic research: a descriptive bibliometric study on scientific authorships. *JAMA Ophthalmol*. 2019;137(11):1223-1231. doi:10.1001/jamaophthalmol.2019.3095.

Poster #B45
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Ocular Findings and Visual Function in Children Examined during the Zika Health Brigade in the US Virgin Islands, March 2018

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Introduction: Among children born with laboratory-confirmed Zika virus (ZIKV) infection, severe visual impairment can occur despite normal ocular structure. The objective of this report is to describe the ocular findings and visual function among children examined during the Department of Health Zika Health Brigade (ZHB) in the United States Virgin Islands (USVI) in March 2018.

Methods: Children in USVI who were part of the United States Zika Pregnancy and Infant Registry (USZPIR), a surveillance system collecting information about pregnancy and infant/child outcomes among pregnancies with laboratory evidence of confirmed or possible ZIKV infection, were eligible to participate in the ZHB. This analysis is based on a retrospective chart review of children examined during the ZHB by ophthalmologists to assess ocular structure and visual function.

Results: Of 242 completed pregnancies from USVI in the USZPIR, 88 children attended the ZHB. This report includes 81 (33.5%) children [48 (59.3%) males] whose charts were located [average gestational age=37.6 weeks (range: 27.6-41.3) and average adjusted age at examination=9.1 months (range: 0.9-21.9)]. Of those examined, 5/81 (6.2%) had microcephaly at birth, 2/81 (2.5%) had a structural eye abnormality, and 19/72 (26.4%) had visual impairment. Among children with normal ocular structure and neurologic examination, 13/51 (25.5%) had visual impairment.

Conclusion/Relevance: Despite a low incidence of abnormal ocular structure and microcephaly, about a quarter of children examined had visual impairment. Our findings emphasize that ophthalmological examinations should be performed in all children with suspicion for antenatal ZIKV infection, even children with normal ocular structure and neurologic examination.

References: 1. Shapiro-Mendoza CK, Rice ME, Galang RR, et al. Pregnancy outcomes after maternal Zika virus infection during pregnancy - U.S. Territories, January 1, 2016-April 25, 2017. MMWR Morb Mortal Wkly Rep. 2017;66(23):615-621.
2. Rice ME, Galang RR, Roth NM, et al. Vital signs: Zika-associated birth defects and neurodevelopmental abnormalities possibly associated with congenital Zika virus infection - U.S. Territories and Freely Associated States, 2018. MMWR Morb Mortal Wkly Rep. 2018;67(31):858-867.
3.Hillman B, Petersen DN, Galang RR, et al. 2018 U.S. Virgin Islands Zika health brigade: Providing recommended pediatric health screenings for infants born to mothers with laboratory evidence of Zika virus exposure during pregnancy. Birth Defects Res. 2019;111(7):360-362.

Poster #B46
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Impact of Socioeconomic Factors in Access to Care in Pediatric Ophthalmology during the COVID-19 Pandemic

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Introduction: Since the COVID-19 pandemic necessitated the widespread implementation of virtual visits, early evidence has suggested that vulnerable populations may be disadvantaged by these healthcare disruptions.[1] We hypothesize that vulnerable populations have disproportionately lost access to care in pediatric ophthalmology during the pandemic.

Methods: We examined patient demographics for visits in the pediatric ophthalmology department from 3/18/19 - 5/31/19 (pre-COVID period) and from 3/16/20 - 5/31/20 (COVID period). We used Pearson's chi-squared tests to compare proportions of overall and telehealth visits by our demographics of interest, with statistical significance set at P<.05.

Results: During the pre-COVID period, 9793 visits occurred with 0.3% (27/9793) of visits conducted virtually. In the COVID period, 4240 visits occurred with 69.3% (2939/4240) of visits conducted virtually. Interpreters were listed as needed at 9.6% (945/9793) of pre-COVID period visits, compared to 7.1% (299/4240) of COVID period visits (P<.001). Patient language was reported as non-English at 11.6% (1132/9793) of pre-COVID period visits, compared to 8.2% (346/4240) of COVID period visits (P<.001). Patients who self-identified as non-White made up 25.2% (2464/9793) of pre-COVID period visits and 19.4% (824/4240) of COVID period visits (P<.001). Among virtual visits, utilization was lower than expected only among non-English speakers (P<.001).

Conclusion/Relevance: Non-White patients, non-English speakers, and those requiring interpreters made up fewer overall visits during the COVID-19 pandemic, but virtual visit utilization was lower only among non-English speakers.

References: 1. Nouri S., Khoong E., Lyles C., & Karliner L. (2020). Addressing Equity in Telemedicine for Chronic Disease Management During the Covid-19 Pandemic. NEJM Catalyst. https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0123

Poster #B47
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Trends in Pediatric Ocular Trauma Presenting to an Ophthalmology-Specific Emergency Department During the COVID-19 Pandemic

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Introduction: The home environment is the most common setting for eye injuries in children.[1,2] As children remained at home throughout the COVID-19 pandemic due to 'Stay at Home' orders and mandated school closures, the potential for ocular injury was increased. We describe the trends in ocular trauma in children presenting to an ophthalmology emergency department (ED) during the COVID-19 pandemic.

Methods: Retrospective review of children (≤18 years old) presenting to an ophthalmology ED from March 1-August 31, 2020.

Results: Children represented 6% (643) of 10,738 ED patients. Of these, 156 (24%) sustained ocular trauma. Although the overall number of visits decreased by 44% compared to the same 6-month period in 2019, trauma-related visits were only 34% lower. Most visits occurred in March (32%) and August (17%). Over half (57%) were male with a mean age of 8.9±1.4 years. Most patients ranged between 1-6 (39%) and 13-18 (32%) years old. There was no difference in average age by month (p=0.71). The majority of visits were due to closed globe trauma (94%), which occurred due to blunt (49%) or sharp (14%) objects, foreign bodies (23%), or chemical injuries (14%). Ten (6%) patients presented with an open globe. There were no other significant differences among average ages by diagnosis, however chemical injuries tended to occur in younger patients (4.7±4.6 years) compared to all other diagnosis groups (9.7±5.4years), (p=0.0002).

Conclusion/Relevance: Although COVID-19 restrictions limited school, recreational activities and team sports, ocular injuries remained prevalent in children during the pandemic. Blunt trauma was most common regardless of age, however chemical injuries occurred predominantly in children <6 years old.

References: 1. Brophy M, Sinclair SA, Hostetler SG, Xiang H. Pediatric eye injury-related hospitalizations in the United States. Pediatrics. 2006;117(6):e1263-1271.
2. Weiss R, He C, Gise R, Parsikia A, Mbekeani JN. Patterns of Pediatric Firearm-Related Ocular Trauma in the United States. JAMA Ophthalmol. 2019;137(12):1363-1370.

Poster #B48
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Strabismus Surgery Decreases the Risk of Injuries among Pediatric Patients in the OptumLabs Data Warehouse

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Introduction: Previous studies have shown an association between injury risk and strabismus in Medicare-beneficiaries1 and children in the OptumLabs Data Warehouse (OLDW, a de-identified, longitudinal health database).2 The injury prevalence in strabismic children was 30% in a study of >10 million patients in the OLDW.2 The purpose of this study was to determine whether strabismus surgery decreases the risk of injury.

Methods: The OLDW was queried for strabismic patients aged<19 years. The patients who underwent strabismus surgery were compared to those strabismic patients who did not. Injury risk (fractures, musculoskeletal injuries, head injuries) was calculated in the non-surgical patients after their first strabismus claim, and compared to the risk in surgical patients post-operatively for the duration of their enrollment in the OLDW.

Results: There were 344,794 patients with strabismus; surgery was performed in 26,459 (7.7%). Injuries were diagnosed after the first strabismus claim in 94,960 (29.8%) non-surgical patients vs 5790 (21.9%) post-surgical patients ($p<0.001$) with a mean follow-up of 4.3±3.1 vs 3.8±3.1 years, respectively. The adjusted hazard ratio for injuries was 0.85 (95%CI:0.83-0.87) for the risk of any injury after surgery. Similarly, the HR was significantly decreased following surgery for esotropia (0.91,95%CI:0.88-0.94), exotropia (0.82,95% CI:0.80-0.85) and hypertropia (0.89,95%CI:0.85-0.93).

Conclusion/Relevance: Strabismus surgery was associated with a 15% decrease in the risk of physical injury. Surgery may be a factor in decreasing injury risk in strabismic patients, particularly in exotropia.
Given the large number of children with strabismus in United States, further assessment of strategies to reduce injuries in children with strabismus are needed.

References: 1. Pineles SL, Repka MX, Yu F, Lum F, Coleman AL. Risk of musculoskeletal injuries, fractures and falls in medicare beneficiaries with disorders of binocular vision. JAMA Ophthalmol 2015;133(1):60-5
2. Pineles SL, Repka MX, Doppee D, Yu F, Velez FG, Perez C, Coleman AL. 'Risk of Physical Injuries in Children with Eye Diseases in the OptumLabs Data Warehouse' AAPOS Abstract, 2020.

Poster #B49
Saturday, April 10, 2021
11:30 AM – 12:30 PM

A Randomized Clinical Trial Evaluating Learning Impacts of Provision of Eyeglasses through a School-Based Vision Program

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Introduction: We assess the impact of eyeglasses provided through a school-based vision program (SBVP) on achievement in English language arts (ELA) and mathematics.

Methods: In this cluster randomized analysis, 119 schools serving 3rd through 8th grade students were randomized into 3 cohorts (C) to sequentially receive vision screening, eye exams, and glasses, when clinically indicated, over 3 years. Treatment effects were assessed by comparing C1 versus C2/3 at the end of Year 1 and by comparing C1/2 versus C3 at the end of Year 2.

Results: Forty-one, 41, and 37 schools were randomized to SBVP services during year 1, 2, and 3, respectively. Students were included if they consented and received eyeglasses (929 students (C1), 724 (C2), and 434 (C3) respectively, 79% Black and 17% Hispanic overall). Eyeglasses had significant positive impact (effect size (ES) = +0.09, $p < .05$) on i-Ready ELA after Year 1. There was a positive, but not significant, impact on i-Ready ELA (ES = +0.09, $p = .09$), and i-Ready Mathematics after year 2 (ES = +0.07, $p = .15$). i-Ready ELA effects were large for special education students (Year 1: ES = +0.25, $p < .01$; Year 2: ES = +0.23, $p < .05$). Students in the lowest achievement quartile at baseline improved on i-Ready ELA (Year 1: ES = +0.25, $p < .01$)

Conclusion/Relevance: Students receiving eyeglasses in a SBVP achieved higher scores on i-Ready standardized reading assessment when compared to control students. There was a noteworthy benefit for students in special education and low baseline achievement.

References: Not applicable

Poster #B50
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Opioid Prescribing Patterns of Pediatric Ophthalmologists and Strabismologists in the Medicare Part D Database

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Introduction: To assess opioid prescribing patterns of AAPOS members.

Methods: AAPOS members that prescribed opioids in the 2013-2017 Medicare Part D Prescriber database were identified. The numbers of opioid prescribers, claims and prescription rate were analyzed using linear regression, ANOVA and t-test. Results <0.05 were significant.

Results: 644 members prescribed opioids from 2013-2017, 58% male and 42% female. Prescribing members decreased from 385 in 2013 to 303 in 2017 (r2=0.93, p=.008). The number of opioids prescribed by members decreased from 3169 to 2867 (r2=0.85, p=.03). The mean opioid prescriptions per member increased from 8.2 to 9.5 (r2=0.93, p=.009) while the mean opioid prescribing rate remained constant (r2=0.02, p=.8). Male members were responsible for more mean beneficiary claims (411.2 to 190.4, p<.001) and mean opioid claims (8.6 to 6.1, p=.01). Older members (>30 years' experience) were responsible for the highest number of opioid claims per year (1749.6, p<.001). Younger members (<20 years' experience) were responsible for the highest opioid prescribing rate (17.9, p<.001).

Conclusion/Relevance: AAPOS members prescribe opioids at a rate (15%) higher than general ophthalmologists (3.5%) which is reasonable given post-operative pain related to strabismus surgery.[1,2] Of AAPOS members, 80.4% write <10 opioid prescriptions per year while 0.7% (5) account for 13.6% of opioids prescribed from 2013-2017. The United States is facing an opioid epidemic. Pediatric ophthalmology is but one of many subspecialties and practice review can lead the way for others to step forward and contribute to the growing body of evidence concerning the inherent risks associated with prescribing opioid analgesics.

References: 1. Patel S, Sternberg P, Jr. Association Between Opioid Prescribing Patterns and Abuse in Ophthalmology. JAMA Ophthalmol. 2017;135(11):1216-1220.
2. Kolomeyer AM, Yu Y, VanderBeek BL. Association of Opioids With Incisional Ocular Surgery. JAMA Ophthalmol. 2019.
3. American Board of Medical Specialties. Specialty and Subspecialty Certificates. https://www.abms.org/member-boards/specialty-subspecialty-certificates. Published 2020. Accessed October 1st, 2020.

Poster #B51
Saturday, April 10, 2021
11:30 AM – 12:30 PM

The Development of an Institutional Protocol Based on National Guidelines Can Help Effectively Utilize Ophthalmic Consults in Suspected Child Abuse

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Introduction: Referral guidelines for an ophthalmic evaluation in suspected child abuse were established in a joint effort by the AAP, AAO and AAPOS and include those cases suspicious for abusive head trauma (AHT) with either increased intracranial pressure, intracranial hemorrhage, unexplained coma, and/or neurologic abnormalities. Detecting intraocular hemorrhages without meeting one (or more) of these criterion is highly unlikely.

Methods: This study retrospectively reviewed all cases of suspected child abuse or neglect cared for at Madigan Army Medical Center from Sep 2017 - Mar 2020 (n = 156), 23 of which were those with injuries (regardless of location) felt to be severe enough to warrant referral to ophthalmology.

Results: The results showed all suspected child abuse patients with posterior segment hemorrhages (2) would have been diagnosed using the recommended national guidelines. Of the remaining 21 who did not show intraretinal hemorrhages, only 7 met those criteria for ophthalmologic consultation.

Conclusion/Relevance: Adhering to the national guidelines for ophthalmic consultation would have captured all of our patients with ophthalmic manifestations of child abuse. Institutional protocols based on national guidelines can and should be developed to ensure the appropriate use of ophthalmic consultation in suspected cases of AHT. Moreover, primary care providers can be reassured that eye findings of abuse will not be missed. The use of institutional protocols following national guidelines has the potential to save time, and money while potentially sparing victims of abuse from suffering the additional trauma of unnecessary ophthalmic exams.

References:

1. Christian C, Levin A. The Eye Examination in the Evaluation of Child Abuse. Pediatrics. 2018;142(2):e20181411.
2. Bhardwaj G, Chowdhury V, Jacobs M, Moran K, Martin F, Coroneo M. A Systematic Review of the Diagnostic Accuracy of Ocular Signs in Pediatric Abusive Head Trauma. Ophthalmology. 2010;117(5):983-992.e17.
3. Binenbaum G, Mirza-George N, Christian C, Forbes B. Odds of abuse associated with retinal hemorrhages in children suspected of child abuse. Journal of American Association for Pediatric Ophthalmology and Strabismus. 2009;13(3):268-272.

Poster #B52
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Impact of COVID-19 on Mental Health in Eye Care Professionals, Staff and Students

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Introduction: The aim of this study was to evaluate the impact of COVID-19 pandemic on mental health in eye care professionals, staff, and optometry students.

Methods: A 23-question survey was sent through social media and email to ophthalmologists, optometrists, staff, and optometry students. Demographics, stress level before and during COVID-19, positive and negative factors which impact mental health and screening questions for depression and anxiety were collected.

Results: A total of 2,134 individuals from 50 USA states and Canada responded to the survey, including 887 optometrists, 252 ophthalmologists, 794 optometry students, and 185 eye care staff (16 had missing job information). There were 1319 participants (61.8%) stated that COVID 19 had a negative impact on their mental health, versus 25.4% stating no impact and 12.6% stating a positive impact. Participants reported significantly higher stress during COVID-19 compared to before, 3.49 (±1.12) vs. 2.86 (±1.02) on a scale of 1-5, $p < 0.0001$. The top 3 self-reported factors that have negatively impacted mental health were: worries about family /friends being infected with COVID-19, worry about being infected with COVID-19 myself, and social isolation. The top 3 activities that helped maintain mental health were: outdoor activities, family time, and exercise.

Conclusion/Relevance: Overall, 38.4% of the respondent reported symptoms of depression, anxiety, or both and 61.8% reported worsening mental health during COVID-19. Female, young people, and minority (Asians) were the risk factors for depression, anxiety, and psychological stress. This study warrants further monitoring and specific interventions for eye care practitioners during the COVID-19 pandemic to prevent mental health disorders.

References: 1.Torjesen I. Covid-19: Mental health services must be boosted to deal with ""tsunami"" of cases after lockdown. BMJ. 2020;369:m1994.
2.Lai J, Ma S, Wang Y, et al. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. JAMA Netw Open. 2020;3(3):e203976.
3.2. Li W, Frank E, Zhao Z, et al. Mental Health of Young Physicians in China During the Novel Coronavirus Disease 2019 Outbreak. JAMA Netw Open. 2020;3(6):e2010705.

Poster #B53
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Visual Acuity and Refractive Findings in Children Prescribed Glasses from a School-Based Vision Program

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Introduction: School-based vision programs (SBVPs) serve disadvantaged communities with higher prevalence of uncorrected visual impairment. We report the vision improvement and refractive profiles in children prescribed glasses from a SBVP in Baltimore, Maryland.

Methods: In this cross-sectional analysis, students from pre-kindergarten through 8th grade who failed vision screening underwent a SBVP eye exam. Students prescribed glasses were included. Lines of visual acuity (VA) improvement was the difference between presenting and best-corrected VA based on non-cycloplegic manifest refraction. Clinically significant refractive error (CSRE) was defined as >/=0.75 diopters (D) myopia, >/=2.00D hyperopia without strabismus, >/=1.00D hyperopia with esodeviation, or >/=1.50D astigmatism AND presenting VA<20/40 or ≥2-line difference with better eye ≤20/30. Characteristics associated with greater VA improvement were explored.

Results: Mean age was 9.4±2.7 years for the 4972 students; 77% were black and 18% were Hispanic. There were 65% students with myopia, 24% with hyperopia, 60% with astigmatism, and 46% with CSRE. In the better and worse eye respectively, median VA improved by 2 and 3 lines, with 70% and 89% had 2 lines or greater improvement, and 94% and 92% improved to >20/40. Students with CSRE had higher rates of gaining >/=2-line improvement in the worse-eye, as were those of older age, black race, or Hispanic ethnicity.

Conclusion/Relevance: SBVPs are effective in correcting visual impairment due to refractive error in school-age children. The majority of students that obtained glasses prescription from our SBVP had at least 2 lines of VA improvement, with most achieving >20/40 vision.

References: N/A

Poster #B54
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Impact of Socioeconomic Inequities and Adverse Childhood Experiences on Visual Function in Pediatric Ophthalmology Patients

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Introduction: Children who experience socioeconomic poverty and/or significant adverse childhood experiences (ACEs) are more likely to develop poorer health outcomes in adulthood. Little is known however on the relationship between the level of visual function and social determinants of health (SDOH) in pediatric ophthalmology patients.

Methods: An institution approved survey on SDOH risk factors and ACEs was completed by 145 patients from 5 different pediatric ophthalmology outpatient clinics in British Columbia. Medical charts of survey participants were reviewed to determine the patients' diagnoses and level of visual function. Descriptive statistics, univariate, and multivariate analysis were performed to analyze the results.

Results: Socioeconomic risk factors were present in all pediatric ophthalmology settings. Characteristics of poverty, including size of support network, level of parental education, annual household income and the number of ACEs a patient experienced, were not associated with level of visual function. 56% (n=81) reported having at least one SDOH risk factor. Food insecurity, housing instability, low income, and lack of social support were all associated with a higher ACEs score ($p<0.05$), and patients who experienced food insecurity were more likely (OR 7.14, 95% CI 1.47-38.44) to have an ACEs score of four or more compared to patients who did not have any SDOH risk factors.

Conclusion/Relevance: Our study found no relationship between the level of visual function and the risk of experiencing negative social determinants of health. Given that all pediatric ophthalmology populations experience socioeconomic poverty, the need to establish social screening and social work support is pertinent for all pediatric ophthalmology clinics.

References: 1. Cumberland PM, Rahi JS, for the UK Biobank Eye and Vision Consortium. Visual Function, Social Position, and Health and Life Chances: The UK Biobank Study. JAMA Ophthalmol 2016; 134:959-66.
2. Williams S, Wajda BN, Alvi R, McCauley C, Martinez-Helfman S, Levin AV. The challenges to ophthalmologic follow-up care in at-risk pediatric populations. Journal of American Association for Pediatric Ophthalmology and Strabismus 2013; 17:140-3.
3. Friedman DS, Repka MX, Katz J, et al. Prevalence of Decreased Visual Acuity among Preschool-Aged Children in an American Urban Population: The Baltimore Pediatric Eye Disease Study, Methods, and Results. Ophthalmology 2008; 115:1786,1795.e4.

Poster #B55
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Photopsias in the Pediatric Population

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Introduction: Photopsias are a common complaint amongst the pediatric population. This study aims to characterize photopsias in children and investigate their natural course and any pathologic associations.

Methods: A retrospective review of patients <18-years-old presenting from 2015-2020 with a chief complaint of photopsias. Patients with a diagnosis of ocular migraine or history of head trauma were excluded. Each patient had a complete dilated ophthalmologic examination with refraction. Data collection included age of onset, laterality, morphology, stimulus, associated symptoms and natural course. Patients still symptomatic at the last visit were contacted by phone to determine if/when symptoms resolved. Furthermore, results of any neurologic consultations were noted.

Results: A total of 124 patients (68 males, 56 females) ages 2-17 years (median 7 years) met inclusion criteria. More than 50% of patients (63) described photopsias as colored or non-colored spots/shapes. Most were unable to specify laterality, but those who did reported bilateral symptoms (51 patients, 41%). The most common stimulus and associated symptom were staring at lights (11 patients, 9%) and headache (16 patients, 13%), respectively. Of the 124 patients, 51 (41%) had successful clinic or telephonic follow-up with 42/51 (82%) reporting symptom resolution within one month of the last visit. The remaining 9 patients (18%) reported improved symptom frequency.

Conclusion/Relevance: To our knowledge, this is the first study to characterize the nature of photopsias in children. Although further studies investigating more patients with improved follow-up would be helpful, this study suggests that photopsias in children are largely a self-limited, benign condition.

References: Brown GC, Brown MM, Fischer DH. Photopsias: A Key to Diagnosis. Ophthalmology. 2015;122(10):2084-2094.
Naegendran ST, Thomas D, Gurbaxani A. Flashes, floaters and fuzz. British Journal Hospital Medicine (London). 2013; 74(2): 91-5
Schankin CJ, Maniyar FH, Digre KB, Goadsby PJ; 'Visual snow' - a disorder distinct from persistent migraine aura, Brain. 2014;137(5):1419-28, https://doi.org/10.1093/brain/awu050

Poster #B56
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Missed Appointments in a Canadian Tertiary Care, Academic Centre Pediatric Ophthalmology and Adult Strabismus Service: Rates and Financial Impact

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Introduction: Missed appointments are barriers to health care delivery that result in loss of revenue and disruption of physician-patient relationship. There is a paucity of data describing the rate and impact of missed appointments in Pediatric Ophthalmology.

Methods: A retrospective review of 3,922 patient appointments for two pediatric ophthalmologists at an academic Canadian institution was conducted over one year. Demographic data included patient age, day and appointment month.

Results: There were 720 missed appointments (18.4%), the equivalent of 26.7 full day clinics. New patients were significantly more likely to miss appointments ($p<0.001$). There was no difference between patient age ($p=0.46$) or day of week ($p=0.16$). There was a significant difference between appointment month ($p=0.001$); the highest rates were January (26.39%) and February (23.11%). Subset analysis of 1574 patients (one of the providers) revealed surgical strabismus patients were significantly more likely to attend appointments ($p<0.001$). Patients were more likely to miss appointments if they previously missed appointment(s) ($p<0.001$) or were referred by nurse practitioners ($p=0.027$). There was no difference between sex ($p=0.111$), distance to clinic ($p=0.073$) or appointment time ($p=0.347$). The average physician billing loss was estimated at $54,722.46 USD in one year.

Conclusion/Relevance: This study identifies factors that can be targeted to improve missed appointments. New patients, non-surgical patients and patients referred by nurse practitioners have higher missed appointment rates. Missed appointments cause significant financial loss, physician time wasted, and increase in patient wait times. In the current COVID-19 environment, reduced clinic capacity makes it essential to reduce missed appointments and associated financial loss.

References: 1. Humphreys L, Hunter AGW, Zimak A, O'Brien A, Korneluk Y, & Cappelli Y. 2000. Why patients do not attend for their appointments at a genetics clinic. J Med Genet, 37(10), 810-815.
2. Bowman RJC, Bennett HGB, Houston CA, Aitchison TC, Dutton GN. 1996. Waiting times for and attendance at paediatric ophthalmology outpatient appointments. BMJ, 313.
3. Guzek LM, Fadel WF, & Golomb MR. 2015. A pilot study of reasons and risk factors for 'no-shows' in a pediatric neurology clinic. J Peds Neuro, 30(10), 1295-9.

Poster #B57
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Prevalence and Distribution of Ocular Disorders in the First Year of Life

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Introduction: The purpose of this population-based study was to describe the prevalence and distribution of eye diseases affecting children in the first year of life.

Methods: The medical records of all infants (</=1 year of age) residing within a well-defined geographic region diagnosed with any ocular disorder from January 1, 2005, through December 31, 2014, were retrospectively reviewed.

Results: A total of 4223 infants were diagnosed with an ocular disorder, yielding an incidence of 20242/100,000 births per year or 1 in 4.9 live births. The most prevalent diagnoses included conjunctivitis in 1695 (40.4%), nasolacrimal duct obstruction in 1275 (30.2%), pseudostrabismus in 173 (4.1%), retinopathy of prematurity in 76 (1.8%), infantile esotropia in 34 (0.8%) and preseptal eyelid cellulitis in 33 (0.8%). Vision was decreased in one or both eyes in 23 (0.6%) infants. A majority of the infants 84.1% were diagnosed and treated by a primary care provider, and 15.9% were evaluated by an eye care provider.

Conclusion/Relevance: Although ocular diagnoses are common in infants, few require evaluation and management by an ophthalmologist. Prior studies have used surveys to estimate ocular disease burden and prevalence data for infants is limited. Understanding the prevalence and distribution of ocular diseases among infants is useful for planning the distribution of clinical resources.

References: -

Poster #B58
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Eye Injuries Associated with Nerf Gun Use in a Pediatric Population: A Case Series

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Introduction: Nerf guns can cause vision-threatening injuries. We conducted a retrospective case series of patients evaluated during the acute management of Nerf gun-associated eye injuries to assess clinical outcomes and follow-up burden.

Methods: An electronic medical record search was conducted for pediatric (age 1-19) patients seen at an academic pediatric ophthalmology clinic between 12/1/2017 and 3/31/2020. 445 patients were identified using ocular injury-related ICD codes. 13 patients met our inclusion criteria of injury with a Nerf gun, evaluation within 48 hours, and completion of follow-up appointments.

Results: Mean patient age was 9.7 years old and most were male (69.2%). At presentation, only ~1/3 had 20/20 near visual acuity and two had pressures >21 mmHg. Hyphema, the most common injury, was documented in 11 patients (84.6%), and commotio retinae, the most severe injury, in one. Four patients (30.8%) required pressure lowering drops over an average of 15 days. Cumulative follow-up for all 13 cases amounted to 61 outpatient visits, with an average of 4.7 visits and 26-day follow-up windows per patient. Activity restriction averaged 15 days per patient, with ~176 cumulative days of restriction for all patients. Although no severe complications were noted at discharge, both blunt trauma and hyphema confer an increased lifetime risk for angle-recession glaucoma, necessitating lifelong follow-up.

Conclusion/Relevance: This case series highlights the ocular dangers and emphasizes the potential loss of productivity for children and their families resulting from Nerf gun injuries. The authors support formal recommendations for eye protection during the use of Nerf guns.

References: 1. Ng DS, Ching RH, Chan CW. Angle-recession glaucoma: long-term clinical outcomes over a 10-year period in traumatic microhyphema. Int Ophthalmol. 2015;35(1):107-113. doi:10.1007/s10792-014-0027-5
2. Blanton FM. Anterior Chamber Angle Recession And Secondary Glaucoma. A Study Of The Aftereffects Of Traumatic Hyphemas. Arch Ophthalmol. 1964;72:39-43. doi:10.1001/archopht.1964.00970020041010

Poster #B59
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Influence of Mother Tongue on Eye Movement During Reading in Primary School Aged Children

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Introduction: Eye movements during reading are influenced by developmental age but may also depend on the mother tongue. Thus we examined whether eye movements during reading differed between native and non-native speakers in primary school children in German speaking Switzerland.

Methods: Children from primary schools in Switzerland were asked to read aloud two different German texts from the IReST, presented on a laptop in a random order. Eye movements were recorded with an SMI tracking bar. Following parameters were assessed for native versus non native speakers: reading speed (words/min), number of saccades, number of fixations and reading errors.

Results: 118 healthy children were recruited from grades 2-5. Visual acuity was normal and Lang II was positive in all. Non native speakers had significantly more saccades/word ($p=0.003$) and fixations per word ($p=0.002$) than German native speakers. German native speakers read significantly faster and with less errors in 2nd grade, but over all grades, native did not differ from non-native speakers in speed ($p=0.28$) or reading errors ($p=0.69$).

Conclusion/Relevance: When normative values for reading are established in primary school children, the mother tongue has to be taken into consideration as well as the school grade of the respective country.
While there is a marked influence of the mother tongue on eye movements in reading in 2nd grade, performance of non-native speaking children improves quickly and these children show no worse performance than native speakers at higher school grades.

References: DNA

Poster #B60
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Epidemiology of Pediatric School-Associated Ocular Injuries

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Introduction: To evaluate emergency department visits related to ocular injuries at school in children ages 5-18 between 2000-2019.

Methods: Retrospective, observational series of ocular injuries at school among children ages 5-18 using the National Electronic Injury Surveillance System, that encompasses a representative sample of 100 U.S. hospital emergency departments (ED). Variables included demographic information, type of eye injury, location, disposition in the ED, and consumer-product causing injury.

Results: A total of 127,838 ED visits for school-associated ocular injuries in children were identified of which 54% (69,163) were in the middle and high school age group, 12-18 years, and 46% in the elementary school group, 5-11. Overall, 83,966 (65.7%) were males accounting for 61.6% of injuries in the younger group and 69.2% in the older group. Ocular contusion was the most common diagnosis. The etiology of most ocular injuries was sports-related (36.1%), pens/pencils (16.3%), workshop equipment (9.4%), and paper products (6.4%). In children aged 5-11, the most common causes of injury were sports/recreation (27.7%), pens/pencils (25.1%), paper products (8.1%), toys (6.4%) and furniture (5.3%) compared to sports/recreation (43.3%), workshop equipment (16.7%), and pens/pencils (8.8%) in the older age group. The majority of patients (98.0%) were released to home from the ED. Of the 558 cases admitted to the hospital, 43% had an open globe injury (OGI).

Conclusion/Relevance: Most school-associated pediatric ocular injuries were minor and sports-related. Injuries with pens/pencils caused one-fourth of the injuries in elementary school children (ages 5-11). Only 0.4% were serious injuries needing hospitalization, less than half of which were OGIs.

References: 1) Consumer Product Safety Commission. National Electronic Injury Surveillance System 2000-2019 on NEISS Online Database, released April, 2020.

Poster #B61
Saturday, April 10, 2021
11:30 AM – 12:30 PM

The Parks Record Project: A Searchable Database of Dr. Marshall Parks' Clinic Records

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Introduction: Dr. Marshall M. Parks (1918-2005) was a pioneer in pediatric ophthalmology and strabismus surgery, having established the first fellowship in pediatric ophthalmology and a founding member and first president of AAPOS (1974-1975). He left behind a wealth of documented clinical encounters, operative notes, and physician communications. Previously stored in several filing cabinets, these records have been digitized into a searchable database.

Methods: 131,366 pages of typewritten medical records of Dr. Parks were scanned and organized into a database by a document processing service. Optical character recognition software was employed to convert each document to a text-searchable PDF.

Results: 25,464 distinct documents were converted and reviewed. Despite heterogeneity in structure and content, the majority represent clinical courses of patients under Dr. Parks' care. Clinical records include patient histories, exam findings and measurements, diagnoses, treatment recommendations, operative reports, and patient outcomes across serial visits. Illustrative of database scope, text searches for common diagnoses reveal 1,959 records with mention of cataract, 2,503 for exotropia, 4,782 for esotropia, 1,280 for glaucoma, 498 for superior oblique palsy, 544 for Duane syndrome, 432 for Brown syndrome, and 356 for thyroid eye disease.

Conclusion/Relevance: This searchable database provides a unique resource for outcomes research in pediatric ophthalmology. Records are searchable by diagnosis, intervention, exam finding, etc.; this represents a powerful tool for those interested in performing retrospective studies in pediatric ophthalmology. A process by which clinician investigators may mine the database for research purposes is currently under consideration by the Children's Eye Foundation.

References: n/a

Poster #B62
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Trends in Pediatric Visits at a Tertiary Ophthalmology Center During COVID-19 Pandemic

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Introduction: Utilization of ophthalmology services dramatically changed during the COVID-19 pandemic. However, the long-term effects on service utilization for children has yet to be investigated.

Methods: Retrospective medical record review of patients ≤ 18 years old presenting to the emergency department (ED) and pediatric ophthalmology clinics (POC) at a tertiary ophthalmology center from May-September 2020. Data regarding patient demographics, diagnoses and visit volumes were analyzed.

Results: There were a total of 1,946 pediatric encounters, 73.3% (1427) which occurred in the POC. The number of patients per month for POC doubled after the first month of reopening and then stabilized; meanwhile, the ED volume experienced only a 5% increase in June and August. The mean age for POC patients was significantly lower compared to ED (7.4 vs 9.8 years, p= <0.05). There was no difference in gender between POC and ED visits (males: 50.0% POC vs 50.2% ED, p=1.00). The three most common diagnoses in POC were strabismus (51.2%), amblyopia (9.8%) and refractive error (9.7%) while in the ED, most children (48.0%) had external and anterior segment pathology, such as chalazion, eyelid edema and corneal abrasions.

Conclusion/Relevance: The age and diagnoses of pediatric patients differed when comparing patients who presented to the POC to the ED. Although the ED volume remained relatively stable even after clinics reopened during the COVID-19 pandemic, the POC visit volume doubled after first month of reopening.

References:

1. Olivia Li JP, Shantha J, Wong TY, Wong EY, Mehta J, Lin H, Lin X, Strouthidis NG, Park KH, Fung AT, McLeod SD, Busin M, Parke DW 2nd, Holland GN, Chodosh J, Yeh S, Ting DSW. Preparedness among Ophthalmologists: During and Beyond the COVID-19 Pandemic. Ophthalmology. 2020 May;127(5):569-572. doi: 10.1016/j.ophtha.2020.03.037. Epub 2020 Mar 31. Erratum in: Ophthalmology. 2020 Aug;127(8):1131. PMID: 32327128; PMCID: PMC7167498.
2. Wong TY, Bandello F. Academic Ophthalmology during and after the COVID-19 Pandemic. Ophthalmology. 2020 Aug;127(8):e51-e52. doi: 10.1016/j.ophtha.2020.04.029. Epub 2020 Apr 21. PMID: 32359842; PMCID: PMC7194607.

Poster #B63
Saturday, April 10, 2021
11:30 AM – 12:30 PM

The Impact of Geographic Socioeconomic Disadvantage on Vision Screening Failure Rates in Schools: Analysis of a School-Based Vision Program

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Introduction: Prior work suggests that children of lower socioeconomic backgrounds are less likely to access vision services and more likely to fail vision screening [1, 2]. We investigated the association between school geographic socioeconomic disadvantage and vision screening failure rates in schools participating in a school-based vision program.

Methods: We calculated vision screening failure rates by grade of pre-Kindergarten through 8th grade students enrolled in Baltimore City Public Schools served by a school-based vision program between 2016-2019. Schools were grouped into quintiles of geographic socioeconomic disadvantage based on ZIP+4 code-specific Area Deprivation Index (ADI) [3]. To investigate the association between screening failure rates and ADI, we used a multilevel mixed effects multivariable model that accounted for clustering of grades within schools and adjusted for school size (enrollment by grade), grade, and year (2016-17, 2017-18, 2018-19). The analysis included 972 grades across 117 schools.

Results: Overall, median screening failure rates by grade were 33.3% (IQR: 26.5%-40.6%). Sixty-five grades (7%) across 7 schools were classified as ADI1 (least deprived), 124 grades (13%) across 14 schools as ADI2, 224 grades (23%) across 25 schools as ADI3, 302 grades (31%) across 37 schools as ADI4, and 257 grades (26%) across 34 schools as ADI5 (most deprived). In an adjusted model, ADI5 was associated with a higher screening failure rate compared to ADI1 (b=6.34%, 95% CI [0.98, 11.70], p=0.02).

Conclusion/Relevance: Schools in most disadvantaged areas had higher vision screening failure rates compared to less disadvantaged schools in a school-based vision program. Additional resources are needed to increase children's access to vision services in deprived areas.

References: [1] O'Colmain U, Low L, Gilmour C, MacEwen CJ. Vision screening in children: a retrospective study of social and demographic factors with regards to visual outcomes. Br J Ophthalmol. 2016 Aug;100(8):1109-13. doi: 10.1136/bjophthalmol-2015-307206. Epub 2015 Nov 23. PMID: 26598576; PMCID: PMC4975846.

[2] Majeed M, Williams C, Northstone K, Ben-Shlomo Y. Are there inequities in the utilisation of childhood eye-care services in relation to socio-economic status? Evidence from the ALSPAC cohort. Br J Ophthalmol. 2008 Jul;92(7):965-9. doi: 10.1136/bjo.2007.134841. Epub 2008 May 14. PMID: 18480307.

[3] Singh GK. Area deprivation and widening inequalities in US mortality, 1969-1998. Am J Public Health. 2003 Jul;93(7):1137-43. doi: 10.2105/ajph.93.7.1137. PMID: 12835199; PMCID: PMC1447923.

Poster #B64
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Excimer Laser Keratectomy for Hyperopia in Special Needs Children: Longer Term Outcomes

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Introduction: We report the results of excimer laser photorefractive keratectomy (PRK) for hyperopia in special needs children who are intolerant of spectacle wear or contact lenses.

Methods: Pre-operative, clinical course, and outcome data were retrospectively collected in this cohort of 35 eyes of 23 patients. Twelve children were treated bilaterally for isoametropia and eleven unilaterally for anisometropia. Mean age at treatment was 10.2 years (range 3 - 19 years). Hyperopic spherical equivalent ranged from +1.6 to +7.3 D (mean +4.8 D) and the desired goal spherical equivalent ranged from plano to +2.3 D. Photorefractive keratectomy (PRK) was performed under brief general anesthesia. Mitomycin C was applied intraoperatively to reduce post-operative haze and regression. Mean follow-up was 4.8 years.

Results: Average amount of hyperopic correction was 3.8 D. Average spherical equivalent and uncorrected visual acuity improved from +4.8 D and 20/63 (0.50 logMAR) preoperatively to +1.7 D and 20/45 (0.35 logMAR) at final follow up. Sphere and cylinder regression averaged 0.21 D/yr and 0.33 D/yr, respectively. Subgroup analysis revealed a greater regression rate in eyes receiving larger spherocylindrical corrections. Visually significant corneal haze occurred in one eye (3%) which improved with extended topical steroid therapy.

Conclusion/Relevance: Special needs children with high hyperopia undergoing PRK achieve reduced ametropia and gains in uncorrected visual acuity. The rate of spherocylindrical regression increases with larger ablations. Further studies will aid in determining the long-term safety and efficacy of this procedure in pediatric patients.

References: Tychsen, L., Packwood, E., and Berdy, G. 2005. Correction of large amblyopiogenic refractive errors in children using the excimer laser. J AAPOS. 9, 3, 224-233.

Tychsen, L. 2009. Refractive surgery for special needs children. Arch Ophthalmol. 127, 6, 810-3.

Settas, G., Settas, C., Minos, E., & Yeung, I. Y. (2012). Photorefractive keratectomy (PRK) versus laser assisted in situ keratomileusis (LASIK) for hyperopia correction. The Cochrane Database of Systematic Reviews, (6), CD007112.

Poster #B65
Saturday, April 10, 2021
11:30 AM – 12:30 PM

A Novel Grading Method to Compare Sphero-Cylinder Spectacle Refractions for Instrument Validation and Remote Lay Dispensing

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Introduction: Portable autorefractors can estimate refractive error in remote locations, but sphero-cylinder comparison and donated-spectacle dispensing is not yet simple(1).

Methods: Normal astigmats determined best corrected acuity, then degraded 1 logMAR (Grade A), 3 logMAR (Grade B) and 6 logMAR (Grade C) to determine limits of astigmatism axis and power at these levels. The cylindrical refraction was vector transformed with J0 on abscissa and J45 on ordinate.

Results: Ten subjects produced multiple refractions at the interfaces of Grades A, B and C representing ovals on the J0, J45 coordinates. When rotated the vertical axis representing 45° or 135°, the horizontal long axis was 1.6 x the short axis. The size of the ovals positively correlated to cylinder power. Given a target refraction, the comparability of a candidate lens was demonstrated on our Excel database yielding a simple A, B, C or worse grade for cylinder, spherical equivalent and pupillary diameter.

Conclusion/Relevance: Inputting a remote autorefraction, pupillary diameter and age as target and a donated spectacle as the candidate with a 'B' grade similarity would be expected to attain 20/40 acuity (3 logMAR degrade) if best corrected visual acuity was 20/20. This practical Excel database could facilitate widespread remote lay dispensing of cylinder as well as spherical spectacles. The grade similarity can also compare refracting tools such as photoscreeners and hand-held autorefractors.

References: 1. Pearce MG. Clinical outcomes following the dispensing of ready-made and recycled spectacles: a systematic literature review. Clin Exp Optom. 2014;97(3):225-233.

Poster #B66
Saturday, April 10, 2021
11:30 AM – 12:30 PM

The Impact of Moderate-to-Late Prematurity on Ocular Structures and Visual Function in Saudi Children

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saudi arabia

Introduction: To assess and compare ophthalmologic and morphologic outcomes between school-age children born moderate-to-late preterm and those born at term.

Methods: Fifty children born moderate-to-late preterm (gestational age [GA] 32 weeks + 0 days to 36 + 6 days, age range 5-10 years) at a tertiary university hospital were age- and sex -matched to full-term controls. Visual acuity, refractive errors, ocular biometry, macular and optic nerve assessments with optical coherence tomography were investigated, and the results were compared between cases and controls.

Results: No differences in visual acuity or refraction were detected between the study groups. Marked differences were observed in the anterior chamber depth, which was shallower in the preterm group (P = 0.044); however, no difference in total axial length was observed. The preterm and control groups significantly differed in terms of central macular thickness (247 ± 19 µm versus 235 ± 22 µm; P = 0.005 right eye); however, the groups did not significantly differ in foveal thickness. Central subfield thickness was also markedly greater in the preterm than in the control children (246.89 ± 19.1 µm versus 236.12 ± 23.3 µm, P = 0.015). No significant differences in mean parafoveal and perifoveal thicknesses were observed between both groups.

Conclusion/Relevance: It is important to recognize that being born preterm might have an impact on some ocular structuresLarger population-based studies should be conducted to study the long-term sequelae of moderate-to-late prematurity.

References: 1. Raffa LH, Dahlgren J, Hellström A, Andersson Grönlund M. Ocular morphology and visual function in relation to general growth in moderate-to-late preterm school-aged children. Acta Ophthalmol. 2016;94(7):712-720. doi:10.1111/aos.13085

2. Raffa L, Aring E, Dahlgren J, Karlsson AK, Andersson Grönlund M. Ophthalmological findings in relation to auxological data in moderate-to-late preterm preschool children. Acta Ophthalmol. 2015;93(7):635-641. doi:10.1111/aos.12763

3. Robaei D, Kifley A, Gole GA, Mitchell P. The impact of modest prematurity on visual function at age 6 years: Findings from a population-based study. Arch Ophthalmol. 2006;124(6):871-877. doi:10.1001/archopht.124.6.871

Poster #B67
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Retinal Hemorrhage after Pediatric Neurosurgical Procedures

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Introduction: Neurosurgical procedures may be considered potential confounding causes of retinal hemorrhage (RH) in children being evaluated for abusive head trauma. We sought to determine the prevalence and patterns of RH attributable to neurosurgical intervention in children.

Methods: Retrospective cohort study of children undergoing neurosurgery who had postoperative indirect ophthalmoscopy within 7 days. Some children were also examined pre-operatively. Primary outcomes were prevalence and patterns of RH attributable to neurosurgery. Medical records were reviewed to identify confounding coexistent diseases.

Results: 573 eyes of 267 children (mean age 6.2 years, range 0.1-18), who underwent 289 neurosurgical procedures (101 craniectomy, 57 burr-hole related, 103 ventricular/cerebrospinal-fluid drain implants, 8 spinal surgery, and 20 other), were studied. Retinal examinations occurred at mean 3.1 days post-operatively (178 at 0-3 days, 111 at 4-7 days). RH's were seen in 32 (11%) cases, but in every case they were either already present on pre-operative examination (13 cases) or matched the pattern of a co-existent known cause of RH, including head trauma with unambiguous history and non-ocular signs (13), hydrocephalus-related increased intracranial-pressure with papilledema-associated peripapillary RH (5), and ROP-ridge-associated RH (1). No RH could be attributed only to neurosurgery.

Conclusion/Relevance: While children undergoing child abuse evaluations may have intracranial hemorrhage requiring neurosurgery that occurs before a dilated retinal examination can be performed, our data suggest that neurosurgery itself is unlikely to produce RH. Neurosurgery is unlikely to cause RH or be a significant confounding factor in the interpretation of retinal hemorrhage patterns in child abuse evaluations.

References: Binenbaum G, Rogers D, Forbes B, Levin A, Clark S, Christian C, Liu G, Avery R: Patterns of Retinal Hemorrhage Associated with Increased Intracranial Pressure in Children. Pediatrics 132(2): e430-4, Aug 2013. Binenbaum G, Forbes BJ: The Eye in Child Abuse: Key Points on Retinal Hemorrhages and Abusive Head Trauma. Pediatric Radiology. doi: 10.1007/s00247-014-3107-9. Epub 2014 Dec 14. (eds.). 44(Suppl 4): S571-7, Dec 2014.

Poster #B68
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Early Recognition of Raccoon Roundworm Retinitis in Toddlers May Limit Neurologic Devastation: A Photographic Report of Two Cases

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Introduction: To report to pediatric ophthalmologists the retina photography of two cases of encephalopathy in toddlers to promote early recognition of indicative eye findings.

Methods: A 15-month-old and a 13-month-old each presented to the ER with several days of progressive altered mental status and lethargy. Both had no visual tracking, diffuse hypertonia, hyperreflexia, and clonus. Blood leukocytosis with eosinophilia and CSF pleocytosis with eosinophilic predominance were present. Blood and CSF cultures were negative. Continuous EEG showed generalized slowing, but no epileptiform activity. Brain MRI revealed nonspecific diffuse white matter changes. (Figures 1,2) Initial retina examination of Case 1 showed an abnormal retinal sheen in the right eye. Repeat examination 5 days later revealed random tracks around the optic nerve. (Figures 3,4) Initial ophthalmologic examination of Case 2 showed a normal exam, though 7 days later an abnormal retinal sheen was present in both eyes. (Figures 5,6)

Results: Each case was positive for Baylisascaris procyonis antibody in the serum weeks into hospitalization. Knowledge of Case 1 by our neurologists [1] resulted in early initiation of high-dose albendazole and steroids for Case 2 to limit neurologic devastation.

Conclusion/Relevance: Pediatric ophthalmologists should be aware of retinal sheen and random tracking in B procyonis retinitis. Early treatment may limit neurologic devastation in toddlers with this eosinophilic meningoencephalitis.

References: [1] Zhang R, Ziobro J, Harmon J, et al. Clinical Reasoning: A 15-month-old boy with progressive lethargy and spasticity. Neurology. 2017;89(12):e135-e139. doi:10.1212/WNL.0000000000004395

Poster #B69
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Retinal Pigment Epitheliopathy in DRESS Syndrome

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Introduction: Drug reaction with eosinophilia and systemic symptoms (DRESS) syndrome is an uncommon life-threatening drug reaction. Clinical features include morbilliform rash, fever, lymphadenopathy, eosinophilia, lymphocytosis, and inflammation of internal organs (1). We report a case of retinal pigment epitheliopathy in DRESS syndrome, the first such case reported in a pediatric patient.

Methods: Case report and literature review.

Results: We report retinal involvement in a 14-year-old patient exposed to lamotrigine who developed DRESS syndrome. The patient developed metamorphopsia prompting evaluation in the eye clinic. This revealed retinal pigment epithelial (RPE) mottling in a disciform pattern in the central and inferior macula with surrounding hypopigmentation. We present the associated visual field, OCT, and autofluorescence fundus photographs. In the weeks following his initial eye examination, systemic prednisone and cyclosporine to treat DRESS syndrome were discontinued. Three months later, he had both improved vision and organization of the ellipsoid zone on OCT.

Conclusion/Relevance: Pediatric patients exposed to several commonly used antibiotics and anticonvulsants can develop DRESS syndrome. Our report characterizes the fundus and imaging findings when outer retinal changes are part of this condition. We provide longitudinal follow up of the clinical exam and imaging findings.

References: 1. Oberlin KE, Rahnamaâ€□Moghadam S, Alomari AK, Haggstrom AN. Drug reaction with eosinophilia and systemic symptoms: Pediatric case series and literature review. Pediatric Dermatology. 2019;36:887-892.

Poster #B70
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Congenital Retinal Folds

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Introduction: Congenital retinal folds are a rare entity whose pathogenesis is incompletely understood. We present a series of patients with this disorder.

Methods: The records of patients with congenital retinal folds were retrospectively reviewed to determine clinical characteristics, family history, ocular complications, and outcomes.

Results: Six eyes of six patients were included in the study. Four of 6 patients presented with strabismus. Two patients were a mother and daughter. Two other patients underwent genetic testing. One patient with juvenile polyposis syndrome had a variant of R492q in IMPDH1. Another patient with a peroxisomal storage disorder had a PEX1 mutation. Three patients developed tractional retinal detachments, and one of these patients required enucleation for a blind, painful eye. Follow-up ranged from 6.0-18.0 years. At last follow-up visual acuity was 20/25 in one eye and ranged from 4/600 to no light perception in the remaining eyes.

Conclusion/Relevance: Four of the patients with congenital retinal folds had an identified genetic component to their disorder as evidenced by genetic testing or positive family history. The most common presentation was strabismus associated with monocular decreased vision. The visual outcome in most patients was very poor, although one patient had excellent vision. Visual outcomes of patients with congenital retinal folds varies, but is usually poor. Patients should be monitored for tractional retinal detachments to preserve vision and should be apprised of the potential risk of having affected offspring.

References: 1. Nishina S, Suzuki Y, Yokoi T, Kobayashi Y, Noda E, Azuma N. Clinical features of congenital retinal folds. Am J Ophthalmol. 2012 Jan;153(1):81-7.e1.

Poster #B71
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Ocular Examinations and Findings in Children on Vigabatrin

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Introduction: Vigabatrin, a commonly used anti-seizure medication, has been associated with retinal toxicity, though the incidence of this side effect is unknown and difficult to accurately assess in children. Our goal was to determine the frequency and utility of eye examinations to detect vigabatrin-related adverse events in children.

Methods: Retrospective chart review of the 133 patients </=18 years prescribed vigabatrin at a tertiary care referral center between January 2012 and June 2019. Information was collected regarding medication use, timing of eye examinations, and abnormal eye examination findings.

Results: 133 children (50.4% female) were prescribed vigabatrin during the study period with median age at drug initiation of 1 year (range 2 months - 16 years). The most common indications were infantile spasms (33.0%), seizures associated with structural brain abnormalities (28.6%), and seizures associated with systemic or genetic syndromes (24.8%). Only 66% of patients underwent an eye examination. Of those with an eye examination, 64% were performed exclusively for vigabatrin screening. Median time between initiation of vigabatrin and eye examination was 2 months (range 0 days - 6.8 years). 42% of eye examinations were normal. The most common abnormalities were strabismus (33%), cortical visual impairment (33%), and optic atrophy (16%). No cases of vigabatrin-related toxicity were identified.

Conclusion/Relevance: The incidence and timing of eye examinations assessing for vigabatrin toxicity are inconsistent and many patients already receive eye examinations for other ophthalmic conditions. Vigabatrin-related retinal toxicity is rare and difficult to assess in children.

References: N/A

Poster #B72
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Predictors of Long-Term Visual Outcome following Retinal Hemorrhage from Abusive Head Trauma

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Introduction: The visual consequences following retinal hemorrhage (RH) from abusive head trauma (AHT) can take years to manifest. We sought to characterize the long-term visual outcomes and prognostic factors in these children.

Methods: Retrospective, multicenter cohort study at 3 hospitals of children with RH from AHT with one or more follow-up eye examinations. Primary outcomes were visual acuity, motility, and intraocular findings. Initial eye findings and non-ocular injuries were examined as predictive risk factors.

Results: In total, 247 children were studied. RH severity at presentation was mild/moderate (25%), severe (56%), severe with retinoschisis or retinal folds (9%), and unspecified (10%). RH severity predicted final visual acuity (better-seeing eye), macular scar, macular atrophy, and optic atrophy ($p<0.001$). Initial visual acuity, optic atrophy, cerebral edema, and hypoxic-ischemic injury also predicted final visual acuity ($p<0.001$). At latest follow-up (mean 2.7 years, range 0.1-16.7 years), ocular findings included strabismus (32%); cortical visual impairment (24%); central visual impairment classified as mild/moderate (9%), severe/near-total/total (11%), unspecified (2%); optic atrophy (12%); macular scar (7%); nystagmus (5%); macular atrophy (3%). Of 5 children with normal vision who underwent macular optical coherence tomography, 3 had abnormal findings.

Conclusion/Relevance: While visual impairment and strabismus are common in children with RH from AHT, long-term follow-up is often lacking. Permanent changes to the retina can occur without obviously impacting vision. Severity of RH and other presenting factors can provide predictive information about final visual outcomes in AHT. Caregivers can be counseled accordingly, and long-term clinical follow-up should be ensured to monitor for visual problems throughout childhood.

References: Lind K, Toure H, Brugel D, Meyer P, Laurent-Vannier A, Chevignard M. Extended follow-up of neurological, cognitive, behavioral and academic outcomes after severe abusive head trauma. Child Abuse Negl 2016 Jan;51:358-67.

Poster #B73
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Normative Values for Standard Full Field Electroretinography in a Tertiary Care Pediatric Population in Chicago

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Introduction: Full-field electroretinography (ERG) is utilized to identify elusive retina disorders, however pediatric normative data is sparse. Various factors including technique, age, and ethnicity can affect results. [1,2] The primary aim of our study was to develop normative data for a pediatric population.

Methods: All normal ERGs done from 2015 to 2019 were collected on children less than 20 years using LKC equipment and bipolar Burian-Allen electrodes, some with general anesthesia. We developed normative data scatter plots for 4 standard scotopic ERG parameters by month for the first year and 8 standard scotopic and photopic ERG parameters by year for the second to twentieth year with linear best-fit lines and ranges (2 standard deviations).

Results: Our technique for performing ERGs (consistent with ISEV protocol) in pediatric patients is described. Sixty-seven eyes (34 patients) had normal ERGs. Scotopic B-wave amplitudes trended to increase and implicit times to decrease with age. For children between 1 and 20 years, photopic B-wave amplitudes also trended to increase and implicit times to decrease with age. The outliers with higher scotopic and photopic B-wave amplitudes had a trend for lighter skin pigmentation (80% Caucasian and 75% Caucasian, respectively) compared to all patients (53.7% Caucasian).

Conclusion/Relevance: In agreement with further reports, age and ethnicity appear to impact ERG values. We describe a standardized technique for performing pediatric ERGs and normative data for the first 11 months of life by month and for 1 to 20 years of life by year that may prove useful to others.

References: 1. Birch DG, Anderson JL. Standardized full-field electroretinography. Normal values and their variation with age. Arch Ophthalmol. 1992 Nov;110(11):1571-6.
2. Parvaresh MM, Ghiasian, L, Falavarjani KG, et al. Normal Values of Standard Full Field Electroretinography in an Iranian Population. J Ophthalmic Vis Res. 2009 Apr; 4(2): 97-101.

Poster #B74
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Retinal Complications of Optic Nerve and Choroidal Colobomas in Pediatric Patients

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Introduction: Colobomas of the choroid and optic nerve predispose patients to retinal detachment and visual loss. This study explored the incidence of retinal complications (fluid, detachment), reviewed their course and management, and identified a novel treatment (oral acetazolamide followed by indirect laser) for early onset retinal detachment in a monocular patient with optic nerve coloboma.

Methods: Retrospective review of cases from 2005 to 2018 at a large tertiary referral center in northwest Louisiana.

Results: Five eyes (four patients) out of forty-three patients (78 eyes) with chorioretinal or optic nerve coloboma were identified as having retinal detachments; one developed serous retinal detachment and four developed rhegmatogenous retinal detachments. Median age of RD in our study was 2.5 years old. Despite anatomic re-attachment in a majority (80%) of cases, visual acuity was no better than 20/400 in all cases.
Six percent of eyes (9% of patients) with chorioretinal and/or optic nerve colobomas developed retinal detachment. Treatment modalities included laser, oral acetazolamide, and vitrectomy with silicone oil or cyanoacrylate glue. In the majority of cases, patients achieved successful surgical anatomic results, but visual prognosis remained poor.

Conclusion/Relevance: Optic nerve and chorioretinal coloboma patients are at increased risk of retinal detachment, which is most common before a child is fully verbal. Frequent exams, at least every three months, should be considered. A novel treatment of oral acetazolamide to shrink a serous retinal detachment followed by indirect laser can be helpful. Prophylactic laser to the edges of the coloboma should be considered in at-risk patients.

References: Daufenbach DR, Ruttum MS, Pulido JS, Keech RV. Chorioretinal colobomas in a pediatric population. Ophthalmology. 1998; 105(8):1455-1458.
Hussain RM, Abbey AM, Shah AR, Dresner KA, Trese MT, Capone A Jr. Chorioretinal coloboma complications: retinal detachment and choroidal neovascular membrane. Journal of Ophthalmic Vision and Research. 2017; 12(1):3-10.
Uhumwangho OM, Jalali S. Chorioretinal coloboma in a paediatric population. Eye. 2014; 28:728-744.

Poster #B75
Saturday, April 10, 2021
11:30 AM – 12:30 PM

Primary Laser Therapy as Monotherapy for Discrete Retinoblastoma

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Introduction: We studied the safety and efficacy of primary laser photocoagulation in managing discrete endophytic retinoblastoma with well-defined borders and attached retina.

Methods: A single-institution retrospective non-comparative review of retinoblastoma children managed with primary laser (February 2004-December 2018). Treatment success was defined by tumor initial and final stability by non-invasive therapy (laser/cryotherapy). Invasive therapies included chemotherapy (systemic or periocular), plaque radiotherapy and/or pars-plana vitrectomy.

Results: Eligible were 117 tumors in 57 eyes of 46 patients. Laser (median 2 sessions) achieved initial stability in 95/117 tumors while 5/117 required additional cryotherapy. Invasive therapy was required for 17/117 tumors to achieve initial stability, and for 21/117 tumors to achieve long-term stability. A single laser session achieved initial stability for 35/117 tumors and final stability for 16/117 tumors. One stable eye (4 tumors) was enucleated to avoid frequent follow-up per parent choice. Tumor recurrences developed in 54/113 tumors, 6 which required invasive therapy. ROC analysis identified threshold largest basal diameter of 3 disc-diameters (DD) for successful non-invasive therapy. With non-invasive therapy alone, 100/111 of tumors </=3 DD and 0/6 >3 DD achieved initial stability ($P < 0.001$). Despite fewer tumors recurred when treated with invasive (4/17) than non-invasive therapy (50/100) ($P=0.043$), fewer recurrences required subsequent invasive therapy (4/50 v 2/4; $P=0.010$). No eyes had tumor progression or extraocular disease. Overall, 29/46 patients (93/113 tumors) avoided invasive therapies.

Conclusion/Relevance: Discrete retinoblastoma </=3DD can be effectively and safely managed with primary laser photocoagulation, avoiding chemotherapy or other invasive therapies in 96/111 tumors.

References: 1. Soliman S, Kletke S, Roelofs K, VandenHoven C, McKeen L, Gallie B. Precision laser therapy for retinoblastoma. Expert review of ophthalmology. 2018;13(3):149-159.
2. Kim JW, Aziz HA, McGovern K, Zolfaghari E, Jubran R, Murphree L et al. Treatment Outcomes of Focal Laser Consolidation during Chemoreduction for Group B Retinoblastoma. Ophthalmol Retina. 2017;1(5):361-368.
3. Lee TC, Lee SW, Dinkin MJ, Ober MD, Beaverson KL, Abramson DH. Chorioretinal scar growth after 810-nanometer laser treatment for retinoblastoma. Ophthalmology. 2004;111(5):992-996.

Poster Session C
(C1 – c78)

Poster #C1
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Comparative Study of Serum Levels of Vascular Endothelial Growth Factor (VEGF) before and after Intravitreal Injection of Two Different Doses of Bevacizumab (IVB) for Retinopathy of Prematurity (ROP)

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Introduction: Comparative Study of Serum Levels of Vascular Endothelial Growth Factor (VEGF) before and after Intravitreal Injection of Two Different Doses of Bevacizumab (IVB) for Retinopathy of Prematurity (ROP).

Methods: This prospective, interventional, institutional study included 38 eyes of 19 premature infants, who were treated for type 1 ROP between March 2019 and March 2020. They were randomly divided into 2 groups; Group A included 9 infants, who received 0.3125mg of IVB in both eyes and Group B included 10 infants, who received 0.625mg of IVB in both eyes.
Systemic levels of serum VEGF were measured using Human VEGF ELISA kit prior to injection, 1 week and 4weeks post-injection in both groups.

Results: The pre-injection serum VEGF levels were 50.89±20.40 pg/ml (27-86) and 61.67±20.84 pg/ml (26-88) in Group A and Group B respectively (P value 0.18). Compared to pre-injection levels, at 1 week and 4weeks post-injection the values were 58.44 pg/ml (P value 0.11) and 82.88 pg/ml (P value 0.08) in Group A; and 68.44 pg/ml (Pvalue0.12) and 64.67 pg/ml(P value 0.44) in Group B. The concentration levels did not show any statistically significant difference between both groups pre-injection (Pvalue 0.18), as well as at 1 week (P value 0.18) and 4 weeks (P value 0.16) post-injection.

Conclusion/Relevance: Systemic level of serum VEGF did not show any statistically significant difference between both groups and between the pre and post-injection levels in each group.

References: 1-Huang CY, Lien R, Wang NK, Chao AN, Chen KJ, Chen TL, et al. Changes in systemic vascular endothelial growth factor levels after intravitreal injection of aflibercept in infants with retinopathy of prematurity. Graefe's Arch Clin Exp Ophthalmol. 2018;
2-Wu WC, Lien R, Liao PJ, Wang NK, Chen YP, Chao AN, et al. Serum levels of vascular endothelial growth factor and related factors after intravitreous bevacizumab injection for retinopathy of prematurity. JAMA Ophthalmol. 2015
3-Wu WC, Shih CP, Lien R, Wang NK, Chen YP, Chao AN, et al. Serum vascular endothelial growth factor after bevacizumab or ranibizumab treatment for retinopathy of prematurity. Retina. 2017;

Poster #C2
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Systemic Hypertension after Intravitreal Bevacizumab Therapy for Type I ROP: Is There Evidence for Concern?

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Introduction: A recent case report in Pediatrics describes the first known case of systemic hypertension 10 days after intravitreal bevacizumab (IVB) treatment for stage 3 ROP. The purpose of this study is to evaluate all cases of neonates with severe ROP (retinopathy of prematurity) for hypertensive crisis after treatment with IVB within 8 weeks of treatment.

Methods: Retrospective chart review of infants with severe ROP: 77 with type 1 ROP treated with bevacizumab, and 78 controls (infants with type 2 ROP or infants with type I treated with laser). We are also reviewing the available neuroimaging for the presence of vasogenic edema indicative of hypertensive crisis and comparing 77 IVB infants to 78 controls.

Results: In the IVB group, 4/77 neonates had a diagnosis of hypertension. Of those four, two had an MRI without explicit vasogenic edema. In the control group, 4/78 had a diagnosis of hypertension. All four had an MRI without explicit vasogenic edema. There was no difference in the proportion of HTN when comparing cases to controls (p=0.99).

Conclusion/Relevance: Preliminary data is reassuring. Future analysis includes a review of continuous vital signs to identify cases of HTN that escaped diagnostic coding. A neuroradiologist will also re-review all completed imaging to look for subtle signs of vasogenic edema. This has implications for the safety profile of bevacizumab in ROP.

References:

1.Twitty G, Weiss M, Albayram MS, et al. Hypertension and Neuroimaging Changes AfterBevacizumab for Retinopathy of Prematurity. Pediatrics. 2020;145(1):e20191814
2.Abbas O, Shamseddin A, Temraz S, Haydar A. Posterior reversible encephalopathy |syndrome after bevacizumab therapy in a normotensive patient. BMJ Case Rep. 2013;2013: bcr2012007995
3.Rodriguez SH, Peyton C, Lewis K, Andrews B, Greenwald MJ, Schreiber MD, et al. Neurodevelopmental outcomes comparing bevacizumab to laser for type 1 ROP. Ophthalmic Surg Lasers Imaging Retina. 2019;50: 337-343. 10.3928/23258160-20190605-01

Poster #C3
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Validation of the Postnatal Growth and Retinopathy of Prematurity Modified Criteria in Latin American Infants

Ellis J. Bloom, BS; Luz Consuelo Zepada-Romero, MD; Maria Marta Galan, MD; Judith Espinoza Navarro, MD; Alejandra G. De Alba Campomanes, MD, MPH; Peiying Hua, MS; Gui-Shuang A. Ying, PhD; Gil Binenbaum, MD, MSCE

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Introduction: We sought to evaluate the performance of the Postnatal Growth and Retinopathy of Prematurity (G-ROP) modified screening criteria in Latin America. These criteria had greater sensitivity and specificity for severe ROP than conventional screening criteria in North America, but infants at risk differ in middle-income countries, where prior models showed poor sensitivity.

Methods: Prospective observational cohort study in Guadalajara, Mexico and La Plata, Argentina. G-ROP criteria (GA<28 wks, BW<1051 g, weight gain<180 g during ages 10-19, 20-29, or 30-39; or hydrocephalus) were applied. Primary outcomes were sensitivity for severe ROP (type 1, 2 or treated) and reduction of infants receiving ROP examinations, with an a priori plan was made to update the model if sensitivity was <100%.

Results: Among the 112 infants (median BW 1413 (range 620-2390) g; median GA 33 (range 25-37) wks), G-ROP criteria predicted 16/19 babies with severe ROP (sensitivity, 84.2), decreasing babies being examined by 33.9%. When updated so the weight gain threshold was <210 g for each three 10-day period, sensitivity increased to 100% (95% CI, 82.4%-100%) and the reduction in babies receiving examinations was 27.7% (95% CI, 20.2%-36.6%).

Conclusion/Relevance: The G-ROP criteria initially exhibited decreased sensitivity for severe ROP. With updating, they achieved 100% sensitivity and maintain a significant benefit of fewer babies requiring examinations. However, the lower CI boundary for sensitivity was low, and excessive oxygen use may still prove to be a confounding factor. Therefore, the updated criteria need to be evaluated in a larger validation before used clinically.

References: Binenbaum G, Bell EF, Bonohue. P, et al. Development of Modified Screening Criteria for Retinopathy of Prematurity. JAMA Ophthalmol. 2018 Jul 12; 136(9): 1034-1040.
Binenbaum G, Tomlinson LA, de Alba Campomanes AG, et al. Validation of the Postnatal Growth and Retinopathy of Prematurity Screening Criteria. JAMA Ophthalmol. 2019 Nov 14; 138(1):31-37.
De Alba Campomanes AG, Espinoza Navarro J, Shaffer J, et al. Postnatal Serum Insulin-Like Growth Factor I and Retinopathy of Prematurity in Latin American Infants. Ophthalmic Epidemiol. 2020 Aug 24; 1-7.

Poster #C4
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Influence of Mosaic Fundus and Fluorescein Angiography Photographs on Treatment Requiring Retinopathy of Prematurity Diagnosis

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Introduction: To describe clinical characteristics of infants with treatment requiring retinopathy of prematurity (ROP) and investigate the potential influence of computer-generated mosaic fundus photographs and fluorescein angiography (FA) images on the diagnosis of ROP.

Methods: Retrospective chart review was conducted on consecutive infants with Type 1 ROP and treated with intravitreal bevacizumab (IVB) injections or conventional retinal laser photocoagulation. Patient characteristics, treatment outcomes and follow-up periods were recorded for each group. Color fundus pictures and corresponding FA images were obtained for each patient using the RetCam (ClarityMedical Systems) and were collaged by Retina software (DualAlign). Four fellowship trained pediatric ophthalmologists individually reviewed and interpreted 20 sets of photographs, presented a diagnosis and plan for each eye in a masked manner.

Results: Forty-eight eyes of 24 patients were included in this study. The mean gestational age was 24.02±0.85 weeks with a mean birth weight of 629.58±126.17 grams in the IVB group and 24.02±0.85 weeks and 629.58±126.17 grams in the laser group ($p>0.05$). At the time of treatment, the mean gestational age was 35.26±1.62 weeks in the IVB group and 38.75±2.03 weeks grams in the laser group ($p<0.01$). Mosaic photographs resulted in improved sensitivity compare with multiple individual photographs for diagnosis of treatment requiring ROP in both groups ($p<0.05$). FA images further showed increased sensitivity with compare to color fundus pictures ($p<0.05$).

Conclusion/Relevance: Mosaic fundus and FA photographs were associated with improved accuracy in diagnoses of treatment requiring ROP and may be considered to improve clinical interpretation in these infants.

References: 1-Patel SN, Klufas MA, Douglas CE, Jonas KE, Ostmo S, Berrocal A, Capone A Jr, Martinez-Castellanos MA, Chau F, Drenser K, Ferrone P, Orlin A, Tsui I, Wu WC, Gupta MP, Chiang MF, Chan RV; i-ROP Research Consortium. Influence of Computer-Generated Mosaic Photographs on Retinopathy of Prematurity Diagnosis and Management. JAMA Ophthalmol. 2016 Nov 1;134(11):1283-1289.
2- Klufas MA, Patel SN, Ryan MC, Patel Gupta M, Jonas KE, Ostmo S, Martinez-Castellanos MA, Berrocal AM, Chiang MF, Chan RV. Influence of Fluorescein Angiography on the Diagnosis and Management of Retinopathy of Prematurity. Ophthalmology. 2015 Aug;122(8):1601-8.

Poster #C5
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Risk of Corneal Epithelial Defects with and without Post-Operative Erythromycin Ointment after Laser Photocoagulation for Retinopathy of Prematurity (ROP)

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Introduction: Corneal epithelial defects occasionally occur following photocoagulation in infants. This study compared the incidence of corneal epithelial defects after laser treatment of ROP with and without the use of postoperative erythromycin ointment.

Methods: Data on 200 eyes of 100 consecutive infants treated with laser for ROP between 2012 and 2018 were retrospectively reviewed. The primary outcome was presence or absence of corneal epithelial defect using fluorescein on bedside examination within the first week following laser. Additional data assessed included: the use of post-operative erythromycin ointment, post-operative day on which examination using fluorescein occurred, presence of corneal translucency, gender, birth weight, and gestation age. The presence or absence of post-operative corneal epithelial defects were compared between eyes receiving post-operative erythromycin ointment or not using a Fisher exact test.

Results: Post-operative corneal epithelial defects were more common in eyes which did not receive post-operative erythromycin, (7 of 40 eyes; 17.5%), compared to eyes which did receive erythromycin, (1 of 160 eyes; 0.6%; $P < 0.0001$). Post-operative bedside examinations with fluorescein were performed within 2 days of surgery on 136 of 200 of eyes (68%). Corneal translucencies were noted in 3 of 200 eyes (1.5%).

Conclusion/Relevance: The risk of corneal epithelial defects was less in eyes which received post-operative prophylactic erythromycin ointment than in those which did not. While multiple variables may influence the presence or absence of post-operative corneal epithelial defects following laser for ROP, consideration for post-operative lubrication following laser for ROP seems reasonable.

References: 1. Fierson WM. Screening Examination of Premature Infants for Retinopathy of Prematurity. Pediatrics. 2018;142(6).
2. Wallace DK, Wu KY. Current and future trends in treatment of severe retinopathy of prematurity. Clinics in perinatology. 2013;40(2):297-310.

Poster #C6
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Investigating Assocation between Sardh Gene RS582326 Polymorphism and Retinopathy of Prematurity (ROP) in Malaysian Infants

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Introduction: Abnormal angiogenesis is the underlying pathogenesis for blinding complications of retinopathy of prematurity[1]. However, angiogenesis is physiologically necessary, hence VEGF variants have been implicated as either protective or associated with higher risk for ROP[2,3]. This study aimed to search for SARDH gene variant association with angiogenesis in severe retinopathy of prematurity. SARDH has been implicated in some tumors.

Methods: A total of 221 infants underwent ROP screening and blood collection after informed consent were taken from parents/guardians. A pilot study detected the presence of SARDH variant. The SARDH single nucleotide polymorphism at rs582326 locus was identified in 5/10 infants with ROP using whole exome sequencing and validated by Sanger sequencing. Three out of four infants with stage 3 disease had SARDH gene (rs582326) C/C polymorphism. TaqMan pre-designed genotyping assay (Applied Biosystems of Life Technologies, Foster city, CA, USA) was performed on the DNA samples. Adjusted odds ratio (OR) was used to assess strength of association between SARDH gene (rs582326) polymorphism and ROP with different genetic models.

Results: After adjusting for age, birthweight and gender, the rs582326 C/C polymorphism was not found to be associated with ROP either in the dominant, recessive or additive models. SARDH gene polymorphism at rs582326 locus was found to have an adjusted odds ratio of 1.39 (95% CI 0.49 - 4.00) in vision-threatening retinopathy of prematurity(VTROP) compared to non-VTROP infants in the dominant model but was not statistically significant.

Conclusion/Relevance: SARDH rs582326 polymorphism was not associated with retinopathy of prematurity angiogenesis in this cohort.

References: 1)Shastry BS, Pendergast SD, Hartzer MK, Liu X, Trese MT. Identification of missense mutations in the Norrie disease gene associated with advanced retinopathy of prematurity. Archives of Ophthalmology 1997; 115(5):651-655.

2) Yian Li, Jiakai Li, Xiang Zhang, Jie Peng, Jing Li, Peiquan Zhao. Identification of Gene Mutations in Atypical Retinopathy of Prematurity Cases. Journal of Ophthalmology Volume 2020, Article ID 4212158. https://doi.org/10.1155/2020/4212158

3) Swan R, Kim JS, Campbell P, et al. The genetics of retinopathy of prematurity: A model for neovascular retinal disease. Ophthalmology Retina 2017 Volume 2, Issue 9, September 2018, Pages 949-962. https://doi.org/10.1016/j.oret.2018.01.016

Poster #C7
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Detectability of Synthetic Retinopathy of Prematurity Retinal Fundus Images

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Introduction: Development of artificial intelligence (AI) algorithms can be limited by a lack of available imaging data, often due to practical limitations or patient privacy considerations. One potential solution is to synthesize realistic medical images of rare diseases using generative adversarial networks (GANs).1,2 In this study, we test the hypothesis that fundus images produced by a newer GAN architecture, pix2pixHD, are realistic enough to be perceived as real by expert clinicians.3

Methods: pix2pixHD was trained to segment fundus images into black/white retinal vessel maps using 200 manually segmented examples. Then, using this GAN, approximately 6000 retinal fundus images from the i-ROP study were segmented into vessel maps, and then reversed to generate color fundus images, which retained similar vascular patterns as original images. 50 real and 50 synthesized images were uploaded to an online grading platform. Four independent, masked ROP experts were tasked with identifying whether images were real or synthetic.

Results: Fisher's Exact Test p-values for the Expert Majority and Experts 1-4, respectively, were: 0.100, 0.505, 0.158, 1.000, and 0.043. This suggests that the majority of experts could not discern between real and synthetic images.

Conclusion/Relevance: The ability to generate realistic synthetic images has a number of potential applications including development of datasets that are challenging to obtain due to practical or privacy considerations, training AI algorithms for rare diseases, augmenting risk prediction models to simulate the expected appearance of progressive disease, and for use in education.

References: 1. Costa P, Galdran A, Meyer MI, et al. Towards Adversarial Retinal Image Synthesis. Published online January 31, 2017. Accessed September 30, 2020. http://arxiv.org/abs/1701.08974
2. Andreini P, Bonechi S, Bianchini M, Mecocci A, Scarselli F, Sodi A. A Two Stage GAN for High Resolution Retinal Image Generation and Segmentation. Published online July 29, 2019. Accessed September 30, 2020. http://arxiv.org/abs/1907.12296
3. Wang T-C, Liu M-Y, Zhu J-Y, Tao A, Kautz J, Catanzaro B. High-Resolution Image Synthesis and Semantic Manipulation with Conditional GANs. Published online November 30, 2017. Accessed September 30, 2020. http://arxiv.org/abs/1711.11585

Poster #C8
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Validation of the WINROP Algorithm for Predicting Retinopathy of Prematurity Requiring Treatment in a Large Canadian Cohort

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Introduction: Retrospective validation studies of WINROP (weight, insulin-like growth factor 1, neonatal, retinopathy of prematurity) in North America have shown variable sensitivities ranging from 81.8-98.6% in detecting severe ROP. As WINROP has yet to be validated in a large Canadian population, we evaluated its use in our neonatal population

Methods: We conducted a retrospective validation study of all infants examined for ROP in one Canadian city between January 2013- December 2017 who met inclusion criteria to be entered into the online WINROP algorithm. Infants' weekly weights were entered until 40 weeks or until an alarm.

Results: 1057 infants were included (mean gestational age 28.4 weeks, mean birth weight 1092 grams). 586 infants were identified by WINROP as high-risk. WINROP correctly predicted Type 1 ROP with a sensitivity of 93.5% (29/31) and 92.3% (24/26) for Type 2 ROP. The sensitivity in detecting infants who required treatment was 95.2% (40/42) and the specificity was 46.2%. The mean time from birth to alarm was 3 weeks and mean time from alarm to treatment was 13 weeks.

Conclusion/Relevance: The WINROP algorithm was effective in detecting ROP requiring treatment in our large Canadian population and could potentially reduce the number of examinations by up to 45%. The algorithm should be used cautiously in infants with genetic abnormalities and high birth weight.

References: 1. Lofqvist C, Hansen-Pupp I, Andersson E, et al. Validation of a new retinopathy of prematurity screening method monitoring longitudinal postnatal weight and insulinlike growth factor I. Archives of ophthalmology (Chicago, Ill : 1960). 2009;127(5):622-627.
2. Jung JL, Wagner BD, McCourt EA, et al. Validation of WINROP for detecting retinopathy of prematurity in a North American cohort of preterm infants. Journal of AAPOS: the official publication of the American Association for Pediatric Ophthalmology and Strabismus. 2017;21(3):229-233.
3. Wu C, Vanderveen DK, Hellstrom A, Lofqvist C, Smith LE. Longitudinal postnatal weight measurements for the prediction of retinopathy of prematurity. Archives of ophthalmology (Chicago, Ill: 1960). 2010;128(4):443-447.

Poster #C9
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Daily Oxygen Supplementation and Risk of Retinopathy of Prematurity

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Introduction: Although higher blood oxygen saturation levels increase the risk of severe retinopathy of prematurity (ROP), complicated measures of respiratory status are impractical as screening criteria. We sought to determine if a simple, clinically useful measure of ROP risk can be developed using degree or duration of oxygen supplementation during the first month of postnatal life.

Methods: North American infants from the G-ROP-1 (29 hospitals, 2006-2012) and G-ROP-2 (41 hospitals, 2015-2017) studies with complete daily supplemental (>21%) oxygen data were studied. Associations between severe ROP and days on supplemental oxygen (DSO) during ages 0-28 days were assessed using multivariable regression, controlling for BW, GA, and other factors. Multiple screening criteria were compared: newly developed criteria incorporating DSO; G-ROP criteria, which include slow weight gain measures; G-ROP updated with DSO; and current guidelines.

Results: 8,949 infants (5,886 G-ROP-1, 3,063 G-ROP-2) were studied. 459 (5.1%) developed Type 1, 523 (5.8%) were treated. DSO during ages 0-28 days was associated with severe ROP overall (aOR 1.054 per day increase, 95%CI 1.039-1.070). The following criteria had 100% sensitivity for Type 1 and higher specificity than current guidelines: new criteria with DSO (BW<901g, GA<26 weeks, DSO>3) had 23% fewer infants examined; modified G-ROP including DSO, 29% fewer; original G-ROP, 32% fewer.

Conclusion/Relevance: A simple DSO measure improves specificity, but is still not as specific as the G-ROP criteria. In high-level neonatal care settings, incorporating simple measures of oxygen supplementation into screening criteria does not improve ROP prediction more than postnatal weight gain.

References: 1. Saugstad OD, Aune D. Optimal oxygenation of extremely low birth weight infants: a meta-analysis and systematic review of the oxygen saturation target studies. Neonatology. 2014;105(1):55-63.
2. Binenbaum et al. Development of Modified Screening Criteria for Retinopathy of Prematurity: Primary Results from the Postnatal Growth and Retinopathy of Prematurity Study. JAMA Ophthalmol. 2018 Sep 1;136(9):1034-1040.

Poster #C10
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Prevalence of Peripheral Avascular Retina in Spontaneously Regressed Retinopathy of Prematurity

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Introduction: Peripheral avascular retina (PAR) predisposes the development of lattice degeneration, atrophic holes, and retinal detachments in individuals with a history of retinopathy of prematurity (ROP).(1) While PAR is commonly observed after vascular endothelial growth factor antagonist therapy for ROP, the prevalence of PAR in spontaneously regressed ROP is unknown.(2,3) In this study, we evaluate the prevalence of PAR in a cohort of patients with a history of extreme prematurity.

Methods: We performed a cross-sectional evaluation of ultra-widefield fluorescein angiography (UWFFA) findings in 30 eyes of 15 patients 4-8 years old recruited from a prospectively collected ROP cohort from the Imaging & Informatics in ROP study. Eyes were excluded if previously treated for ROP. UWFFA was reviewed by two independent, masked graders for presence of PAR.

Results: 15 patients (28 eyes) met inclusion criteria in this ongoing follow-up study. Average (± standard deviation) gestational age and weight were 27.9 (± 2.4) weeks and 1.0 (± 0.25) kg, respectively. Average age was 6.7 (± 1.3) years. 13, 12, and 3 eyes had a history of no, mild, and type-2 ROP. At long-term follow-up, 14/15 (93%) patients demonstrated regions of PAR on UWFFA, with 10/28 (36%) eyes demonstrating non-perfusion with or without leakage in zone 2.

Conclusion/Relevance: These findings indicate a high prevalence of PAR in spontaneously regressed ROP. As survival in extreme prematurity increases, so may the incidence of late vitreoretinal complications even in untreated patients, consequently influencing their longitudinal ophthalmologic management.

References: 1. Hamad AE, Moinuddin O, Blair MP, et al. Late-Onset Retinal Findings and Complications in Untreated Retinopathy of Prematurity. Ophthalmol Retina 2020;4:602-612.
2. Lepore D, Quinn GE, Molle F, et al. Follow-up to Age 4 Years of Treatment of Type 1 Retinopathy of Prematurity Intravitreal Bevacizumab Injection versus Laser: Fluorescein Angiographic Findings. Ophthalmology 2018;125:218-226.
3. Harper 3rd CA, Wright LM, Young RC, Read SP, Chang EY. Fluorescein Angiographic Evaluation of Peripheral Retinal Vasculature After Primary Intravitreal Ranibizumab for Retinopathy of Prematurity. Retina 2019;39:700-705.

Poster #C11
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Management of Stage 3-and-a-half Retinopathy of Prematurity

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Introduction: Stage 3 ROP with an elevated ridge and traction passing to stage 4 is a challenging problem for our tertiary center as we receive infants beyond proper screening times from centers that lack ROP screening programs. Intravitreal Anti-VEGF may provide rapid resolution but carries the risk of crunch and detachment. Laser is theoretically safer, but the retina may have detached before the effect of laser is reached.(1)
In this study we propose naming this condition stage 3-and-a-half ROP and describe our preferred management strategies.

Methods: A retrospective review of 22 eyes of 11 infants who presented with Stage 3-and-a-half ROP from January 2016 till January 2020 in AbulReesh Childrens' Hospital, Cairo University.

Results: Treatment followed one of the following patterns: Group A: Exclusive laser (n=8). Group B: Exclusive injection (n=6) . Group C : A combination of laser and injection in the same setting (n=2) or within 72 hours (n=2) The main outcome was to report the rate of poor outcomes at final follow up, defined as retinal detachment or macular dragging. 22.7 % (n=5) had a poor outcome with 4 eyes in group A (1 eye each) and 1 eyes in group B and no patients in group C.

Conclusion/Relevance: These results suggest that 1 out 5 late presenting eyes will have a poor outcome if treated conventionally. Combining laser and injection appears to provide better outcomes, however this needs to be verified prospectively with more patients Proper screening, and early treatment remain the best ways to prevent this situation from occurring.

References: 1-Yonekawa Y, Thomas BJ, Thanos A, et al. THE CUTTING EDGE OF RETINOPATHY OF PREMATURITY CARE: Expanding the Boundaries of Diagnosis and Treatment. Retina. 2017;37(12):2208-2225. doi:10.1097/IAE.0000000000001719

Poster #C12
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Blindness Secondary to Retinopathy of Prematurity in Sub-Saharan Africa

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Introduction: Africa has been called the 'New Frontier' of Retinopathy of Prematurity (ROP).1 However, it was only previously documented as a cause of blindness in 8 of 48 (16.7%) sub-Saharan African countries. The purpose of this study was to better understand the prevalence and breadth of blindness from ROP in sub-Saharan Africa.

Methods: A questionnaire was sent to 455 ophthalmologists practicing in sub-Saharan Africa; the questionnaire was available in English, French and Portuguese.

Results: Responses were received from 132 of 455 (29%) ophthalmologists to whom the survey was sent. Eighty-three respondents were identified as ROP-involved ophthalmologists and were from 26 of 48 (54%) countries in sub-Saharan Africa. Ophthalmologists in 23 countries reported that they examined at least one child who was blind from ROP during the last 5 years. Sixteen of these countries had not previously reported cases of blindness from ROP in the literature. The prevalence of Type 1 or more severe ROP in their unit was reported to be increasing by 31 of 77 (40%) of all ROP-involved ophthalmologists. ROP-involved pediatric ophthalmologists and retinal surgeons reported the number of infants they had examined annually with Type 1 or more severe ROP had increased from a median of 1 (range: 0-15) to a median of 4 (range: 0-40) from 2015 to 2019. ROP was estimated to be the cause of blindness for 10% of all blind children examined by ROP-involved pediatric ophthalmologists and retinal surgeons during 2019.

Conclusion/Relevance: ROP is becoming a more important and widespread cause of childhood blindness in sub-Saharan Africa.

References: 1. Gilbert C, Malik ANJ, Nahar N, et al. Epidemiology of ROP update - Africa is the new frontier. Semin Perinatol. 2019;43:317-322. doi:10.1053/j.semperi.2019.05.002

Poster #C13
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Reducing Neonatal Pain Scores During Retinopathy of Prematurity (ROP) Screening Exams

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Introduction: ROP examinations are typically carried out using one of two methods. The more common method employs the use of a lid speculum, while the alternative technique requires the ophthalmologist's to open the eyelids without everting the tarsal plate using their fingers. We hypothesized that the use of the finger method would result in reduced infant pain scores during an ROP exam.

Methods: This study adhered to the tenets of the Declaration of Helsinki and was processed by Research Ethics Board under quality improvement. Preterm infants being screened for ROP in the NICU were randomized by week of scheduled screening to examination with lid speculum or finger technique. Pain was assessed using the Premature Infant Pain Profile, which provides a validated objective measure of non-verbal pain on a scale of 0-21 and incorporates post menstrual age, heart rate, and oxygen saturation.

Results: This study included 78 infants (56% female, mean birth weight 688 grams, mean PMA 35.4 weeks). The mean pain scores were 11.2 and 6.3 for the speculum and finger groups respectively. The decrease in pain score observed in the finger method group was statistically significant ($p < 0.001$).

Conclusion/Relevance: The use of the 'finger technique' on suitable infants may decrease procedural pain during ROP screening. In our experience, the finger technique was not suitable for infants with significant eyelid swelling or anteriorly located ROP (anterior zone 2 and zone 3).

References: 1. Dhillon B, Wright E, Fleck BW. Screening for retinopathy of prematurity: are a lid speculum and scleral indentation necessary? Journal of pediatric ophthalmology and strabismus. 1993;30(6):377-381.
2. Kirchner L, Jeitler V, Pollak A, et al. Must screening examinations for retinopathy of prematurity necessarily be painful? Retina (Philadelphia, Pa). 2009;29(5):586-591.
3. Stevens B, Johnston C, Petryshen P, Taddio A. Premature Infant Pain Profile: development and initial validation. The Clinical journal of pain. 1996;12(1):13-22.

Poster #C14
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Comparison of the G-ROP Versus WINROP Algorithm in Predicting Retinopathy of Prematurity

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Introduction: Given its high morbidity, guidelines for Retinopathy of Prematurity (ROP) require high sensitivity for detecting sight-threatening ROP, and many infants are subjected to unnecessary repeated eye examinations. Several models aim to improve specificity based on postnatal weight gain. Initial validation studies for the WINROP algorithm have shown variable sensitivity, limiting its clinical use. The G-ROP algorithm was more recently developed and utilizes six specific criteria, with promising initial validation studies. However, G-ROP hasn't been validated in a Canadian population. The purpose of this study was to validate the G-ROP algorithm and compare its sensitivity and specificity to the WINROP algorithm in detecting infants with ROP requiring treatment.

Methods: This retrospective validation study was performed between January 2013 and December 2017 to identify all infants who had undergone ROP screening at any of the five neonatal intensive care units in Calgary, Alberta. Infants and their weekly weights were entered into the WINROP and G-ROP algorithms.

Results: 1002 infants were included (mean gestational age 28.4 weeks, mean birth weight 1092 grams). WINROP had a 95% sensitivity and 46% specificity in detecting infants requiring treatment. Two infants with ROP were not detected with WINROP. G-ROP had 100% sensitivity and 50% specificity in detecting infants requiring treatment.

Conclusion/Relevance: G-ROP was able to detect all infants requiring treatment for ROP in our large Canadian cohort compared to 44 of 46 for WINROP. G-ROP is a promising screening tool that can be used in our patient population with further validation studies.

References: Zepeda-Romero, L. C., Hård, A. L., Gomez-Ruiz, L. M., Gutierrez-Padilla, J. A., Angulo-Castellanos, E., Barrera-de-Leon, J. C., ... & Löfqvist, C. (2012). Prediction of retinopathy of prematurity using the screening algorithm WINROP in a Mexican population of preterm infants. Archives of Ophthalmology, 130(6), 720-723.
Choi, J. H., Löfqvist, C., Hellström, A., & Heo, H. (2013). Efficacy of the screening algorithm WINROP in a Korean population of preterm infants. JAMA ophthalmology, 131(1), 62-66.
Lundgren, P., Sjöström, E. S., Domellöf, M., Smith, L., Wu, C., VanderVeen, D., ... & Löfqvist, C. (2015). The specificity of the WINROP algorithm can be significantly increased by reassessment of the WINROP alarm. Neonatology, 108(2), 152-156.

Poster #C15
Sunday, April 11, 2021
11:30 AM – 12:30 PM

A Comparison of Primary Laser versus Delayed Laser after Bevacizumab for Type 1 Retinopathy of Prematurity (ROP)

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Introduction: While type 1 ROP may initially be treated with bevacizumab, subsequent laser may be required. We sought to compare the characteristics of laser photocoagulation performed as primary treatment versus 'delayed' laser performed after primary bevacizumab treatment for type 1 ROP.

Methods: We performed a retrospective cohort study of consecutive infants treated for type 1 ROP before post-menstrual age 36 weeks from 2010-2018. Infants treated with primary laser only were compared to infants initially treated with intravitreal bevacizumab and then subsequently treated with laser. Primary outcome was number of laser spots. Secondary outcomes included: mean power, gross energy (spots*power*duration), return to baseline respiratory status, and vascularization reaching the nasal ora.

Results: Twenty-four eyes treated with delayed laser required fewer laser spots than 52 eyes treated with primary laser (mean 1022 vs. 1376, P=0.0005). Delayed laser also resulted in: lower power (mean 192 mW vs. 221 mW, P=0.0117), lower gross energy (mean 37 vs. 61, p=0.0001), more frequent return to respiratory baseline by 24 hours (7/11 vs. 6/26 patients, P=0.0187) and more frequent vascularization to the nasal ora at time of laser (10/24 vs. 3/52, P=0.0045) than primary laser.

Conclusion/Relevance: Delayed laser after bevacizumab resulted in fewer spots, less power, less gross energy, quicker return to respiratory baseline and greater vascularization to the nasal ora than primary laser. When required, delayed laser may be less severe and better tolerated than primary laser. Further research is needed to confirm these results and determine the indications for retreatment with laser after bevacizumab.

References: 1. Lee, J. Y., Chae, J. B., Yang, S. J., Yoon, Y. H., & Kim, J. G. (2010). Effects of intravitreal bevacizumab and laser in retinopathy of prematurity therapy on the development of peripheral retinal vessels. Graefe's Archive for Clinical and Experimental Ophthalmology, 248(9), 1257-1262.
2. Mintz-Hittner, H. A., Kennedy, K. A., & Chuang, A. Z. (2011). Efficacy of intravitreal bevacizumab for stage 3+ retinopathy of prematurity. New England Journal of Medicine, 364(7), 603-615.
3. Yoon, J. M., Shin, D. H., Kim, S. J., Ham, D. I., Kang, S. W., Chang, Y. S., & Park, W. S. (2017). Outcomes after laser versus combined laser and bevacizumab treatment for type 1 retinopathy of prematurity in zone I. Retina, 37(1), 88-96.

Poster #C16
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Retinopathy of Prematurity and Telemedicine in Developing Countries

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Introduction: Retinopathy of prematurity (ROP) is one of the leading causes of childhood blindness in developing countries where we can observe financial deficiencies and lack number of ophthalmologists for adequate ROP screening. These are the preliminary results from a broader study which aims to evaluate the effectiveness of telemedicine using non-contact digital fundus camera as a coadjuvant in the detection of severe cases of retinopathy of prematurity.

Methods: transversal study, carried out in maternities of the Municipal Health Bureau of Rio de Janeiro. It ranged from Apr 2018 to May 2019. The first exam was taken between the 4th and 6th week of life, with indirect binocular ophthalmoscopy (observer 1) and digital image capture with the Pictor Plus®, Volk camera, which was remotely evaluated by two other ophthalmologists (observer 2 and 3), aiming to compare the results.

Results: 126 patients were submitted to evaluation and a total of 233 exams were taken (466 eyes); Mean GA 29 + 2 wk. Mean BW 1195 + 310 g. Mean days of life at the first examination 52 + 21 days. Interobserver 1 and 2 agreement: k 0,761 (CI 0,668-0,854); p<0,001; Proportions of agreement 0,943 (CI 0,915-0,962) and interobserver 1 and 3 agreement: k 0,626 (CI 0,511-0,741); p<0,001; Proportions of agreement 0,971 (CI 0,891-0,944).

Conclusion/Relevance: Statistical analysis of the results suggest that the use of noncontact digital fundus camera, which has lower cost than wide-angle ones, may be effective as a telemedicine tool in the detection of posterior pole disease and preventing child blindness.

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.
2. Prakalapakorn SG, Wallace DK, Freedman SF. Retinal imaging in premature infants using the Pictor noncontact digital camera. J AAPOS. 2014;18(4):321-326.
3. Classification of Retinopathy of Prematurity. The International Classification of Retinopathy of Prematurity Revisited. Arch Ophthalmol. 2005;123(7):991-999.

Poster #C17
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Machine Learning and Logistic Mixed Model Approach to Create Handheld Optical Coherence Tomography Models Predicting Referral-Warranted Retinopathy of Prematurity

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Introduction: Handheld spectral domain optical coherence tomography (SD-OCT) is a non-invasive imaging tool recently used to identify findings associated with retinopathy of prematurity (ROP) severity not visible by standard screening methods.[1,2]

Methods: Prospective, observational study of premature infants screened for ROP between July 2015 and February 2018. Indirect ophthalmoscopy identified infants with referral-warranted ROP,[3] which for this study also included pre-plus disease. Handheld SD-OCT was performed on the same day and graded for findings associated with ROP severity. Extreme gradient boosting by machine learning and a generalized linear mixed model approach were performed on demographic and imaging data to create models predicting referral-warranted ROP.

Results: This study included 167 imaging sessions of 71 infants (45% male, mean gestational age 28.2 +/- 2.8 weeks, birth weight 995.6 +/- 292.0 grams). The area under the receiver operating characteristic curve (AUC) was 0.83 for the machine learning model, 0.96 for the generalized linear mixed model. The strongest predictors in both models were birth weight, gestational age, Vitreous Opacity Ratio (vitreous opacities per unit vitreous area), vessel elevation, and hyporeflective vessels. A generalized linear mixed model that included only demographic data, without OCT findings, yielded an AUC of 0.68.

Conclusion/Relevance: Multivariate models to predict referral-warranted ROP can be developed from demographic and handheld OCT data. A generalized linear mixed model resulted in a more accurate prediction of referral-warranted ROP compared to extreme gradient boosting by machine learning. Creating and validating similar mathematical models in larger datasets may lead to a useful, non-invasive ROP screening tool.

References: 1. Zepeda EM, Shariff A, Gillette TB, et al. Vitreous Bands Identified by Handheld Spectral-Domain Optical Coherence Tomography Among Premature Infants. JAMA Ophthalmol. 2018;136(7):753-758.
2. Maldonado RS, Yuan E, Tran-Viet D, et al. Three-dimensional assessment of vascular and perivascular characteristics in subjects with retinopathy of prematurity. Ophthalmology. 2014;121(6):1289-1296.
3. Ells AL, Holmes JM, Astle WF, et al. Telemedicine approach to screening for severe retinopathy of prematurity: a pilot study. Ophthalmology. 2003;110(11):2113-2117.

Poster #C18
Sunday, April 11, 2021
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Characteristics of Spontaneous Regression of Mild and Moderate Retinopathy of Prematurity (ROP)

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Introduction: We aim to explore the characteristics of ROP which is not treated and spontaneously regresses.

Methods: A retrospective chart review of 521 consecutive infants screened for ROP from 2016-2019 was performed. Data were collected on patients with at least stage 1 ROP, but who were not treated. Highest stage of ROP was noted. The primary outcome measure was presence of residual fibrotic retinal tissue at discharge from ROP screening. Secondary outcome measures include: vitreous hemorrhage, presence of residual fibrotic vitreous tissue, and retinal detachments noted after discharge from ROP screening. Comparisons between groups were made using Fisher exact tests.

Results: 131 patients (262 eyes) met inclusion criteria. Eyes whose highest stage of ROP was stage 2 or 3 showed more residual fibrotic retinal tissue at discharge from ROP screening (48/81 eyes, 59%) than eyes whose highest stage of ROP was stage 1 (9/181, 5%) ($P<0.0001$). Of the 57 eyes with residual fibrotic tissue at discharge from ROP screening, 38 had subsequent follow up, and none went on to develop retinal detachment. One eye had vitreous hemorrhage noted at post-menstrual age 44 1/7 weeks. Three of 262 eyes (1%) had fibrotic vitreous tissue at discharge.

Conclusion/Relevance: Residual fibrotic retinal tissue is not uncommon after spontaneous regression of ROP, particularly in patients with stage 2 or 3. Despite residual fibrosis, we did not identify any patients who developed RD after discharge from acute ROP screening. Our data support the current AAP guidelines for discharge of patients with spontaneously regressed ROP.

References: Fierson WM. Screening Examination of Premature Infants for Retinopathy of Prematurity. Pediatrics. 2018;142

Poster #C19
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Do All Children Screened for Retinopathy of Prematurity Require Follow-Up Ophthalmic Examinations after Discharge?

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Introduction: The current expert guidelines for retinopathy of prematurity screening (ROP) include recommendation for a 4-6 month follow-up after the final ROP exam to screen for cataracts, strabismus, and amblyogenic refractive errors. Because there is a shortage of ophthalmologists and families of premature children are burdened by travel/appointments, we reviewed ocular findings at 4-6 month follow-up.

Methods: Records of children screened for ROP at St. Louis Children's Hospital between 1/1/2013-12/31/2018 were included. 1379 babies met screening criteria, 1108 survived to first eye exam, 424 had 4-6 month follow-up. Patients with a history of ROP requiring treatment and congenital defects requiring long-term ophthalmology follow-up were excluded leaving 309 patients.

Results: First follow-up occurred at 1.04+/-0.68 years. Patients were a median of 27 weeks gestational age at birth (range 22-37 weeks). 6 patients (1.9%) were diagnosed with amblyopia based on a better visual acuity in 1 eye. 13 patients (4.2%) were diagnosed with a refractive error requiring glasses based on AAO Preferred Practice Pattern guidelines. 22 patients (7.1%) had strabismus defined as a tropic deviation greater than 10 PD. 0 patients had cataracts. 33 patients (10.6%) had one of the above diagnoses.

Conclusion/Relevance: Published incidences of cataracts, strabismus, refractive error, and amblyopia at age 12 months are limited. However, it is possible that the incidences in our cohort are not significantly greater than among non-premature children. Additional research is needed to determine whether all patients undergoing ROP screening require follow-up after commencement of screening exams.

References: Preferred Practice Patterns. Pediatric Eye Evaluations. American Academy of Ophthalmology. https://www.abcd-vision.org/references/AAO-2007PediatricEyePPP.pdf
American Academy of Pediatrics Section on Ophthalmology. Screening Examination of Premature Infants for Retinopathy of Prematurity. Pediatrics 2013;131;189.

Poster #C20
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Preterm Infant Stress during Handheld Optical Coherence Tomography versus Binocular Indirect Ophthalmoscopy Examination for Retinopathy of Prematurity

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Introduction: Exposure of preterm infants to stress can lead to neurodevelopmental deficits. We compared stress during investigational optical coherence tomography (OCT) imaging to that during binocular indirect ophthalmoscopy (BIO) examination for retinopathy of prematurity (ROP).

Methods: In this prospective observational study, infants were examined at the bedside in the intensive care nursery. We included 16 preterm infants (mean ± standard deviation gestational age of 27±3 weeks and birth weight of 869±277grams) enrolled in the STudy of Eye imaging in Preterm infantS (BabySTEPS) (clinicaltrials.gov: NCT02887157) who qualified for ROP screening and had written consent by a parent or legal guardian. We measured infant stress using a modified neonatal pain assessment tool that assessed infant cry score, facial expression, heart rate, respiratory rate, and oxygen saturation, before (baseline) and during OCT imaging and BIO examination of each the first and second eyes.

Results: For 71 eye examinations of 16 infants, mean change from baseline to OCT/BIO exam was lower during OCT imaging than during BIO for infant cry score (first eye: 0.03±0.3 vs 1.68±1.2, respectively; second eye: 0.1±0.3 vs 1.97±1.2, respectively), facial expression (first eye: 4% vs 83%, respectively; second eye: 6% vs 88%, respectively), and heart rate (first eye: -7±16 vs 13±18, respectively; second eye: -3±18 vs 20±20beats per minute, respectively) ($p<0.001$ for all). Change in respiratory rate and oxygen saturation did not differ between OCT imaging and BIO.

Conclusion/Relevance: For preterm infants, investigational OCT imaging of ROP is less stressful than BIO examination by an expert pediatric ophthalmologist.

References: 1. Younge N, Goldstein RF, Bann CM, et al. Survival and Neurodevelopmental Outcomes among Periviable Infants. N Engl J Med. 2017;376(7):617-628.
2. Smith GC, Gutovich J, Smyser C, et al. Neonatal intensive care unit stress is associated with brain development in preterm infants. Ann Neurol. 2011;70(4):541-549.

Poster #C21
Sunday, April 11, 2021
11:30 AM – 12:30 PM

A Comparison of ROP in Preterm Infants over 1000 grams: Shreveport, LA and Kyiv, Ukraine

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Introduction: This study explores the incidence and prevalence of Type 1 ROP and stage 4 and 5 ROP in infants with birth-weights over 1000 grams in two cities: Kyiv, Ukraine and Shreveport, LA.

Methods: Preterm infants seen at the National Children Specialized Hospital 'Ohmatdyt', a large tertiary referral hospital in Kyiv, Ukraine were compared to three NICU units in Shreveport, LA, to contrast the incidence and severity of ROP in pre-term infants with birth-weights over 1000 grams.

Results: In Shreveport, LA, 113 preterm infants with birth-weights 1000 grams or greater were identified. None developed Type 1 ROP. Stage 1 or 2 ROP was noted in 25 infants (22.1%). Two infants (1.7%) developed stage 3 ROP. None developed plus disease and none required treatment.
In Kyiv, Ukraine, 245 infants with birth-weights 1000 grams or more were identified. Type 1 ROP requiring laser developed in 89 (36.3%). Aggressive posterior ROP (AP-ROP) developed in 29 patients (11.8%). Twenty- four patients (9.8%) developed stage 4a or 4b ROP requiring vitrectomy. In infants with birth-weights 1500-1999 grams, 21/73 (28.7%) infants developed Type 1 ROP. Eleven of this group (15%) required vitrectomy for stage 4a or 4b retinal detachment. Two patients with birth-weights over 2000 grams developed Type 1 ROP. One had AP-ROP.

Conclusion/Relevance: Severe ROP in infants with birth-weights over 1000 grams is common in Ukraine (and likely many other middle-income countries). The results are likely due to differences in NICU care.

References: 1- Cryotherapy for Retinopathy of Prematurity Cooperative Group, Multicenter trial of cryotherapy for retinopathy of prematurity: ophthalmological outcomes at 10 years. Arch Ophthalmol. 2001;1191110- 1118
2-Gilbert C, Foster A . Childhood blindness in the context of Vision 2020-the right to sight. Bull World Health Organ 2001; 79: 227-232.
3- 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: 1684-1694.

Poster #C22
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Validation of a Retinopathy of Prematurity Activity Scale

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Introduction: A retinopathy of prematurity (ROP) activity scale was developed to provide a standardized ordinal approach to track disease progression and regression in clinical trials (Smith et al., 2018). We sought to validate the activity scale in two large, diverse cohorts.

Methods: Secondary analysis of two multicenter cohort studies (one retrospective and one prospective) conducted at 45 hospitals in North America (G-ROP). Stage, zone and plus diagnoses of eyes were used to assign activity scores ranging from 0 to 22; and mild (0-7), moderate(8-12), and severe(13-22) classifications; following the paradigm in the original publication. Primary outcomes were proportions of eyes developing Type 1 ROP or treatment.

Results: 95,067 examinations of 22,899 eyes were studied. ROP was 'mild' in 92.8%, moderate in 5.1%, and severe in 2.1% of examinations. Risk of Type 1 ROP/treatment increased with increasing initial-examination activity score for all but 3 of the 22 levels. Across all postmenstrual ages, 'moderate' scores had higher risk of progression to Type 1/treatment than 'mild'scores. At treatment, 79.4% of treated eyes had 'severe', 16.6% 'moderate', and 3.9% 'mild' disease scores.

Conclusion/Relevance: This ROP activity scale was validated using patient data. The findings generally support the scale sequence and broad categorizations of severity, but the sequences of scale points for which risk of Type 1/treatment does not increase stepwise should be reconsidered.

References: Smith LEH, Hellström A, Stahl A, et al. Development of a Retinopathy of Prematurity Activity Scale and Clinical Outcome Measures for Use in Clinical Trials. JAMA Ophthalmol. 2018;137(3):305–311.
Binenbaum G, Bell EF, Donohue P, et al. Development of Modified Screening Criteria for Retinopathy of Prematurity: Primary Results From the Postnatal Growth and Retinopathy of Prematurity Study. JAMA Ophthalmol. 2018;136(9):1034–1040.

Poster #C23
Sunday, April 11, 2021
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Brain Development in Infants Treated for Retinopathy of Prematurity (ROP) with Anti-VEGF Injection vs Laser Using Data from Term Brain MRIs

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Introduction: Anti-VEGF agents have emerged as a valuable treatment for retinopathy of prematurity (ROP), especially in posterior Type 1 disease. Though long-term safety in infants is largely unknown, growing evidence suggests anti-VEGF agents may effect newborn neuro-development. Intravitreal bevacizumab (IVB) is absorbed systemically and leads to suppression of serum VEGF for 2 weeks1. Pre-term infants treated with IVB versus laser had higher odds of neurodevelopmental delay2. Additionally, recent animal studies demonstrate reduced white matter development in fetal mice after injection with anti-VEGF3.

This study will evaluate white matter development in the term brain MRIs of infants treated for Type 1 ROP by IVB vs laser.

Methods: With the Developing Brain Institute, total Kidokoro score with white and grey matter sub-scores will be compared from Term Brain MRIs of 56 infants treated for ROP with IVB or laser photocoagulation. The scoring neuro-radiologist is blinded to ROP treatment group.

Results: For the period of 2006 to 2020, 56 premature infants were identified with a "Term MRI" between 36 and 46 weeks postmenstrual age performed after ROP treatment. Kidokoro scoring is ongoing for those not previously scored at the institute. Demographics, medical comorbidities and time from ROP treatment to term MRI will be considered in our statistical analysis. Infants with congenital brain malformations will be excluded.

Conclusion/Relevance: Term brain MRI analysis by Kidokoro scoring may contribute to our understanding of the long-term safety of intravitreal bevacizumab.

References: 1. Wu WC, Lien R, Liao PJ, et al. Serum levels of vascular endothelial growth factor and related factors after intravitreous bevacizumab injection for retinopathy of prematurity. JAMA Ophthalmol. 2015;133(4):391-397. doi:10.1001/jamaophthalmol.2014.5373

2. Morin J, Luu TM, Superstein R, Ospina LH, Lefebvre F, Simard MN, Shah V, Shah PS, Kelly EN; Canadian Neonatal Network and the Canadian Neonatal Follow-Up Network Investigators. Neurodevelopmental Outcomes Following Bevacizumab Injections for Retinopathy of Prematurity. Pediatrics. 2016 Apr;137(4):e20153218. doi: 10.1542/peds.2015-3218. Epub 2016 Mar 17. PMID: 27244705.

3. Scafidi J, Ritter J, Talbot BM, Edwards J, Chew LJ, Gallo V. Age-Dependent Cellular and Behavioral Deficits Induced by Molecularly Targeted Drugs Are Reversible. Cancer Res. 2018 Apr 15;78(8):2081-2095. doi: 10.1158/0008-5472.CAN-17-2254. Epub 2018 Mar 20. PMID: 29559476; PMCID: PMC5899652.

Poster #C24
Sunday, April 11, 2021
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Trends in Retinopathy of Prematurity Screening, Incidence, Severity, and Treatment in the United States, the Vermont Oxford Network Experience from 2008-2018

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Introduction: Retinopathy of Prematurity (ROP) is the leading preventable and treatable cause of childhood blindness in the United States (US).1 Vermont Oxford Network (VON) is a voluntary collaborative of over 1200 neonatal intensive care units (NICUs) worldwide. The purpose of this study was to evaluate the trends in ROP screening, incidence, severity, and treatment in US NICUs over the last 11 years.

Methods: We assessed trends in the proportion of eligible infants that received ROP screening, incidence, severity, and treatment of ROP from 2008-2018 using logistic regression models.

Results: This analysis includes standardized data collected on 381,065 infants at 819 US NICUs participating in VON from 2008-2018. Over time, more eligible infants received ROP screening (89% in 2008 to 91% in 2018, trend $p<0.001$), of those screened, less ROP was reported at every stage (overall, 37% in 2008 to 32% in 2018, trend $p<0.001$), less retinal ablation (laser or cryotherapy) was performed (6% in 2008 to 2% in 2018, trend $p<0.001$), and more anti-vascular endothelial growth factor (VEGF) was injected (1% in 2012 to 2% in 2018, trend $p<0.001$).

Conclusion/Relevance: Amongst NICUs in the US participating in VON from 2008-2018, more infants were screened for ROP, less ROP was reported at all stages, and while less surgery was performed, the use of anti-VEGF treatment has increased. However, up to 10% of eligible infants are still not being screened for ROP while in the NICU. Neonatal networks provide valuable information to help understand performance over time and opportunities for quality assessment/improvement.

Reference: 1) Kong L, Fry M, Al-Samarraie M, Gilbert C, Steinkuller PG. An update on progress and the changing epidemiology of causes of childhood blindness worldwide. J AAPOS. 2012;16:501-507.

Poster #C25
Sunday, April 11, 2021
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Effects of Altitude on Retinopathy of Prematurity

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Introduction: Given the myriad bodily effects of both high altitude and prematurity in their own right, we explored whether increasing altitude affects the incidence, onset, or severity of retinopathy of prematurity (ROP).

Methods: Secondary analysis was performed using ROP screening data on 11,463 infants from two North American Studies: G-ROP-1 (retrospective, 7483 infants from 29 hospitals, 2006-2012) and G-ROP-2 (prospective, 3980 infants from 41 hospitals, 2015-2017). Outcomes included rates and timing of onset of any ROP or severe (type 1, 2, or treated) ROP, stratified by hospital altitude and controlled for birth weight and gestational age in multivariable analysis.

Results: Hospital elevation ranged from 13 to 5280 feet above sea level. Severe ROP developed in 1,434/11,463 (12.5%) infants. For every 500-ft elevation increase, there was a small but significant increase in the rate of any ROP (adjusted odds ratio (aOR) 1.04, 95% CI 1.02-1.06, p=0.001) and severe ROP (aOR 1.03 95% CI 1.00-1.06, p=0.03). ROP incidence was 48.3% at high (>4000 ft) and 42.1% at low (<1400 ft) altitude (p=0.44). Severe ROP incidence was 17.2% at high versus 12.2% at low altitude (p=0.01). Postmenstrual age (PMA) at development of any ROP did not differ between high and low altitude (mean 35.8 and 35.7 weeks, respectively). However, for every 500 feet higher, severe ROP developed 0.14 PMA weeks later. (37.9 versus 36.9 weeks at high and low altitudes respectively, 95% CI 0.07-0.20, p<0.001).

Conclusion/Relevance: While the initial onset of ROP appears unaffected, increasing altitude is associated with increased risk, and delayed onset, of severe ROP.

References: 1. Martínez JI, Román EM, Alfaro EL, Grandi C, Dipierri JE. Geographic altitude and prevalence of underweight, stunting and wasting in newborns with the INTERGROWTH-21st standard. J Pediatr (Rio J). 2019;95:366-73.

2. Lee SK, Ye XY, Singhal N, De La Rue S, Lodha A, Shah PS, for The Canadian Neonatal Network. Higher Altitude and Risk of Bronchopulmonary Dysplasia among Preterm Infants. Am J Perinatol. 2013;30(07): 601-606.

Poster #C26
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Late Visual Outcomes in Infants Treated with Primary Bevacizumab for Type 1 Retinopathy of Prematurity

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Introduction: To describe visual acuity after 4 years of age in infants treated with primary bevacizumab (IVB) for type 1 retinopathy of prematurity (ROP) and to correlate structural findings on fluorescein angiography (FA) with functional outcomes.

Methods: Infants born between 1/2011 and 1/2014 were identified by review of the medical records. Visual acuity was measured after 4 years of age. As described in the ET-ROP study, normal visual acuity was 20/40 (logMar 0.3) or better. Examination under anesthesia with FA and prophylactic laser if necessary was recommended for all patients who received primary IVB. Vascular abnormalities were reviewed by 2 experts.

Results: A total of 23 infants (46 eyes) completed visual acuity testing. Median age was 6 years (IQR, 4-7). Median visual acuity was logMAR 0.18 (IQR, 0-0.3). Normal vision was recorded for 39/46 (85%) eyes. Twenty-one patients (42 eyes) completed an examination under anesthesia with FA. All eyes had some peripheral capillary abnormalities (shunts, tangles, or abnormal branching); most had peripheral nonperfusion (90%) and leakage (64%).

Conclusion/Relevance: Most eyes treated with IVB for type 1 ROP had normal visual acuity. Our results after IVB in this study compare favorably to 6-year visual outcomes in the ET-ROP study, in which 34.6% of early-treated eyes had normal visual acuity. Nonetheless, a high percentage of eyes had abnormal vascular patterns on FA, which may be related to underlying ROP or to treatment. Peripheral vascular changes are common in eyes with ROP treated with IVB, but they do not preclude excellent visual acuity.

References: 1. Early Treatment for Retinopathy of Prematurity Cooperative Group; Good WV, Hardy RJ, Dobson V, et al. Final visual acuity results in the early treatment for retinopathy of prematurity study. Arch Ophthalmol 2010;128:663-71.
2. Mintz-Hittner HA, Kennedy KA, Chuang AZ; BEAT-ROP Cooperative Group. Efficacy of intravitreal bevacizumab for stage 3+ retinopathy of prematurity. N Engl J Med 2011;364:603-15.
3. Lepore D, Quinn GE, Molle F, et al. Follow-up to age 4 years of treatment of type 1 retinopathy of prematurity intravitreal bevacizumab injection versus laser: fluorescein angiographic findings. Ophthalmology 2018;125:218-26.

Poster #C27
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Effects of Timing and Type of Enteral Feedings on Risk of Retinopathy of Prematurity

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Introduction: Enteral feedings are more beneficial than parenteral feedings to extremely premature infants. Early feedings decrease risk of necrotizing enterocolitis and bronchopulmonary dysplasia, but effects on retinopathy of prematurity (ROP) are not known. We evaluated the effects of timing and type of enteral feedings on risk of ROP.

Methods: Retrospective cohort study of infants at 29 North-American hospitals in 2006-2012 (The G-ROP Study). Associations were evaluated between enteral feeding status by week of life and any ROP or SEVERE ROP (ETROP Type 1 or Type 2), adjusting for birthweight (BW) and gestational age (GA) using multivariable regression, and between type of feeding (breastmilk vs formula) and risks of any ROP and SEVERE ROP, adjusting for BW, GA, and the week of life enteral feedings were initiated.

Results: Among 7483 infants, 3224(43.1%) had ROP, and 931(12.4%) severe ROP. Compared to NPO, any enteral feeding was independently protective for any ROP and SEVERE ROP in each of weeks 1-6, with adjusted odds ratios ranging from 0.5 to 0.74 ($p<0.02$-0.0001) for ANY ROP and 0.43 to 0.59 ($p<0.02$-0.0001) for SEVERE ROP. Feeding type (breastmilk vs formula) was not associated with risk of ROP or severe ROP.

Conclusion/Relevance: Enteral feeding during each of the first 6 weeks of life was strongly associated with a lower risk of ROP and severe ROP. However, ROP risk was not impacted by the choice of breastmilk over formula. NICU care protocols should be evaluated for opportunities to provide enteral feedings of any type as early as possible.

References: 1. Development of Modified Screening Criteria for Retinopathy of Prematurity: Primary Results From the Postnatal Growth and Retinopathy of Prematurity Study. Binenbaum G, Bell EF, Donohue P, Quinn G, Shaffer J, Tomlinson LA, Ying GS; G-ROP Study Group. JAMA Ophthalmol. 2018 Sep 1;136(9):1034-1040.
2. Wildhaber BE, Yang H, Spencer AU, Drongowski RA, Teitelbaum DH. Lack of enteral nutrition--effects on the intestinal immune system. J Surg Res. 2005;123(1):8-16.
3. Quigley M, Embleton ND, McGuire W. Formula versus donor breast milk for feeding preterm or low birth weight infants. Cochrane Database Syst Rev. 2018;6:CD002971.

Poster #C28
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Vitreous Opacities in Full-Term and Preterm Infants by Handheld Swept Source Optical Coherence Tomography

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Introduction: This study used an investigational handheld swept-source optical coherence tomography (SS-OCT) (1) device to compare punctate vitreous opacity density in full-term and preterm infants.

Methods: In this prospective cohort study, 251 SS-OCT imaging sessions were performed on 78 infants (49% female, 36% preterm with mean 1018±338 grams birth weight, 28.6±3.2 weeks gestational age) between April 2018-June 2019. Full-term infants underwent imaging once at <72 hours of life, and preterms were imaged at each routine retinopathy of prematurity (ROP) examination. Three masked, trained graders analyzed images for predetermined imaging findings. Semiautomated methods quantified the vitreous opacity density.

Results: All SS-OCT sessions produced adequate quality images to determine presence or absence of punctate vitreous opacities. Punctate vitreous opacities were present in 25/28 (89%) preterms and 41/50 (82%) full-terms. Dice coefficient and F1 score, used to assess intergrader vitreous opacity density agreement, were 0.99±0.03 and 0.77±0.31, respectively. Vitreous opacity density in preterms was 0.118±0.2, compared to 0.031±0.1 in full-terms (p=0.009). In preterms, vitreous opacity density correlated with ROP zone (p=0.044) and stage (p=0.031), intraventricular hemorrhage (p=0.028), subchorionic hemorrhage (p=0.026), and African American race (p=0.023), but not plus disease (p=0.818). In full-terms, vitreous opacity density correlated with maternal diabetes (p=0.049).

Conclusion/Relevance: Our investigational handheld SS-OCT achieves high quality vitreoretinal images in awake infants. Punctate vitreous opacities are a frequent finding in both full-term and preterm infants, with increased density in preterms, especially those with severe ROP.

References: 1. Moshiri Y, Legocki A, Zhou K, et al. Handheld Swept-Source Optical Coherence Tomography with Angiography in Awake Premature Neonates. Quant Imaging Med Surg, 2019;9:1495-1502.

Poster #C29
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Semi-Automated Vessel Analysis of En Face Vessel Maps of the Posterior Pole Generated from Bedside Optical Coherence Tomography

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Introduction: We recently showed the feasibility of using en face vessel maps generated from bedside optical coherence tomography (OCT) to evaluate posterior pole vascular disease in retinopathy of prematurity.1 The purpose of this study was to evaluate the feasibility of using semi-automated vessel analysis software (ROPtool) to detect plus or pre-plus disease in these images.

Methods: Using OCT images captured prospectively from preterm infants under the BabySTEPS study, we selected one imaging session/eye using a pre-determined algorithm to maximize the proportion with pre-plus and plus disease. For this feasibility study, we generated en face vessel maps from imaging sessions which captured all four quadrants (using </=4 images/session). Two non-ophthalmologist tracers analyzed the images with ROPtool using quadrant-level methodology2 to extract dilation and tortuosity indices: tortuosity index (TI), dilation index (DI), sum of adjusted indices (SAI), and tortuosity-weighted plus (TWP). We used receiver operator characteristic (ROC) curves to evaluate ROPtool's ability to identify plus or pre-plus disease, using clinical examination results as the reference.

Results: Of 42 eyes (21 infants), 1 had plus, 6 pre-plus, and 35 neither on clinical examination. ROPtool tracers 1 and 2 could trace 98% (165/168) and 94% (158/168) of the quadrants, respectively, and >/=3 quadrants/session in 98% (41/42) and 95% (40/42) of eyes, respectively. For each index, the area under the ROC curves for detecting plus or pre-plus disease for tracer 1vs2 was: TI, 0.92vs0.92; DI, 0.67vs0.77; SAI, 0.90vs0.91; and TWP, 0.91vs.0.91, respectively.

Conclusion/Relevance: ROPtool can trace en face OCT vessel maps to accurately detect plus and pre-plus disease.

References: 1. Seely KR, Wang KL, Tai V, et al. Auto-Processed Retinal Vessel Shadow View Images From Bedside Optical Coherence Tomography to Evaluate Plus Disease in Retinopathy of Prematurity. Transl Vis Sci Technol. 2020;9(9):16.
2. Weinert MC, Wallace DK, Freedman SF, Riggins JW, Gallaher KJ, Prakalapakorn SG. ROPtool analysis of plus and pre-plus disease in narrow-field images: a multi-image quadrant-level approach. J AAPOS. 2020;24(2):89.

Poster #C30
Sunday, April 11, 2021
11:30 AM – 12:30 PM

A Smartphone Application to Measure Neurodevelopmental Outcomes among Infants with Retinopathy of Prematurity

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Introduction: To describe a smartphone application (BabyMoves) for remote neurodevelopmental evaluation of infants with ROP using the General Movement Assessment (GMA). The GMA reliably predicts cerebral palsy (CP) at 3-4 months corrected age, is the most sensitive and specific early marker of neurocognitive impairment, and correlates with white matter abnormalities on MRI as well as Bayley (BSID-III) scores.

Methods: Prospective study including patients screened for ROP from 10/2019 to present. The primary outcome measure was the absence of fidgety movements on the GMA, which predicts CP.

Results: Seventy families have consented, of which 38 videos were completed-a majority black (80%) and female (61%). Overall, 22/38 had any ROP, 11/38 had severe ROP, and 4/38 received primary bevacizumab for Type 1 ROP. Twelve (32%) had videos suspicious for Cerebral Palsy (CP). Compared to infants with mild or no ROP, infants with severe ROP had 4x increased odds of CP ($p = 0.06$), which was not significant after controlling for severe intraventricular hemorrhage (IVH). At this time, bevacizumab does not appear associated with CP ($p = 0.41$), while shunted hydrocephalus is strongly linked to CP ($p = 0.01$).

Conclusion/Relevance: While enrollment is ongoing, preliminary results are reassuring that remote assessment via a smartphone application can expedite neurodevelopmental outcomes among patients with ROP. While BSID scores are needed, the GMA can help establish the developmental trajectory. Particularly in post-COVID times, remote assessment has signficant benefits. BabyMoves offers a convenient, economical way to evaluate the systemic implications of ROP treatment.

References:

1. Bosanquet M, Copeland L, Ware R, Boyd R. A systematic review of tests to predict cerebral palsy in young children. Dev Med Child Neurol. 2013;55(5):418-426.
2. Peyton C, Yang E, Msall ME, et al. White matter injury and general movements in high-risk preterm infants. AJNR Am J Neuroradiol. 2017;38(1):162-169.
3. Spittle AJ, Olsen J, Kwong A, et al. The Baby Moves prospective cohort study protocol: using a smartphone application with the General Movements Assessment to predict neurodevelopmental outcomes at age 2 years for extremely preterm or extremely low birthweight infants. BMJ Open. 2016;6(10):e013446.

Poster #C31
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Birth Weights Are a Stronger Predictor of ROP Progression to Plus Disease than Gestational Age in Community Hospital Screenings

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Introduction: Timing of Retinopathy of Prematurity (ROP) screenings are based on a baby's gestational age (GA). We examined if birth weight (GW) is a better predictor of ROP progression to plus disease than GA in community hospitals.

Methods: ROP CHECK (Glacier Medical Software, Inc) retrospectively examined ROP based on GA using national screening guidelines from 7 Western U.S. community NICUs over 8 years. A total of 2,103 live birth infants under 31 weeks GA were evaluated. The range, standard deviation, and average GW for every neonate within GA of 22-29 weeks was compared to the national average. The incidence of Plus disease ROP for neonates within 100g intervals was calculated, and compared with incidence based on GA.

Results: Our study found the GW's for any given GA concordant with the national average. However, there was a very large range of GW's for a given GA. The incidence for plus disease and range by GA was: 25 wk = 11% (311-1580g); 24 wk = 20% (240-1140); 23 wk = 26% (415-856g); <23 wk = 27% (450-1000g). By weight, incidence was: 700g = 20%; 600g = 27%; 500g = 33%; 400g = 48%; 300g = 50%.

Conclusion/Relevance: Because of the large variation of GW for a given GA, the incidence of 'plus' ROP is better correlated with GW. Timing of exams based on GA, may not adequately take into account small or large GA babies. Neonates with BW that fall below the mean for GA, may require more aggressive/ earlier screening due to a higher risk of ROP progression.

References: IRB
CHLA 19-00105, CHILDREN'S HOSPITAL OF LOS ANGELES

Poster #C32
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Associations of Cardiovascular Disease with Retinopathy of Prematurity

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Introduction: To determine the associations of specific types of cardiovascular diseases (CVD) in premature infants with the development of retinopathy of prematurity (ROP) in a large cohort of at-risk infants.

Methods: We performed secondary analyses of data from the Postnatal Growth and ROP Validation Study (GROP-2), a prospective multi-center study of infants undergoing ROP examinations at 41 hospitals. CVD was categorized based on pulmonary blood flow (PBF) and systemic blood flow (SBF) characteristics, and the presence of pulmonary hypertension (PPHN) or dysrhythmia. Primary outcomes were associations between any and each type of CVD and ROP or severe ROP.

Results: Among 3,980 infants, 13.3% had CVD, 40.4% developed ROP, and 12.6% developed severe (ETROP type 1 or 2) ROP. Infants with PPHN and with changes in PBF had more days on supplemental oxygen in the first month of life than infants without CVD. The presence of any CVD was associated with increased risk of any stage ROP (adjusted odds ratio (aOR) 1.29, 95% CI 1.02-1.64, p=0.03) but not severe ROP. Among CVD categories, only increased PBF was associated with a higher risk of ROP (aOR 1.47, 95% CI 1.09-1.99, p=0.01), and only PPHN was associated with a higher risk of severe ROP (aOR=2.35, 95% CI 1.19-4.64, p=0.01).

Conclusion/Relevance: The presence of CVD that causes increased PBF in premature infants increases risk of developing ROP, and the presence of PPHN increased the risk of severe ROP. Other types of CVD were not associated with ROP.

References: 1. Mansour AM, Bitar FF, Traboulsi EI, Kassak KM, Obeid MY, Megarbane A, Salti HI 2005 Ocular pathology in congenital heart disease. Eye (Lond) 19:29-34.
2.. Arriola-Lopez AE, Martinez-Perez ME, Martinez-Castellanos MA 2017 Retinal vascular changes in preterm infants: heart and lung diseases and plus disease. J AAPOS 21:488-491 e481.
3. Binenbaum G, Tomlinson LA, de Alba Campomanes AG, Bell EF, Donohue P, Morrison D, Quinn GE, Repka MX, Rogers D, Yang MB, Yu Y, Ying GS, Postnatal G, Retinopathy of Prematurity Study G 2019 Validation of the Postnatal Growth and Retinopathy of Prematurity Screening Criteria. JAMA Ophthalmol.

Poster #C33
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Association of Surgical Necrotizing Enterocolitis with Retinopathy of Prematurity

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Introduction: We evaluated a commonly suggested association between necrotizing enterocolitis (NEC) and retinopathy of prematurity (ROP).

Methods: Secondary analysis of G-ROP-1 data, a retrospective study at 29 North-American hospitals between 2006-2012. Multivariable analysis was used to analyze the associations between surgical NEC and the development of ROP or Type 1 or Type 2 ROP, adjusting for birth weight (BW), gestational age at birth, small-for-gestational-age (BW<10%ile), chronic lung disease, hydrocephalus, intraventricular hemorrhage, periventricular leukomalacia, and patent ductus arteriosus. Timing of NEC was considered 'early' (8-28 days) or 'late' (>28 days). Presumed spontaneous intestinal perforations during postnatal life week one were excluded

Results: Of 7,483 infants, 356 (4.8%) developed surgical NEC, 200 (2.7%) developed early NEC. 283 (79%) of infants with NEC had ROP; 140 (39%) had Type 1/2 ROP. NEC was independently associated with ROP (aOR 2.7, 95% CI 1.9-3.7) and Type 1/2 ROP (aOR 2.5, 1.9-3.3). Early NEC appeared more strongly associated with ROP (aOR 3.1, 2.1-4.8) and Type 1/2 ROP (aOR 3.3, 2.3-4.7) than late NEC (aOR 2.1, 1.3-3.4);(aOR 1.9, 1.3-2.8). Median postmenstrual ages of onset of ROP and Type 1/2 ROP did not differ significantly among infants with no, early, or late NEC

Conclusion/Relevance: Surgical NEC, especially when occurring earlier in postnatal life, increases the risk of ROP and Type 1/2 ROP but does not alter the time course of ROP. Suppression of serum IGF-1 level by NEC is a hypothetical mechanism connecting NEC and ROP.

References: Binenbaum G, Tomlinson LA. Postnatal Growth and Retinopathy of Prematurity|Study: Rationale, Design, and Subject Characteristics. Ophthalmic Epidemiol. 2017 Feb;24(1):36-47.

Poster #C34
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Racial Differences in Retinopathy of Prematurity

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Introduction: We sought to distinguish racial differences in the incidence and course of retinopathy of prematurity (ROP), in a large, broad-risk cohort.

Methods: According to maternal race, premature infants in the two Postnatal Growth and ROP (G-ROP) studies were classified into 3 racial groups: White (N=5580), Black (N=3252), and Asian (N=353). Incidence, severity, and time course of ROP, were compared adjusted by birth weight (BW) and gestational age (GA). Daily weight gain rates (WGR) during ages 10-39 days were also compared, slow WGR being a risk factor for ROP.

Results: Black infants had lower BW (means 1035g,1131g,1144g, P<0.001) and GA (28.2,28.6,29.1 weeks, P<0.001) than White and Asian infants, respectively. Mean WGR during ages 10-19 and 20-29 days were similar across groups, but during ages 30-39 days were lower among Black and Asian infants than among White infants (P<0.001). Yet, the incidence of ROP was lower among Black (42.1%) and Asian (30.6%) infants than White infants (43.2%) (adjusted risk ratio (aRR) 0.83 and 0.77, respectively, P<0.001), and the incidences of severe ROP (11.1%,12.4%,11.9%) and plus disease (3.6%,6.3%,5.9%) were lower among Black infants than White and Asian infants (aRR 0.69 and 0.44, P<0.001). There were no differences among racial groups in the timing of ROP and severe ROP.

Conclusion/Relevance: Despite having lower BW, GA, and postnatal weight gain, all of which are risk factors for ROP, Black infants were at lower risk of ROP, severe ROP and plus disease than White infants. The time course of ROP was unaffected by maternal race.

References: Saunders RA, Donahue ML, Christmann LM, et al. Racial variation in retinopathy of prematurity. The Cryotherapy for Retinopathy of Prematurity Cooperative Group. Arch Ophthalmol. 1997;115(5):604-608.
Ying GS, Quinn GE, Wade KC, et al. Predictors for the development of referral-warranted retinopathy of prematurity in the telemedicine approaches to evaluating acute-phase retinopathy of prematurity (e-ROP) study. JAMA Ophthalmol. 2015;133(3):304-311.
Ying GS, Bell EF, Donohue P, Tomlinson LA, Binenbaum G, Group GRR. Perinatal Risk Factors for the Retinopathy of Prematurity in Postnatal Growth and Rop Study. Ophthalmic Epidemiol. 2019;26(4):270-278.

Poster #C35
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Strabismus Rehabilitation – Where Surgery and Orthoptic Treatment are Side by Side

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Introduction: Bifoveal fusion in children with congenital and early acquired strabismus is very important in the binocular functions recovering. This study aims to analyze bifoveal fusion recovering using method of LCD glasses with alternating occlusion of vision fields and compare its efficacy with orthoptic treatment using synoptophore.

Methods: 86 patients with prior esotropia and post-operative absence of bifoveal fusion started treatment on synoptophore. They were united in «synoptophore» group. 43 of them who's bifoveal fusion didn't recovered underwent treatment with LCD glasses («LCD group»).

Results: Mean age of patients in «synoptophore» group was 6,1±2,1years, mean age of patients in «LCD» group 5,5±1,4 years. All patients had hyperopic refraction. Post-operative all patients had orthotropy. Patients in «synoptophore» group received 4 courses of synoptophore treatment during one year. Patients in the main group wore LCD glasses 4 hours/day. There was no statistically significant difference between groups.
The period of observation was 12 months. Bifoveal fusion was achieved in 16 patients in «synoptophore» group (18,6%), and in 29 patients in «LCD» group (67,4%). Binocular vision was achieved in 21 patients in «synoptophore» group (24,4%), and in 20 patients in «LCD» group (46,5%). Recovery time was 9,2±2,5 months in «synoptophore» group and 6,8±2,5 patients in «LCD» group.

Conclusion/Relevance: Bifoveal fusion recovering 67,4% of cases using LCD glasses compared with 18,6% of cases using synoptophore treatment can be explained by a more effective treatment. Alternating occlusion of vision fields with LCD glasses is an effective mean of bifoveal fusion and binocular function recovery in patients after successful strabismus surgery.

References: 1.Wang J, Neely D, Galli J, Schliesser J, Graves A, Damarjian T, Kovarik J, Bowsher J, Smith H, Donaldson D, Haider K, Roberts G, Sprunger D, Plager D. A pilot randomized clinical trial of intermittent occlusion therapy liquid crystal glasses versus traditional patching for treatment of moderate unilateral amblyopia. J AAPOS. 2016;20(4):326-331. doi:10.1016/j.jaapos.2016.05.014.

Poster #C36
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Comparison of Simultaneous Prism and Cover Test (SPCT) with Prism and Alternate Cover Test (PACT) Measurements with Final Power of Press-On Prism Power Dispensed

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Introduction: Diplopic patients with smaller angles of misalignment are often treated with Press-On® membrane prism, and sometimes will report failure with prism treatment. One possible explanation is that the prism power was greater than the manifest deviation with correction provided for the deviation measured by prism alternate cover test (PACT). This study explores the association of strabismic angle obtained by simultaneous prism and cover test (SPCT) and PACT with the power of Press-On® prism used in adults with symptomatic strabismus.

Methods: Retrospective review of adult patients seen by one orthoptist in a 12-month period, who were prescribed Press-On® prism for diplopia after evaluation with SPCT and PACT measurements at distance. Prism dispensed was chosen with assistance from the patient using a trial acrylic prism set.

Results: One hundred eight adult patients had prism dispensed. Eighteen had both SPCT and PACT measurements. Mean SPCT measurement was 6 prism diopters (PD) (median, 6 PD range 2-14 PD) and mean PACT was 12 prism diopters (median 16 PD, range 6-30 PD). The mean prism power dispensed was 7 PD (median 6PD, range 1-15 PD). There was minimal difference (1 PD) between SPCT and applied prism power ($p=0.35$), suggesting a close relationship between the SPCT measurements and Press-On prism power applied. There was a large difference (5 PD) between PACT measurements and prism dispensed ($p=<0.001$). Fourteen patients (78%) remained in this prism power one year later. Four patients elected to have eye muscle surgery, 3 with horizontal strabismus with SPCT measurements in excess of 10PD, and PACT measurements > than 15PD

Conclusion/Relevance: Prisms were effective in alleviation of diplopia in symptomatic adults. It is reasonable to initiate treatment with a weaker prism approximating the SPCT measurement, building up only if there are continuing symptoms.

References: 1. Tamhankar MA, MD; Ying G, Volpe NJ. Effectiveness of Prisms in the Management of Diplopia in Patients Due to Diverse Etiologies. J Pediatric Ophthalmology and Strabismus. 2012;49(4):222-228.
2. Holmes JM, Leske DA, Hohberger GG. Defining Real Change in Prism-Cover Test Measurements. American J Ophthalmology. 2008;145(2): 381-385.
3. Repka MX, Wentworth D. Predictors of Prism Response During Prism Adaptation. J of Pediatric Ophthalmology and Strabismus. 1991;28(4):202-205.

Poster #C37
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Long-Term Ophthalmic Outcomes in 120 Children with Unilateral Coronal Synostosis: A Retrospective Look Over 20 Years

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Introduction: Prior studies comparing ophthalmic outcomes after treating unicoronal synostosis (UCS) by early endoscopic strip craniectomy (ESC) versus later fronto-orbital advancement (FOA) were modest in sample size, lacked consistent age adjustment and were contested. We report long-term age-adjusted ophthalmic outcomes for a large cohort after non-randomized treatment by one of these two options.

Methods: Retrospective chart review of patients with treated UCS born since 2000 obtained cycloplegic refractions, sensorimotor examinations, and strabismus procedures before craniofacial repair, and thereafter, at 18 and 60 months of age (early and late examinations). V-pattern strabismus was graded as mild (absent or + 1/-1 oblique dysfunction) versus moderate-to-severe (=+2/-2 oblique dysfunction or left to right vertical alignment change of = 20 PD or ocular torticollis >15°).

Results: 60 infants were treated by FOA and 60 by ESC. By late examination, aniso-astigmatism was present in 71.8% versus 46% of those treated by FOA versus ESC (P<0.0001). By late examination, age-adjusted odds ratio of moderate-to-severe V-pattern strabismus after treatment by FOA versus ESC was 2.65 (95% CI: 1.37-6.28; P =0.02) and strabismus surgery performed in 26 infants treated by FOA versus 13 treated by ESC (OR 2.8; P=0.02). Amblyopia developed in 60% treated by FOA compared to 35% treated by ESC (OR 3.0, 95% CI: 1.3 - 6.7, P=0.02).

Conclusion/Relevance: This largest-to-date study of age-adjusted ophthalmic outcomes confirms better long-term outcomes after treatment of USC by endoscopic strip craniectomy. Recognition and referral of affected infants by the earliest months of life facilitates the opportunity for endoscopic repair.

References: MacKinnon S, Proctor MR, Rogers GF, et al. Improving ophthalmic outcomes in children with unilateral coronal synostosis by treatment with endoscopic strip craniectomy and helmet therapy rather than fronto-orbital advancement. J AAPOS 2013;17(3):259-65.

Isaac KV, MacKinnon S, Dagi LR, et al. Nonsyndromic Unilateral Coronal Synostosis: A Comparison of Fronto-Orbital Advancement and Endoscopic Suturectomy. Plast Reconstr Surg 2019;143(3):838-48.

Weiss AH, Phillips JO. Hypertropia associated with superolateral translation of the superior rectus muscle pulley in unilateral coronal synostosis. Arch Ophthalmol 2006;124(8):1128-34.

Poster #C38
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Binocular Vision Abnormalities in Parkinson's Disease

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Introduction: Visual impairments due to abnormal binocular eye movements are common in patients with Parkinson's Disease (PD)1-3. The purpose of our study is to examine the correlation between vergence abnormalities and associated strabismus and severity of Parkinson's disease.

Methods: We studied 23 subjects (15 PD and 8 age-matched controls). All the subjects had a complete eye exam including strabismus measurements. High-resolution eye-tracker was used to quantify convergence and divergence abnormalities using LED targets placed at distances ranging from 20 cm to 240 cm along the median plane. We computed the vergence gain (left-right eye amplitude/target amplitude), peak velocities and latencies. The neurologic impairment was quantified using the Unified Parkinson's Disease Rating Scale (UPDRS), disease-duration, Activity-specific Balance Confidence (ABC) scale, and fall frequency.

Results: We found that PD patients had significant impairment of both convergence and divergence compared to controls with reduced vergence gain and peak velocities and prolonged latencies. There was a strong correlation between convergence and divergence gains and clinically measured strabismus angles (R-values, convergence=0.8; divergence=0.6). The divergence gain in PD was 0.58±0.14, significantly lower than controls (0.98±0.13,ANOVA,$p<0.05$). The convergence gain was 0.64±0.29, also significantly lower compared to controls (1.09±0.31,ANOVA,$p<0.05$). The reduction in convergence and divergence gains correlated with the UPDRS (R-values, convergence=0.3; divergence=0.6). There was a weak correlation with other parameters such as age, ABC scale, and fall frequency.

Conclusion/Relevance: PD patients have both convergence and divergence insufficiency, which can impact the vision-related quality of life. The binocular abnormalities correlate with disease severity and duration of PD.

References: 1) Repka MX, Claro MC, Loupe DN, Reich SG. Ocular motility in Parkinson's disease. J Pediatr Ophthalmol Strabismus. 1996 May-Jun;33(3):144-7. PMID: 8771514.

2) Savitt J, Aouchiche R. Management of Visual Dysfunction in Patients with Parkinson's Disease. J Parkinsons Dis. 2020;10(s1):S49-S56. doi: 10.3233/JPD-202103. PMID: 32741840.

Kang SL, Shaikh AG, Ghasia FF. Vergence and Strabismus in Neurodegenerative Disorders. Front Neurol. 2018 May 16;9:299. doi: 10.3389/fneur.2018.00299. PMID: 29867716; PMCID: PMC5964131.

Poster #C39
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Impact of Diplopic versus Non-Diplopic Strabismus on Quality of Life in Adolescent Children, Assessed Using the PedEyeQ

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Introduction: We compare the impact of diplopic versus non-diplopic strabismus on functional vision and eye-related quality of life (ERQOL) of adolescent children and their parents, assessed using the Pediatric Eye Questionnaire (PedEyeQ).

Methods: 12- to 17-year-old children with strabismus (n=20 diplopic, n=36 non-diplopic), and 1 parent for each child, completed the PedEyeQ. Children completed the Child 12-17 year PedEyeQ (Functional Vision, Bothered by Eyes/Vision, Social, Frustration/Worry domains); parents completed the Proxy (Functional Vision, Bothered by Eyes/Vision, Social, Frustration/Worry, Eye-care domains) and Parent PedEyeQ (Impact on Parent and Family, Worry about Child's Eye Condition, Worry about Child's Self-perception/Interactions, Worry about Child's Functional Vision). For each domain, median PedEyeQ scores (range: 0-100) were calculated and distributions compared between diplopic and non-diplopic patients using Wilcoxon tests.

Results: Child PedEyeQ domain scores were significantly lower for diplopic children with strabismus than non-diplopic children with strabismus on: Functional Vision (72 vs 90; P=.006), Bothered by Eyes/Vision (65 vs 90; P=.002), and Frustration/Worry (53 vs 78; P<.001). There was no difference on the Child Social domain (85 vs 93; P=.26). Interestingly, Proxy and Parent PedEyeQ scores were similar for parents of diplopic and non-diplopic children (P>.06 for each comparison).

Conclusion/Relevance: Adolescent children with diplopic strabismus experience significantly greater deficits in functional vision and ER-QOL than those with non-diplopic strabismus. Parents may be less aware of the additional impact of diplopia on their children. Addressing diplopia appears particularly important when managing childhood strabismus.

References: .

Poster #C40
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Effectiveness of Single Botulinum Toxin Injection for Strabismus in Children with and without Neurological Disorders

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Introduction: Children with neurocognitive disorders have increased rate of strabismus. Botulinum toxin (BTX) injection, an alternative to incisional surgeries, requires shorter anesthesia time, minimal postoperative care and may be more desirable for medically complex patients. Published studies mostly focused on Botox strabismus treatment for children without associated conditions. We compared treatment effects in children with and without neurocognitive disorders.

Methods: Retrospective study reviewed electronic medical record between 2011 and 2019, children underwent a single extraocular muscle BTX injection were grouped into simple (S) without known assocated conditions and complex (C) with neurocognitive disorders. Treatment outcomes were compared using Mann-Whitney and Chi-squared tests. Success was defined as residual deviation <11 prism diopters >3 months post-injection.

Results: Group-S: N=68 (40 ET and 28 XT), age at injection 4.5±3.8YR; pre-injection deviations ET 31.4±20.7 and XT -29.8±16.2; deviation reductions ET 20.2±2.3 and XT -11.6±14.2 ($P<0.01$). Success rate: ET 47.5%, XT 18% ($P=0.02$). Group-C: N=44 (29 ET, 15 XT), age 3.8±3.0YR; pre-injection deviations ET 35.1±13.7 and XT -28.3±7.94; deviation reductions ET 17.9±12.8 and XT -4.7±8.5. ($P<0.001$). Success rate: ET 28.2%, XT 13.3% ($P=0.4$). Both groups had a strong correlation between pre- and post-injection deviation (group-S: $R=0.87$, $P<0.001$; group-C: $R=0.78$, $P<0.001$), no correlation between dosage and deviation change (group-S: $R=-1.0$, $P=0.38$; group-C: $R=-0.02$,$P=0.91$). Transient ptosis was the most common adverse events: group-S 36/68 and group-C 21/44 and lasted 4.0±1.9 weeks

Conclusion/Relevance: BTX injection is a viable option for children with strabismus and neurocognitive disorders, and has stronger effect for ET than XT for both groups

References: Hauviller, V., S. Gamio and M. V. Sors (2007). 'Essential infantile esotropia in neurologically impaired pediatric patients: is botulinum toxin better primary treatment than surgery?' Binocul Vis Strabismus Q 22(4): 221-226.

Poster #C41
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Effect of Lane Length on Strabismus Measurements

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Introduction: Our study aims to investigate the effect of decreasing distance from the patient to fixation target on the measurement of strabismus with known distance-near disparity.

Methods: Strabismus measurements were taken by one pediatric ophthalmologist at our standard lane length of 18 feet and compared to those taken at 16, 14, 12 and 10 feet from the fixation target. A clinically meaningful measurement difference was defined as a difference of > 5 diopters (D) since a difference of that magnitude would likely alter surgical planning.

Results: Thirty-nine subjects, including 22 exotropes and 17 esotropes were included in this ongoing study. In the exotrope group, lengths of 16, 14 and 12 feet were non-inferior when compared to 18 feet (mean diopter difference = 1.27, 1.27 and 1.73, respectively, $p < 0.05$). In the esotrope group, 16 and 14 feet were non-inferior to 18 feet (mean diopter difference = 1.06 and 2.65, respectively, $p < 0.05$).

Conclusion/Relevance: The current study is the first to measure strabismus at various non-mirrored distances from the patient to the fixation target. Data collected to date suggest measurements taken at shorter distances are similar to those taken at the standard 18ft distance. With a large enough data sample, we propose a potential error factor could be developed to help surgical planning when measurements are taken in smaller examination rooms.

References: Kushner BJ & Morton G. Measurement of strabismus in shortened exam lanes versus the 20-foot lane. Annals of Ophthalmology. 1982;12(1):86-89.
Stager D. & Everett M. Comparison of strabismus measurements in in mirrored and twenty foot lanes. American Orthoptic Journal. 1987;37(1):74-76.

Poster #C42
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Appearance of Strabismus in Implicit Association Tests

Justin D. Marsh, MD; Zachery Harter, MS; Henry Yeh, PhD

Introduction: Strabismus is a well-known cause of negative prejudice from non-strabismic observers. Implicit association tests are a commonly used tool to analyze participant implicit bias as it relates to a particular difference between test groups. A popular and publicly available implicit association test has been utilized throughout medical literature and contains photos of potentially strabismic subjects.

Methods: Three-hundred forty-eight medical students participated in a survey evaluating for the appearance of strabismus in photos from a commonly utilized 'Race' implicit association test. Analysis was performed to determine if strabismus was perceived equally between both groups tested in the implicit association test.

Results: Photos of six individuals of African descent were perceived as having strabismus more frequently (62%) than photos of individuals of European descent (31%, odds ratio 3.85, 95% CI 3.34 to 4.44, P<0.0001). Participants who identified as Black or African American similarly perceived strabismus more frequently in individuals of African descent (58%) than those of European descent (24%, odds ratio 4.36, 95% CI 2.13 to 8.96, P<0.0001).

Conclusion/Relevance: Photos used in a commonly utilized implict association test appear to differ not only in ethnicity but also in extraocular alignment. Because extraocular alignment is a known cause of negative prejudice, results of this particular implicit association test should be interpreted with caution.

References: 1. Olitsky SE, Sudesh S, Graziano A, Hamblen J, Brooks SE, Shaha H. The negative psychosocial impact of strabismus in adults. J AAPOS 1999 Aug; 3(4):209-11

2. Capers Q 4th, Clinchot D, McDougle L, Greenwald AG. Implicit Bias in Medical School Admissions. Acad Med 2017 Mar;92(3):365-69.

3. Van Ryn M, Hardeman R, Phelan SM, Burgess DJ, Dovidio JF, Jeph Herrin, Burke SA, Nelson DB, Perry S, Yeazel M, Przedworski JM. Medical school experiences associated with change in implicit racial bias among 3547 students: A medical school CHANGES study report. J Gen Intern Med 2015 Dec; 30(12): 1748-56.

Poster #C43
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Strabismus in Pediatric Cataract Surgery

Lauren C. Mehner, MD; Ghada H. Allam, MD; Chandler Mitchell, BS; Derek T. Sprunger, MD

Introduction: Various factors may influence the incidence of strabismus in patients who undergo pediatric cataract surgery. We aim to evaluate the pre- and post-operative characteristics of children who had strabismus after cataract surgery and results of those who underwent strabismus surgery.

Methods: This is a retrospective chart review of 321 patients under age 18 years who underwent lensectomy with or without intra-ocular lens (IOL) implantation and at least 1 year of follow-up from 2005 to 2017 at Riley Hospital for Children, Indianapolis, Indiana.

Results: Forty-five % (146/321) of patients had strabismus after cataract extraction, and 30.8% of those patients (45/146) went on to have strabismus surgery. Patients with strabismus were significantly younger at the time of cataract surgery [5.28 (4.44) years vs 7.62 (5.19), $p<0.001$] compared with patients without strabismus. They were also more likely to have a unilateral cataract [98/146 (67%) vs 80/165 (49%), $p <0.001$], and be aphakic after surgery [53/145 (36%) vs 31/165 patients with IOL (19%), $p<0.001$]. Patients who had subsequent strabismus surgery were more likely to have post-operative amblyopia (80% vs 20%, $p<0.001$). The type of strabismus did not vary significantly by type of cataract, pre-operative visual acuity, unilateral vs bilateral cataract, or lens status. Most patients (93%) achieved successful realignment with 1 strabismus surgery (mean follow-up 4.16 years (SD 2.71).

Conclusion/Relevance: Children who undergo cataract extraction have a high incidence of strabismus and should be monitored for this condition. Successful realignment can be achieved with strabismus surgery.

References: Weisberg OI, Sprunger DT, Plager DA, Neely DE, Sondhi N: Strabismus in pediatric pseudophakia. Ophthalmology 2005; Vol. 112:1625-1628.

Poster #C44
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Effect of Combining Inferior Oblique Muscle Weakening Procedures with Bilateral Injection of Botulinum Toxin to both Medial Recti on Esotropia's Surgical Correction

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Introduction: To evaluate the effects of combing inferior oblique muscle (IO) weakening procedures with injection of botulinum toxin (BTX) to both medial recti on the primary position horizontal alignment after surgery to correct esotropia.[1,2]

Methods: The medical records of patients who underwent BTX to both medial recti with or without IO weakening procedures between 2015-2020 were retrospectively reviewed. Patients with neurological diseases, previous surgeries, or incomplete data were excluded. The amount of correction per international unit of BTX was calculated by the equation (preop deviation-postop deviation\dose of BTX) in patients with isolated BTX (group BTX) and those undergoing additional IO weakening (group IO). Only calculations from the first injection or the combined approach were used for analysis for patients with multiple injections.

Results: Out of 219 (111 male 50.7%) patients, 186 underwent BTX, and 33 had additional IO. Success rates of BTX (45.2%), and IO (48.5%) were not significantly different (P=0.724). There was no difference in age, gender, pre-operative deviations, Botulinum dose, visual acuity, or follow-up between the groups (P>0.05). The final postop deviation did not differ between the groups, 14.35±14.60 PD in BTX Vs. 11.76±14.94 PD in IO (P=0.350). The calculated mean effect of Botulinum toxin in each group was 3.68±3.67 PD/IU in the BTX group Vs. 4.51±3.92 PD/IU in the IO group; with no significant difference between the groups (P= 0.237).

Conclusion/Relevance: There was no effect of combining IO weakening with BTX injection on the final horizontal deviation. Surgeons should not modify the dose of Botulinum when the two are combined.

References: 1. Isaac CR, Chalita MR. Effect of combining oblique muscle weakening procedures with bimedial rectus recessions on the surgical correction of esotropia. J AAPOS. Published online 2015. doi:10.1016/j.jaapos.2014.10.020
2. Hinds AM, Solebo L, Theodorou M, Hancox J, Adams G. Predicting outcomes for children undergoing botulinum toxin treatment for horizontal strabismus. Investig Ophthalmol Vis Sci. Published online 2016.

Poster #C45
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Old Strabismus Surgery is not a Sight for Sore Eyes: New Approaches are Necessary

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Introduction: We have developed a technique of gentle strabismus surgery 'STRABO Care'. We performed experiments that proved usefulness of radiowave knife and safety of using thin suture material. The goal of the study was to compare rehabilitation of patients after strabismus surgery with our minimally traumatic technique and the traditional approach using conventional instrumental methods (OCT, videooculography). This was a prospective, patient and assessor blind, randomized trial.

Methods: The study included 60 children (30+30). The groups were comparable in age, strabismus onset, duration and strabismus amount. All consenting patients were operated by recession of medial rectus and plication of lateral recuts and were randomized into 2 groups: minimally traumatic technique in the main group and traditional approach in the control group. We compared both groups by individual parameters - level of inflammation (chemosis (OCT)), conjunctival hyperemia, swelling of the eyelids,as well as the eye movement on the first day after surgery (videooculography). We used Mann-Whitney and Fisher's exact tests, with significance at P </= 0.05.

Results: The thickness of the conjunctival flap over the site of recession according to OCT in the main group (408,35 (221-695) µm) on average was 1.7 times thinner than in the control group (698 (463-1474) µm). The eye excursion on the first day after surgery was: reduced in the main group by an average of 6.27 degrees, reduced in the control group by 14.7 degrees due to pain.

Conclusion/Relevance: In contrast to the traditional approach «STRABO care» technique:
- has practically no effect on the postoperative eye excursion.
- minimizes intraoperative tissue injury, which reduces swelling of the conjunctiva and periorbital tissues
- helps reduce patient's discomfort
- improves accuracy of dosage.

References: Aznauryan E., Aznauryan I., Balasanyan V. Minimal invasive radio wave technique for strabismus surgery. JAAPOS. 2015; 19(4):10.

Poster #C46
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Surgical Dose-Response in Paretic Strabismus

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Introduction: Published nomograms that guide surgery for esotropia are largely based on surgical experience treating non-paretic strabismus. Our goal was to characterize the surgical dose-response among patients with abducens palsy and to compare it to nomograms described for non-paretic strabismus.

Methods: We performed a retrospective chart review of pre- and post-operative sensorimotor exams on patients with abducens palsy treated with horizontal recession and/or resection surgery over a 10-year period. Exclusion criteria included prior eye muscle surgery and concomitant vertical muscle surgery including transpositions.

Results: Forty-two of 79 patients with abducens palsy met inclusion criteria. Mean age was 38ï,±31 years, gender distribution of 21 male, 21 female. The most common etiologies were tumor, surgery/trauma, and elevated intracranial pressure. Mean pre-operative esotropia measures were 32ï,±15 PD at distance and 30ï,±18 PD at near. Surgical dose-response was significantly greater at distance(3.1ï,±0.2 PD/mm) than near (2.7ï,±0.2 PD/mm) (p=0.01), but the overall fits were consistent with surgical nomograms for esotropia [1, 2]. Multivariate linear regression analysis revealed that treatment by recession and/or resection had no independent effects on surgical dose-response. Excessive medial rectus tone causing mechanical restriction of abduction, confirmed at onset of surgery, did not alter the surgical dose-response at distance but imparted a 1.0ï,±0.4 PD/mm greater dose-response effect at near (p=0.03).

Conclusion/Relevance: Correction of strabismus of a paretic etiology may follow established nomograms with the caveat that a greater dose-response effect may result at near for patients with secondary antagonist muscle contracture [3].

References: [1] Cestari D, Hunter D. Learning Strabismus Surgery: Lippincott Williams & Wilkins; 2013.
[2] Hered R. Basic and Clinical Science Course, Section 06: Pediatric Ophthalmology and Strabismus: American Academy of Ophthalmology; 2020.
[3] Lyu IJ, Lee JY, Kong M, Park KA, Oh SY. Surgical Responses of Medial Rectus Muscle Recession in Thyroid Eye Disease-Related Esotropia. PLoS One. 2016;11:e0146779.

Poster #C47
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Accuracy of Surgical Memory in Patients with Prior Strabismus Surgery

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Introduction: Strabismus is often a chronic condition resulting in more than one surgery over a patient's lifetime. When planning a repeat surgery, it is important to obtain as much information about prior strabismus surgeries as possible. Oftentimes, distant surgical records are unobtainable leaving self-reporting from patients as the only source of details about childhood surgeries. This study examines whether patient surgical memory is an adequate tool to influence treatment.

Methods: A retrospective chart review was conducted of all patients who underwent strabismus surgery at an academic eye center between 2011 and 2019, with history of strabismus surgery >5 years prior to the time of repeat surgery (63 total). Accuracy of surgical memory was assessed by comparing pre-operative interview notes to surgical findings.

Results: All but one patient in the study could not recall which muscles had previously been operated on, and 93% were unable to access prior surgical records. Over half could not provide accurate surgical details during their pre-operative interview. Of these patients, most admitted to forgetting details of their surgeries, but others provided details later proven in surgery to be inaccurate, such as which had been the previously operative eye.

Conclusion/Relevance: These results demonstrate the difficulty of obtaining details on prior strabismus surgeries. Patient memory of earlier surgeries is mostly unreliable necessitating correlating conjunctival scars with subjective history when possible. Educating patients and families about the long-term nature of strabismus often requiring further management and encouraging them to collect their surgical operative reports could enhance definitive surgical planning in the future.

References: Kim WJ, Kim MM. Subsequent strabismus surgeries in patients with no prior medical records. Indian J Ophthalmol. 2018;66(10):1451–1455. doi:10.4103/ijo.IJO_332_18

Leffler CT, Vaziri K, Schwartz SG, et al. Rates of reoperation and abnormal binocularity following strabismus surgery in children. Am J Ophthalmol. 2016;162:159–166.e9. doi:10.1016/j.ajo.2015.10.022

Patty L, Wu C, Torres M, Azen S, Varma R; Los Angeles Latino Eye Study Group. Validity of self-reported eye disease and treatment in a population-based study: the Los Angeles Latino Eye Study. Ophthalmology. 2012;119(9):1725–1730. doi:10.1016/j.ophtha.2012.02.029

Poster #C48
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Population-based Prevalence of Infectious Complications Following Strabismus Surgery

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Introduction: Previously reported rates of postoperative complications following strabismus surgery have been limited to single center reports or provider surveys. The purpose of this study is to report the population-based prevalence of infectious complications following strabismus surgery.

Methods: This is a retrospective observational prevalence study, approved for IRB exemption, of individuals enrolled in a US managed care network who underwent strabismus surgery from 2003 to 2017. Data were abstracted from the Optum© Clinformatics® Data Mart Socioeconomic Status Medical Claims dataset. Amongst the patient cohort, infectious complications occurring within 30 days of strabismus surgery were abstracted and categorized further based on ICD-9 and ICD-10 codes for external infections and endophthalmitis.

Results: Of the 45,513 unique strabismus surgery cases, 677 (1.49%) had infectious complications. These included 168 (0.37%) patients with an abscess/eyelid inflammation, 166 (0.36%) with orbital or preseptal cellulitis, 53 (0.11%) with endophthalmitis, and 9 (0.02%) with endophthalmitis and cellulitis. In addition, 281 (0.62%) patients were coded as having a nonspecific postoperative infection.

Conclusion/Relevance: Previously reported rates of postoperative cellulitis have been much lower than we found ranging from 0.05% to 0.09% for cellulitis, and 0.001% to 0.028% cases for endophthalmitis. Our data suggests a prevalence 4 times higher than previously reported. However, there are limitations to population-based claims data, including mis-categorization and a lack of correlating clinical data that may skew the results though post-hoc analyses were completed to ensure appropriate cohort selection. Rates of postoperative infectious complications following strabismus surgery may be much higher than previously reported.

References: 1. Recchia FM, Baumal CR, Sivalingam A, et al. Endophthalmitis after pediatric strabismus surgery. Arch Ophthalmol 2000; 118:939-942.
2. Ing MR. Infection following strabismus surgery. Ophthalmic Surg 1991; 22:41-43.
3. Kivlin JD, Wilson ME. Periocular infection after strabismus surgery: The Periocular Infection Study Group. J Pediatr Ophthalmol Strabismus 1995; 32:42-49.

Poster #C49
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Suture Plication in the Treatment of Complicated Paralytic Strabismus

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Introduction: Complicated strabismus frequently requires multiple surgeries to improve ocular alignment, double vision and anomalous face posture.

Methods: 10 patients with complicated horizontal strabismus who failed previous operations were treated with suture plication of the insertion of the paralyzed extraocular muscle to the adjacent orbital periosteum.

Results: All 10 patients showed significant improvement in ocular alignment in the primary position.
5/10 patients had minimal residual double vision that was amenable to medical treatment.
Face turn was improved in all cases.

Conclusion/Relevance: Suture plication of the insertion of paralytic muscles improved the ocular alignment, anomalous face turn and double vision in all cases.

References: Goldberg RA, Rosenbaum AL, Tong JT. Use of apically based periosteal flaps as globe tethers in severe paretic strabismus. Arch Ophthalmol 2000;118:431-437.
Bicas HE. Surgically implanted elastic band to restore paralyzed ocular rotations. J Pediatr Ophthalmol Strabismus 1991;28:10-13.
Salazar-Leon JA, et al. The surgical correction of paralytic strabismus using fascia lata. J Pediatr Ophthalmol Strabimus 1998;35:27-32.

Poster #C50
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Overcorrection After Vertical Muscle Transposition with Augmentation Sutures in Sixth Nerve Palsy

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Introduction: To report a series of cases, who developed consecutive exodeviation after vertical muscle transposition (VRT) performed for sixth nerve palsy, describe their management and analyze their outcome.

Methods: This is an institutional study on patients who developed consecutive exotropia following VRT for sixth nerve palsy in 2 different centers. The age, gender, cause, and time to surgery were reviewed. Ductions, versions, and angles of misalignment were analyzed. In those who developed an exotropia > 10 PD after surgery, a second surgery was performed. The time to the second surgery, intraoperative findings, surgical procedure and outcome were studied.

Results: A total of 164 cases of VRT for sixth nerve palsy were identified. Nine patients developed consecutive exotropia > 10 PD (5.5%). There were no significant differences in the characteristics of those who developed overcorrection compared to those who did not. Five patients had full-tendon muscle transposition, 3 patients had Hummelsheim procedure and 1 patient had Jensen procedure. The average angle of consecutive exotropia was 26 ± 9 PD (range10-40 PD). After the second surgery, angle of exotropia decreased to 21±15 PD. Seven patients still had residual exotropia =10PD and the exotropia was corrected in the remaining 2 patients. The time to second surgery in those 2 patients was much shorter than the other 7 patients.

Conclusion/Relevance: Patients who undergo VRT should be followed up in the early postoperative period and revisiting the transposition should be done immediately in case of consecutive exotropia to avoid permanent overcorrection.

References: 1. Gunton KB. Vertical rectus transpositions in sixth nerve palsies. Curr Opin Ophthalmol 2015;26:366-70.
2. Leiba H, Wirth GM, Amstutz C, Landau K. Long-term results of vertical rectus muscle transposition and botulinum toxin for sixth nerve palsy. J AAPOS 2010; 14:498-501.
3. Lee JY, Lim HW, Yoon J, Oh JE, Park KA, Oh SY. Comparison of the Efficiency of Various Muscle Transposition Procedures Using a Novel Three-Dimensional Model. PLoS One 2018; 13(9): e0204078.

Poster #C51
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Current Practice Patterns of Vasoconstrictor Use Among Strabismus Surgeons

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Introduction: The purpose of this study was to determine the current practice patterns of conjunctival vasoconstrictor use among strabismus surgeons.

Methods: Members of the Pediatric Ophthalmology LISTSERVE were asked to complete a survey retrospectively evaluating their topical vasoconstrictor practice patterns and perceptions for strabismus surgery.

Results: 175 respondents from 23 countries of the roughly 1300 LISTSERVE members replied to the survey. Most participants were from group private (37.1%), university-affiliated (32.6%), or hospital-employed practices (17.1%). 148(84.6%) of respondents apply topical medication during strabismus surgery for vasoconstriction. 41.6%(n=72) believe applying topical vasoconstrictors is not necessary. The most common vasoconstrictor was 2.5% Phenylephrine (n=118; 67.4%) followed by Oxymetazoline (n=23; 13.4%). Cost was not a consideration for 83.1%(n=123) of surgeons. Most common reasons for not considering costs were related to the relatively low cost (n=56; 45.5%), past training or they had always used them (n=28; 22.8%), the drops were helpful (i.e. dilation, decreased bleeding, etc.), and cost was never considered (10.6%). 16.6% of surgeons would avoid use during primary surgery versus 5.1% in reoperations.

Conclusion/Relevance: Vasoconstrictor use for strabismus surgery is standard, though many surgeons believe it is not necessary but still provides several benefits such as decreased bleeding and dilation in the event of a globe puncture. Vasoconstrictor choice and utilization may provide an opportunity, though small, to reduce costs of strabismus surgery. This study provides a current perspective on practice patterns among strabismus surgeons throughout the world and may lead to further discussion about appropriate vasoconstrictor choice and utilization.

References: n/a

Poster #C52
Sunday, April 11, 2021
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Post-Operative Outcomes in Pediatric Patients with Strabismic Amblyopia Unresponsive to Therapy

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Introduction: Multiple studies indicate that post-surgical motor/sensory outcomes are improved in patients whose strabismic amblyopia has been fully treated prior to undergoing surgery. To our knowledge, this study is the first to review surgical outcomes in patients unresponsive to conservative therapy and examine whether improving alignment with surgery leads to improvements in visual acuity. We also evaluated several pre-operative variables to determine any significant predictors for improved vision or successful alignment.

Methods: A group of pediatric patients (N=47) with strabismic amblyopia unresponsive to at least 6 weeks of therapy underwent strabismus surgery and were retrospectively reviewed following approval by the University of Tennessee Institutional Review Board. Multiple pre-operative variables were evaluated, including: pre-operative vision and misalignment, treatment duration, compliance, length of follow up, and age at time of surgery.

Results: Vision in the amblyopic eye had a statistically significant improvement compared to pre-operative vision ($p<0.004$). Mean ocular misalignment at final visit was 11.29 prism diopters with over 50% of patients having less than 10 prism diopters of deviation. Neither pre-operative visual acuity nor magnitude of misalignment had any association with post-operative alignment outcomes.

Conclusion/Relevance: Our results indicate that strabismus surgery can help to improve vision and alignment in patients that have failed conservative amblyopia therapy. Further prospective studies with larger sample sizes may be needed in order to identify variables that can predict improved surgical outcomes and when best to time surgical intervention.

References: Archer, Steven M. “Why Strabismus Surgery Works: the Legend of the Dose–Response Curve.” Journal of American Association for Pediatric Ophthalmology and Strabismus, vol. 21, no. 4, 2017, doi:10.1016/j.jaapos.2017.07.005.?

Braverman, Rebecca S. “Introduction to Amblyopia.” American Academy of Ophthalmology, American Academy of Ophthalmology, 22 Nov. 2017, www.aao.org/disease-review/amblyopia-introduction#disqus_thread.?

Dadeya, Subhash, and Kamlesh Ms. “Is It Mandatory to Treat Amblyopia Prior to Surgery in Esotropia?” Acta Ophthalmologica Scandinavica, vol. 79, no. 1, 2001, pp. 28–30., doi:10.1034/j.1600-0420.2001.079001028.x.

Poster #C53
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Anatomical Features of Extraocular Muscles in Patients with Strabismus Who Underwent Surgical Treatment

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Introduction: To describe the anatomical characteristics of the extraocular muscles in patients with strabismus that were treated with surgery in Bogotá, Colombia between August of 2017 and January of 2019.

Methods: Transversal and descriptive study. All patients with strabism diagnosis in two hospitals in Bogotá were included. The sociodemographic and clinical information were colleted before surgery. During surgery the distance between the corneoscleral limbus and the muscle insertion was measured. The descriptive analysis was made for every muscle, clustered by age, gender and diagnosis.

Results: The characteristics of 120 muscles were analyzed, most of the patients were women (55.8%), the average age was 7 years and the majority of eyes were left (50.8%). The most frequent surgery made was the rectus muscle recession (82.5%). The mean distance of the rectus muscle position was 4.75mm from the limbus, 0.75mm below the measure reported of this muscle in the spiral of Tillaux. Most of the patients that had the lateral rectus intervened had an exotropia diagnosis (77,7%), and the mean distance between the limbus and the lateral rectus muscle was 6.2mm ±0.5. The diagnosis of the patients with superior rectus muscle surgery (33,3%) was dissociated vertical deviation.

Conclusion/Relevance: The mean distance of the insertion of the extraocular muscles evaluated is smaller than the one reported in the literature. The eyes that had esotropia had the medial rectus 0.75mm closer to the limbus than it is reported. Similarly, the lateral rectus muscle was found to be 0.78mm closer to the limbus in patients who had exotropia diagnosis, these findings could be related to the development of this pathology.

Change in the anatomical position of the insertion of extraocular muscles may be related to the pre-surgical diagnosis of strabismus and can explain in some way its pathophysiology.

References: 1. Gunton KB, Wasserman BN, DeBenedictis C. Strabismus. Prim Care. 2015;42(3):393-407.
2. Marroquín G, Solano A, Moncada L, Rojas MC, Escaf S, Fernandez AM, et al. Oftalmología Pediátrica. Guías de manejo. ACOPE 2006. 203 p.
3. Von Norden GKC, Emilio C. Binocular Vision and Ocular Motility. Theory and management of Strabismus. 6th ed: Mosby.Inc; 2002.
4. Fabiszewska-Górna D. [Asymmetry of eyeball insertion of the median and lateral rectus muscles and its significance for the function of these muscles in strabismus]. Klin Oczna. 1984;86(9):395-7.
5. Bruenech JR, Kjellevold Haugen IB. How does the structure of extraocular muscles and their nerves affect their function? Eye (Lond). 2015;29(2):177-83.
6. Sevel D. The origins and insertions of the extraocular muscles: development, histologic features, and clinical significance. Trans Am Ophthalmol Soc. 1986;84:488-526.

Poster #C54
Sunday, April 11, 2021
11:30 AM – 12:30 PM

The Efficacy of Unilateral Lateral Rectus Recession for Moderate-angle Exotropia in Young Children

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Introduction: Several surgical methods have been suggested for the correction of intermittent exotropia. The purpose of this study is to evaluate the surgical outcomes of unilateral lateral rectus recession in the treatment of moderate-angle exotropia (</=25 PD (prism diopters)) in the pediatric population.

Methods: The charts of all children younger than 12 years of age with moderate-angle exotropia who were operated during the years 2006-2018 were retrospectively reviewed. The angle of exotropia (PD) before and after surgery and the success rate (deviation of </= 10 PD at last follow-up examination) were documented. Minimum follow-up time was 6 months.

Results: Fifty-eight patients underwent unilateral lateral rectus recession. Mean age at surgery was 6.4 ± 1.9 years. Exotropia improved from a preoperative angle of 21.3 ± 4.5 PD to 3.5 ± 5.8 PD postoperatively at distance, and from a preoperative angle of 9.2 ± 7.1 PD to 1.6 ± 3.3 PD postoperatively at near. Success rate was 86.2%. There were 2 (3.4%) cases of overcorrection (consecutive esotropia). No cases of lateral incomitance were observed. Mean postoperative follow-up time was 2.3 ± 1.7 years.

Conclusion/Relevance: In children with moderate angle exotropia, high success rate was achieved by performing unilateral lateral rectus recession. The risk of overcorrection was low.

References: Suh SY, Choi J, Kim SJ. Comparative study of lateral rectus recession versus recession-resection in unilateral surgery for intermittent exotropia. J AAPOS. 2015 Dec;19(6):507-11

Poster #C55
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Dorsal Midbrain Syndrome: Outcomes after Strabismus Surgery

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Introduction: Dorsal midbrain syndrome is a complex neuro-ophthalmologic diagnosis that often disrupts ocular motility and alignment [1]. Data surrounding the manifestations and surgical management of strabismus in these patients are limited. The purpose of this study is to characterize the surgical approach and outcomes of surgery for strabismus caused by dorsal midbrain syndrome.

Methods: We performed a retrospective chart review of all patients diagnosed with dorsal midbrain syndrome at Boston Children's Hospital ophthalmology between 2010-2018. Historical data, sensorimotor function, and surgical intervention (if performed) were of primary focus.

Results: Of 313 records reviewed, 34 patients met inclusion criteria; 26/34 (76%) were male, and the median age was 10.5 (range 1-54 years). Pineal neoplasm was the most common cause, driving disease in 15/34 patients (44%). Strabismus was present in 31/34 (91%), the most common forms being exotropia at distance (16/31; 53%) and convergence insufficiency (17/31; 56%). Among strabismus cases, 16/31 (52%) arose after initiation of treatment for the underlying etiology. Eleven patients (35%) underwent primary strabismus surgery, and 2/11 required a second surgery. At last post-operative visit (mean post-operative interval 2.7 years), 7/11 (64%) had 10 and 5 prism diopters (PD) of manifested horizontal and/or vertical deviations, respectively, and 7/11 (64%) had met surgical goals. Overall, 5/7 (71%) had no fusion on Worth 4-Dot testing and 7/11 (64%) had no measurable near stereopsis.

Conclusion/Relevance: Dorsal midbrain syndrome commonly results in exotropia and convergence insufficiency. Although motor outcomes of strabismus surgery are favorable, functional sensory improvements occurred less frequently in this cohort.

References: 1. Hoehn ME, Calderwood J, O'Donnel T, Armstrong GT, Gajjar A. Children with dorsal midbrain syndrome as a result of pineal tumors. JAAPOS. 2017;21(1):34-38.

Poster #C56
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Range of Forced Cyclorotation in Superior Oblique Palsy and V-Pattern Strabismus

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Introduction: To quantify a passive range of cyclorotation using a smartphone application and evaluate its associations with fundus torsion and rectus muscle cyclorotation in superior oblique palsy (SOP) and V-pattern strabismus.

Methods: Fifty-two patients showing overelevation in adduction (30 with congenital SOP and 22 with V-pattern strabismus) underwent forced cyclorotation on the photographs. A photograph of the globe was taken in maximally excyclorotated and incyclorotated positions after marking at the 6 and 12 o'clock limbus under general anaesthesia, and the rotational alignment of these markings was read using the toriCAM application. The degrees of forced cyclorotation were compared between the two groups. Disc-fovea angle on fundus photographs and rectus muscle cyclorotation in the coronal view on orbital computed tomography were correlated with the range of forced excyclorotation.

Results: The range of forced excyclorotation was greater in V-pattern strabismus than that in SOP (58.5° vs. 46.8°, $p < 0.001$), whereas the ranges of incyclorotation were similar between the two groups (39.0° vs. 39.0°, $p = 0.543$). Regression analysis revealed a significant increase in the range of excyclorotation with the degree of rectus muscle excyclorotation, after accounting for age and angle of hypertropia ($r^2 = 0.475$, $p = 0.001$). The range of excyclorotation did not correlate with the amount of fundus extorsion and grade of overelevation in adduction.

Conclusion/Relevance: The range of excyclorotation was correlated with the rectus muscle excyclorotation in these populations, suggesting that the results from this forced cyclorotation test may reflect orbital alignment and oblique muscle status.

References: 1. Jung JH, Holmes JM. Quantitative intraoperative torsional forced duction test. Ophthalmology 2015;122:1932–1938.
2. Lemos J, Eggenberger E. Clinical utility and assessment of cyclodeviation. Curr Opin Ophthalmol 2013;24:558–565.

Poster #C57
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Quantitative Intraoperative Torsional Forced Duction Test in a Pediatric Population

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Introduction: To compare an existing method for quantifying intraoperative torsional forced ductions in adults to a pediatric population.

Methods: We studied 37 total patients, with data from 37 Right Eyes, 36 Left eyes. 14 with SO Laxity noted intraoperatively. In the OR under general anesthesia, the limbus was marked at opposing 180 degree positions (either 12 and 6 o'clock or 9 and 3 o'clock) and the globe was maximally incyclorotated and excyclorotated without retroplacement until initial resistance was felt. Using a Mendez ring, the angle of rotation was read by the surgeon (R.G.).

Results: Significantly greater median incyclorotation and excyclorotation was noted in pediatric patients compared to adult patients. (Median Incyclorotation 40 in pediatrics, 30 in adults. Median Excyclorotation 50 in pediatrics, 30 in adults) ($T= -6.88$, $p< .001$; $T= -3.6$, $p< .001$, respectively) There was statistical significance when measuring incyclorotation with regards to superior oblique laxity. ($P = 0.012$) The clinical significance of this finding is unknown however. No significance was determined when measuring excyclorotation ($P = 0.365$) with regards to superior oblique laxity. Finally, no significant difference in intorsion or extortion was noted with regards to horizontal strabismus

Conclusion/Relevance: We found consistently larger median values of both incyclorotation and excyclorotation in pediatric patients when compared to established adult medians. Reasonings behind this can be due to difference in anatomy and age. These measurements may be important for planning operations on the oblique muscles.

References: Guyton DL. Exaggerated traction test for the oblique muscles. Ophthalmology 1981;88:1035–40.

Holmes JM. Quantitative Intraoperative Torsional Forced Duction Test. Ophthalmology 2015;122:1932-1938.

Cioplean D, Nitescu Raluca L. Age related strabismus. Rom J Ophthalmol. 2016;60(2):54-58.

Poster #C58
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Outcomes of Botulinum Toxin Injection of the Inferior Oblique Muscles

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Introduction: To evaluate outcomes of botulinum toxin (BTX) injection of the inferior oblique (IO) muscles.

Methods: Retrospectively reviewed BTX-injected IO muscles at Boston Children's Hospital from 7/2010 to 7/2020. Primary outcomes were improvement of V-pattern and primary position hypertropia at short- (<6 months) and long-term (> 6 months) follow-up. Secondary outcomes included IO overaction, torsion, and re-operation rate.

Results: 28 BTX-injected IO muscles of 18 patients were identified. Median age was 4.5 [range 1-69] years with median long-term follow-up of 11 [6-72] months. Median BTX dose injected was 5.0 [3.0-7.0] units. Indications for BTX injection included V-pattern strabismus (N=7), hypertropia (N=7), or both (N=4). Injections were performed concurrently with treatment of horizontal strabismus in all but 3 cases. Median V-pattern magnitude was 10 [5-16] PD. Improvement occurred in 64% (7/11) short-term and 57% (4/7) long-term. Intervention for residual V-pattern occurred in 36% (4/11) at a median 6 [4-7] months following injection. Median hypertropia magnitude was 9 [2-14] PD. Improvement occurred in 64% (7/11) short-term and 25% (2/8) long-term. Intervention for residual hypertropia occurred in 55% (6/11) at a median 15 [6-36] months. The difference in mean IO overaction grade between pre-operative (+1.4 ± 0.7) and long-term follow-up (+0.8 ± 0.7) was statistically significant ($p = 0.003$). A single case of periorbital hematoma self-resolving without sequelae was reported.

Conclusion/Relevance: BTX injection of the IO muscles can be a useful adjunct to the management of V-pattern strabismus, and unilateral injection may help in some cases of primary position hypertropia.

References: 1. Bagheri, A. & Eshaghi, M. Botulinum Toxin Injection of the Inferior Oblique Muscle for the Treatment of Superior Oblique Muscle Palsy. *J AAPOS* 10, 385-388 (2006).
2. Bansal, S. & Marsh, I. B. Inferior Oblique Botulinum Toxin Injection: A Postoperative Diplopia Test for Secondary Inferior Oblique Muscle Overaction. *J. Pediatr. Ophthalmol. Strabismus.* 53, 80-84 (2016).
3. Escuder, A. G. & Hunter, D. G. The Role of Botulinum Toxin in the Treatment of Strabismus. *Semin. Ophthalmology* 34, 198-204 (2019).

Poster #C59
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Cerebral Correlates of Facial Asymmetry Associated with Superior Oblique-Related Ocular Torticollis

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Introduction: Facial asymmetry often develops in patients with superior oblique (SO) palsy and torticollis that manifests early in life, though the pathogenesis of this asymmetry is unknown [1-3]. We hypothesized that this asymmetry may be related to asymmetry in blood flow, which would also affect intracranial structures. To address this question, we assessed for cerebral anatomic asymmetries in conjunction with facial asymmetry in individuals with SO palsy and torticollis.

Methods: We retrospectively reviewed the charts of patients evaluated at Boston Children's Hospital over a 10-year period with a diagnosis of SO palsy, brain MRI without structural abnormalities, and external photographs. Facial asymmetry scores were calculated using external photographs. Cerebral asymmetry was measured using the frontal and occipital lateral ventricular horn areas.

Results: Thirty-three patients (mean age of 16+/-7.5) met inclusion criteria. Mean head tilt was 7.9+/-8.7 degrees. In 23/33 (70%) cases, head tilt was congruent with direction of facial asymmetry, and within this subset, the magnitude of head tilt correlated significantly with facial asymmetry score ($r=0.42$, $p=0.046$). Frontal cerebral asymmetry, but not occipital, correlated significantly with the absolute degree of head tilt ($r=0.45$, $p=0.03$). The direction of cerebral asymmetry corresponded with the facial asymmetry in 11/23 (48%) of cases.

Conclusion/Relevance: These findings identify the frontal horn of the lateral ventricle as a correlate of facial asymmetry associated with torticollis secondary to SO palsy. While the results are consistent with our hypothesis, further work is needed to directly assess whether cerebral and facial asymmetries are driven by asymmetries in vascular flow.

References: 1. Akbari MR, Khorrami Nejad M, Askarizadeh F, Pour FF, Ranjbar Pazooki M, Moeinitabar MR. Facial asymmetry in ocular torticollis. J Curr Ophthalmol. 2015 Mar-Jun;27(1-2):4-11.
2. Greenberg MF, Pollard ZF. Ocular plagiocephaly: ocular torticollis with skull and facial asymmetry. Ophthalmology. 2000 Jan;107(1):173-8; discussion 178-9.
3. Rao R, Morton GV, Kushner BJ. Ocular torticollis and facial asymmetry. Binocul Vis Strabismus Q. 1999;14(1):27-32.

Poster #C60
Sunday, April 11, 2021
11:30 AM – 12:30 PM

The Use of OCT in the Assessment of Ocular Torsion

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Introduction: Measurement of ocular torsion is an essential part of evaluation, differential diagnosis and management of patients with strabismus. Conventionally, double Maddox rod testing (DMRT) and dilated fundus photography are used to measure ocular torsion. DMRT depends upon reliable patient response. Fundus photography requires dilation and analysis. Heidelberg Ocular Coherence Tomography (OCT) provides an assessment of torsion as a disc-foveal angle (DFA) easily obtained without dilation, but this has not been clinically validated. We studied the correlation between DMRT, fundus photography, and OCT methods of measuring torsion.

Methods: Twenty-six subjects with >5 degrees of ocular torsion from various mechanisms, and 15 controls without strabismus were enrolled into an IRB-approved prospective study. Subjective measurements were obtained with DMRT and objective measurements with undilated OCT and dilated fundus photographs. OCT measurements were compared to the other two methods.

Results: Preliminary results from regression analysis show high correlation in the measurement of torsion between the two objective methods. DMRT reliably predicts the direction of torsion but the degree was inconsistent with the objective tests. None of the controls showed significant torsion.

Conclusion/Relevance: DMRT is the gold standard for assessing ocular torsion but is subjective and may be unreliable. Fundus photography requires additional time for dilation and analysis. OCT imaging has the potential to be an accurate tool for measuring torsion. OCT may be considered complementary to DMRT providing objective evidence of torsion without requiring dilation.

References: Sophocleous, S. (2017) Use of OCT for objective assessment of fundus torsion. BMJ Case report.

Poster #C61
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Different Surgical Modalities for Varying Presentations of Superior Oblique Palsy

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Introduction: The aim of our study was to evaluate surgical management for different presentations of superior oblique palsy (SOP).

Methods: All patients with superior oblique palsy who underwent surgical treatment between 2008 and 2018 at Midwest eye Institute, Indianapolis, IN were included in the study.| Age of presentation, gender, etiology of SOP, fundus extorsion, degree of hypertropia, degree of inferior oblique overaction and type of surgery were considered.

Results: A total of 265 patients were identified. The median age at presentation was 39 years (range 3 months to 87 years). 147 (55.47%) were males. 31.7% were diagnosed as congenital, 24.15% long standing, 16.2% acquired & 27.55% unclear etiology. Inferior oblique (IO) myectomy was the primary muscle surgery in 60% followed by Inferior oblique recession (20%) & assorted other vertical muscles (20%). The patients were subdivided into group A having primary IO surgery & group B having primary other vertical muscle surgery. Further muscle surgery wasn't indicated in 74.6% in group A vs 51.1% in group B, P= 0.001*.

Conclusion/Relevance: The study suggests that IO myectomy is the most effective primary surgery for management of superior oblique palsy.

References: Mollan SP, Edwards JH, Price A, Abbott J, Burdon MA. Aetiology and outcomes of adult superior oblique palsies: a modern series. Eye (Lond) 2009; 23:640-44.

Poster #C62
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Unilateral Graded Marginal Myotomy for Minimally Overacting Inferior Oblique Muscle

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Introduction: Incomitant hypertropia from mild inferior oblique overaction pose a surgical challenge due to variability across gaze positions. We report the results of a graded marginal myotomy procedure to correct incomitant hypertropias related to minimal inferior oblique overaction.

Methods: A retrospective chart review of patients having intermittent exotropia with small-angle incomitant hypertropia and minimally overacting inferior oblique muscles (= +2) that had surgery from July 2017-July 2019 was performed. Of the 116 patients, 34 patients that had marginal myotomy of inferior oblique were included. These patients were divided into two groups; Group 1 (18) with patients that had small marginal inferior oblique myotomy for Hypertropia </= 4 PD in primary gaze and </= 8 PD in the contralateral gaze, Group 2 (16) with patients that had large marginal myotomy for Hypertropia in primary gaze >4 and </= 8PD and </= 12 PD in contralateral gaze.

Results: In Group 1, mean preoperative hypertropia in primary and contralateral gaze of action was 1.47 PD and 4.19 PD respectively. The mean postoperative deviation in primary and contralateral gaze was 0.04 PD and 0.14 PD. In Group 2, mean preoperative hypertropia in primary and contralateral gaze of action was 5.06 PD and 9.80 PD respectively. The mean postoperative deviation in primary and contralateral gaze was 0.40 PD and 0.73 PD respectively. Mean follow-up period was 22.77 months.

Conclusion/Relevance: Graded Inferior Oblique Marginal Myotomy is an excellent addition to our existing armamentarium. It offers a safe, easy, effective sutureless alternative to weakening a minimally overactive inferior oblique muscle.|

References: 1. Cruz FC, Robbins SL, Kinori M, Acera E, Granet D. Z-myotomy of the inferior oblique for small incomitant hypertropias. J AAPOS. 2015 Apr;19(2):130-4.
2. Mellott ML, Scott WE, Ganser GL, Keech RV. Marginal myotomy of the minimally acting inferior oblique muscle in asymmetric bilateral superior oblique palsies. J AAPOS. 2002 Aug;6(4):216-20.

Poster #C63
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Treatment of Persistent Strabismus Following Anterior Transposition of the Inferior Oblique Muscles

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Introduction: Children with infantile strabismus may undergo anterior transposition of the inferior oblique muscles (IOAT) for treatment of vertical and V-pattern strabismus. This study evaluated the effect of inferior oblique myectomy for treatment of persistent ocular misalignment following IOAT.

Methods: This was a retrospective chart review of patients with infantile strabismus who had persistent ocular misalignment following IOAT. The IOAT procedures were initially performed in conjunction with horizontal rectus muscle surgery for treatment of V-pattern strabismus, overelevation in adduction, or dissociated vertical deviation.

Results: Thirteen patients underwent myectomies of previously anteriorly transposed inferior oblique muscles. The indications for surgery were persistent V-patterns (6 patients), vertical strabismus (4 patients), or both (3 patient). Follow-up ranged from 1 week -10.5 years (mean 5.5 years) after the myectomies. Six patients had good outcomes following inferior oblique muscle myectomy alone. The mean improvement in the V-pattern was 16 prism diopters. Six patients had good outcomes following one additional surgery (4 for hyperdeviations, one for a persistent pattern and one for both). One patient had a persistent hypotropia and did not return for follow-up.

Conclusion/Relevance: Children with infantile strabismus often have vertical or pattern strabismus that is treated with IOAT. If children have persistent strabismus following IOAT, myectomy of the inferior oblique muscles may be effective in treating residual hyperdeviations and V-patterns, but additional procedures may be necessary to achieve good ocular alignment.

References: Han J, Han SY, Lee JB, Han SH. Surgical management of long-standing antielevation syndrome after unilateral anterior transposition of the inferior oblique muscle. J AAPOS 2014;18:232-234.

Poster #C64
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Effect of 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 4th nerve palsy with large angle vertical deviation and/or large inferior oblique muscle overaction (IOOA). The IO is transferred nasally to the inferior rectus muscle. The aim of the present study was to evaluate the effect on vertical deviation and IOOA after IOANT.

Methods: We reviewed charts of all patients undergoing IOANT at one ophthalmology department from January 2018, to September, 2020.

Results: We performed IOANT on 41 patients in the study period. Nine patients were excluded due to other simultaneous procedures or other pathology. Three patients are awaiting follow-up. In the remaining 29 patients, three patients had undergone previous IO recession within one year prior to IOANT conversion. In these, we use measurements from before the first procedure in our calculations.

We placed short tag noose adjustable sutures in 20 cases, of which we adjusted two patients on day six after surgery due to overcorrection Median vertical deviation decreased from 23PD to 1PD with a mean effect of 22? (range 0PD-48PD), and median IOOA decreased from 3 to 0 with a median effect of 2.5 (interquartile range [2;3]). Mean effect of IOANT did not differ depending on placement of the IO.

Conclusion/Relevance: IOANT is a useful procedure for treating fourth nerve palsy with large vertical deviation and large IOOA.

References: 1) Saxena R, Sharma M, Sing D, Sharma P. Anterior and nasal transposition of inferior oblique muscle in cases of superior oblique palsy. J AAPOS. 2017 Aug;21(4):282-285

Poster #C65
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Trichromatic Enhanced Dynamic Color Screening with a Handheld Gaming Device

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Introduction: Beyond conventional isochromatic color plate screening, further quantification and classification has required substantial time and expense with the static Farnswell-Munsel 100 and Innova Rabin tests. Dynamic color screening games were developed for the Nintendo 3DS console(1).

Methods: Eleven patients whose color deficiency was noted on Ishihara were compared with 12 age-matched normals performing gold-standard Innova Rabin color test in addition to PDI Check dynamic color games resembling Farnsworth-Munsel presentation (version 0.2.8) and 3-color iso-luminance gray (version 0.2.13).

Results: Tests of red, green and blue cone-deficient with the v0.2.8 had sensitivity/specificity/PPV of 92%/86%/92% protanopes, 78%/90%/88% deutanopes and 87%/50%/93% tritanopes. Version 0.2.13 had sens/spec/PPV of 78%/83%/78% red-cone, 100%/85%/80% green cone and 67%/78%/33% blue cone. Corresponding IntraClass Correlation (ICC) utilizing v0.2.8 were red-cone 0.22(-0.02-0.60), green-cone 0.34(-0.10-0.67) and blue-cone 0.38(0.12-0.75). ICC for v0.2.13 were higher with protanope 0.62(-0.07-0.87), deuteranope 0.64(-0.09-0.88) and tritanope (0.31(-0.07-0.70). The PDI Check color game took from 40 sec to 2 minutes even for color deficient patients.

Conclusion/Relevance: Both the Farnswell-Munsel type and the iso-luminance gray type had excellent validation when screening cone-deficient color types with the latter better quantifying the degree of defect.
The PDI Check color game quickly identifies the 4% of patients with inherited color deficiencies.

References: (1) Smith KA, et al: Performance of a quick screening version of Nintendo 3DS 'PDI Check' game on patients with ocular suppression. J Pediatr Ophthalmol Strabismus 2019, 56(4):234-7.

Poster #C66
Sunday, April 11, 2021
11:30 AM – 12:30 PM

A New Visual Acuity Test for Use in Children age 4-17

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Introduction: The computer age has opened many doors to new ways to measure visual acuity and visual performance, but they are generally only computerized graphic images or portions of standard charts. The 'DYOP' (short for Dynamic Optotype) is a rotating, segmented optotype. Unlike static image vision tests, such as a logMAR chart, a DYOPis a segmented, circular figure composed of equally spaced gap/segments which spin at a constant velocity. Our research goal was to test a simple visual acuity test based on dynamic target that is minimally dependent on familiarity with symbols and letters. The visual acuity results obtained from children using the DYOP visual acuity were compared with results obtained with the Lea numbers ETDRS chart.

Methods: Monocular visual acuity was tested using both the new DYOP visual acuity test and the Lea numbers ETDRS chart, alternating the order of administration between subjects. Testing was performed on the subject's eye with the poorest acuity.

Results: The acuities were shown to have a strong linear correlation (r =0.88) and a mean difference in acuity of -0.01 (95% confidence interval, -0.02 to 0.01) logMAR, equivalent to approximately less than one letter, with the DYOP test underestimating the vision as determined by the ETDRS chart. The 95% limits of agreement were ±1.2 lines.

Conclusion/Relevance: This study supports the validity of the new DYOP visual acuity test as a measure of visual acuity in pediatric patients aged 4 to 17 years with vision ranging from 20/16 to 20/200.

References: Candy TR, Mishoulam SR, Nosofsky RM, Dobson V. Adult discrimination performance for pediatric acuity test optotypes.Invest Ophthalmol Vis Sci 2011;52:4307-13.
Graf MH, Becker R, Kaufmann H. Lea Symbols: visual acuity assessment and detection of amblyopia. Graefes Arch Clin Exp Ophthalmol 2000; 238:53- 8.
Vision in Preschoolers (VIP) Study Group. Visual acuity results in school-aged children and adults: Lea Symbols chart versus Bailey-Lovie chart. Optom Vis Sci 2003; 80:650-4.

Poster #C67
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Comparison of a Virtual-Reality Headset-Based Perimetry Device to Standard Humphrey Visual Field in Normal Children

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Introduction: Perimetry in children is an invaluable modality for assessing afferent function. Current threshold perimeters demonstrate relatively poor reliability and satisfaction. The Olleyes VisuALL (OV) is a commercially available video-game based automated static threshold perimeter that uses a Virtual Reality headset, and a wireless remote.

Methods: Fifty normal subjects ages 9-17 (mean=13 years, 50% female) performed Humphrey Visual Field (HVF) 24-2 and Olleyes VisuALL pediatric threshold perimetry. Test time, reliability parameters, and effects of age, gender, and ethnicity were evaluated. Normative threshold sensitivities were established by percentile. Patient satisfaction surveys were administered.

Results: Mean time to completion for OV and HVF was 7.56 and 5.31 min/eye respectively. Age-adjusted thresholds were similarly distributed between OV and HVF (Mean sensitivity 31.8+/-1.11dB OV, 31.0+/-1.53dB HVF), mean inter-subject variability was no different (8.2+/-0.37% OV and 8.0+/-0.27% HVF). Mild age-effects on threshold sensitivity in OV were similar to HVF ($R2 = 0.10$ $p<0.01$ OV; $R2 = 0.08$ $p<0.025$ HVF). Mean threshold sensitivities in the same eye were compared by linear regression ($R2 = 0.11$ $p<0.001$), and there was no significant difference in the number of abnormal responses per field using a 5th percentile cutoff. (2.24 in OV vs 2.27 in HVF, $p>0.7$). Patient satisfaction scores favored the OV device experience (4.12/5 vs 3.26/5, $p<0.001$).

Conclusion/Relevance: This commercially available head-mounted perimeter can be used reliably in children and is associated with higher patient satisfaction than HVF. A normative dataset is now available and the device can be used in clinic, hospital, or home settings.

References: Patel DE, Cumberland PM, Walters BC, Russell-Eggitt I, Rahi JS; OPTIC study group. Study of Optimal Perimetric Testing in Children (OPTIC): Feasibility, Reliability and Repeatability of Perimetry in Children. PLoS One. 2015 Jun 19;10(6):e0130895.

Poster #C68
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Visual Acuity Testing Methods in Children

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Introduction: We sought to determine the clinical feasibility at varying ages of visual acuity (VA) testing methods in children. There are limited studies using 'real-world' patient level data on this subject.

Methods: Retrospective, observational cross-sectional study of children examined at a multi-provider pediatric ophthalmology clinic over a 10-year period. Primary outcomes were the proportions of all successful VA measurements at each age that were completed using each method. Testing routinely began with the 'highest' method and proceeded 'downwards' as follows: optotypes: Snellen, HOTV, Lea or other symbols; and then non-optotypes: Teller, fixation, light perception. Secondary outcomes included use of matching, crowding bars, and single versus linear optotypes.

Results: In total, 279,500 successful visual acuity measurements were completed during the study period, ranging 14,012-24,046 measurements per year and 4,313-6,758 per 3-month period, from birth to 10 years. Successful optotype testing rose rapidly from 2% to 80% between ages 2 and 4 years. At 3 years, 49% could complete optotype testing (23% with symbols, 16% HOTV, 3% Snellen, 7% unspecified); and by 4.5 years, 89% could complete optotype testing (13% symbols, 43% HOTV, 19.0% Snellen, 14% unspecified). Snellen letters could be completed by 48% at age 5 and 75% at age 8.

Conclusion/Relevance: Half of children could complete optotype testing by age 3 years, and 80% by age 4. Such large-scale patient-level data may help guide visual acuity testing approaches and expectations in pediatric and comprehensive ophthalmology clinics and vision screening practices in primary care settings.

References: 1. Holmes JM, Beck RW, Repka MX, et al. The Amblyopia Treatment Study Visual Acuity Testing Protocol. Arch Ophthalmol. 2001;119(9):1345-1353.
2. Schmidt P, Maguire M, Dobson V, Quinn G, Ciner E, Cyert L, Kulp MT, Moore B, Orel-Bixler D, Redford M, Ying GS; Vision in Preschoolers Study Group. Comparison of preschool vision screening tests as administered by licensed eye care professionals in the Vision In Preschoolers Study. Ophthalmology. 2004 Apr;111(4):637-50.

Poster #C69
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Pupil-Size and Refractive Normative Data in Israeli Children

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Introduction: The aim of this study is to present the normative data collected by Plusoptix S12 photoscreener, among children in Israeli kindergartens, in order to determine a good estimate of average pupil size, incidence of anisocoria and normative refractive data among the pediatric population.

Methods: This is a retrospective study of 101,417 Israeli children between ages 4 - 5 years old, examined using the Plusoptix S12 photoscreener. The examinations were carried out at kindergartens in major cities in Israel. Data collected included age, sizes of both pupils and magnitude of anisocoria, sphere, cylinder, and SE, obtained between the years 2013 - 2018.

Results: The size of the pupil, in our study group, was measured separately for the right and left eyes. The calculated results were 5.83 mm ± 0.87, and 5.82 mm ± 0.88 respectively. 13.26% (13,448 children) were found with anisocoria = 0.4mm; of these, 6.23% (6,314 subjects) had anisocoria of 0.5 - 0.9 mm, and 0.66% (669 subjects) had anisocoria of > 1.0 mm. The mean sphere and cylinder values were 0.84D 0.73 and -0.53D ± 0.48 respectively. The mean calculated SE was 0.56D±0.6. No difference found between sexes, or between different cities.
According to the Vision Screening Guidelines[3], 807 children (0.80%) had hyperopia (>3.50D) and 171 children (0.17%) had myopia (>3.00D). 6,307 children (6.22%) had astigmatism (>1.5D) and 11,008 children (10.85%) had anisometropia (>1.5D SE).

Conclusion/Relevance: The presented data, which is the largest study group to the best of our knowledge, gives an estimate of normative pupil size, and anisocoria prevalence and refractive data in pediatric population. Further examinations in other geographic areas and in other age groups should be continued.

References: 1. Silbert J., et al. 'Pupil size and anisocoria in children measured by the plusoptiX photoscreener'. Journal of AAPOS 17.6 (2013): 609-611.
2. Boev AN., et al. 'Quantitative pupillometry: Normative data in healthy pediatric volunteers'. Journal of Neurosurgery 103.6 (2005): 496-500.
3. Donahue SP, Arnold RW, Ruben JB; AAPOS Vision Screening Committee. Preschool vision screening: what should we be detecting and how should we report it? Uniform guidelines for reporting results of preschool vision screening studies. J AAPOS 2003:7(5):314-316.

Poster #C70
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Detection of Treatment-Requiring Hyperopia using a Photo Vision Screening Device in a Preschool Population

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Introduction: Hyperopia is common in childhood, but can cause refractive or strabismic amblyopia if significant hyperopia remains untreated. While current guidelines recommend treatment of hyperopia with esotropia starting at 1.50-2.00 D, there is no definitive cut off for hyperopia without strabismus. The plusoptiX S12 (POS12) using Option 4, refers for hyperopia at 2.50 D or greater. This study seeks to determine the accuracy of detecting significant hyperopia in preschool children for referral at 2.50 D.

Methods: Vision screenings were conducted for Head Start children (mean age 55.2 months old) by Elks Preschool Vision Screening using the plusoptiX S12 (Option 4). Free onsite eye exams were performed on all children screened. Statistical analysis for photoscreenings and cycloplegic refractions were performed using R statistical software (version 3.5.0).

Results: Dilated eye exams were completed on 45 plusoptiX referrals and 66 passes. Of these 111 children, there were 25 children diagnosed by eye exam with hyperopia exclusively. Of those, 5 children had hyperopia greater than 2.50 D. Glasses were prescribed to 2 of these children. The POS12 referred 1 of these 2 for hyperopia. The sample size was too small to accurately report sensitively and specificity for hyperopia exclusively. Overall, the sensitivity for detection of any treatment-requiring refractive error was 82.2% and specificity of 87.9%, with PPV 82.2% and NPV of 87.9%.

Conclusion/Relevance: The majority of children in our study had hyperopia plus other eye conditions. The overall sensitivity and specificity of the POS12, when looking at all eye conditions, is sufficiently accurate for a public screening program.

References: Barugel R, Touhami S, Samama S, et al. Evaluation of the Spot Vision Screener for children with limited access to ocular health care. J AAPOS. 2019;23(3):153.e1-153.e5. doi:10.1016/j.jaapos.2018.09.012

Poster #C71
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Quickly Closing the Loop for Failed Vision Screening Referrals – A Multi-Disciplinary Rapid Access Vision Screening Pilot Clinic

Laura K. Chalkley, CO; Leila Hajkazemshirazi, OD; Maanasa Indaram, MD; Karen Cooper, CO; Tansy (Hui) Wong, COT; Julius Oatts, MD; Elise Harb, OD; Alejandra G. de Alba Campomanes, MD, MPH

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Introduction: Primary care vision screenings generate a large volume of pediatric ophthalmology referrals. These children need to be seen quickly to rule out or confirm ophthalmologic diagnoses, however timely access to specialty services is often limited.

Methods: Children aged 0-5 with failed vision screening were directly scheduled into a dedicated vision screening service run cooperatively by orthoptists, optometrists and ophthalmologists. All visits included vision testing, orthoptic examination, cycloplegic refraction and dilated fundus examination. New patient clinic volumes and referral-to-appointment access times were compared pre and post intervention. Referral results, parent satisfaction scores, diagnoses, exam length and visit reimbursement were collected.

Results: 235 patients were evaluated during 12 months of a team-based pilot clinic. Referrals were: failed photo-screening (53%), possible strabismus (31%) and failed visual acuity test (16%). 88 children (37%) were confirmed to have amblyopia risk factors (22%) or strabismus (15%). Median referral-to-appointment time was 48.5 days (range 4-238 days), compared to a typical 76 day wait. The average visit length was 64 minutes, compared with 95 minutes for a new patient visit for the same complaint in a typical pediatric ophthalmology clinic. Mean new patient per clinic average increased from 5.8 to 17.5. Satisfaction was rated as 'totally satisfied' by 80% of parents.

Conclusion: The volume of patients being referred for comprehensive eye exam is increasing, in part due to the introduction of photo-screening before 3 years of age. This increased demand cannot be met using current models. We describe an innovative service that provides rapid access to high quality care, providing timely intervention to those with true amblyopia risk factors or strabismus. Additionally, visit times were reduced, and access to regular pediatric ophthalmology and optometry clinics improved.

References:

1) Zuckerman KE, Perrin JM, Hobrecker K, Donelan K. Barriers to Specialty Care and Specialty Referral Completion in the Community Health Center Setting. The Journal of Pediatrics. 2013;162(2).
2) Cotter SA, Cyert LA, Miller JM, Quinn GE. Vision Screening for Children 36 to <72 Months. Optometry and Vision Science. 2015;92(1):6–16.
3) Wallace DK, Repka MX, Lee KA, Melia M, Christiansen SP, Morse CL, et al. Amblyopia Preferred Practice Pattern®. Ophthalmology. 2018;125(1).
4 Law MX, Pimentel MF, Oldenburg CE, de Alba Campomanes AG. Positive predictive value and screening performance of GoCheck Kids in a primary care university clinic. *Journal of American Association of Pediatric Ophthalmology and Strabismus*. 2020;24(1)

Poster #C72
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Drive-thru Children Eye Screening using a Vision Screening Device in Response to Covid 19 in Indonesia

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Introduction: Covid-19 pandemic has changed the way of delivering health services worldwide into telemedicine and drive-thru examination. Most schools also shift into online learning, including in Greater Jakarta, Indonesia. It has been reported that myopia prevalence is high in Southeast Asia, and refractive errors if not corrected properly may lead to amblyopia. Therefore, a regular eye screening is important. This study aims to report an outdoor drive-thru children eye screening utilizing Plusoptix A12 in Indonesia.

Methods: A case series of consecutive subjects aged 4 to 17 years that underwent drive-thru eye screening using digital Snellen chart at 4 feet distance and Plusoptix A12 autorefractor photoscreening at 3 feet distance while seated inside a car in a 1 month period of July 2020 are included in the study.

Results: Forty-seven children (male: 19; female: 28), aged 4 to 16 years (mean: 8.5; median: 10) were screened. 29 (61.7%) underwent further eye examination for subjective refraction in the clinic, while 18 (38.3%) were either determined not subjected to further eye examination or had their eye examination done in another health facility. Myopia requiring spectacle correction was found in as early as 5 years of age (10%). The incidence of myopia detected was highest in the >10 years age group (67%)

Conclusion/Relevance: The use of Plusoptix A12 in conjunction with visual acuity testing in an outdoor, drive-thru setting is an effective and safe method of children eye screening. This method is useful for myopia detection in Indonesia while maintaining physical distance during Covid 19 pandemic.

References: 1.Xiong S, Sankaridurg P, Naduvilath T, et al. Time spent in outdoor activities in relation to myopia prevention and control: a meta-analysis and systematic review. Acta Ophthalmol. 2017:95(6);551-56
2.Fogel-Levin M, Doron R, Wygnanski-Jaffe T, et al. A comparison of plusoptix A12 measurements with cycloplegic refraction. J AAPOS 2016:20(4);310-314
3.Payerols A, Eliaou C, Trezequet V, et al. Accuracy of Plusoptix A09 distance refraction in pediatric myopia and hyperopia. BMC Ophthalmol 2016:1;16:247-248.

Poster #C73
Sunday, April 11, 2021
11:30 AM – 12:30 PM

A Retrospective Cohort Study of Failed Vision Screening Visits for Refractive Error Presenting to Pediatric Eye Providers

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Introduction: Automated vision screening of pre-school aged children is an important tool in the prevention of visual impairment. We report the characteristics of the referrals for failed vision screen in our department.

Methods: IRB approved, retrospective cohort study from October 2017 - August 2019 of pediatric patients referred for failed vision screen via automated visual screener. Patients with other ophthalmologic diagnosis were excluded. Descriptive statistics and logistic regression analyses were used to determine the true positive screening rate using AAPOS published guideline1 as well as the presence of treatable amblyogenic risk factor (ARF) due to refractive errors published from the American Academy of Ophthalmology.

Results: 1150 patient encounters met our inclusion criteria; 488 (42%) were under 2, 236 (21%) between 2-3. Under age 2, 29.7% were true positives and 60.6% of those had ARF. The true positive rate amongst patients under the age of 2 were low; 8% for myopia, 13% for hyperopia, 32% for astigmatism. Over the age of 2, there is an increase in the likelihood of true positives overall, 43%; 37% for 2-4 year-olds, 56% of patients over 4. Treatable refractive errors also increased amongst the over 2 year-olds; 36% between 2-3, 42% between 3-4, and 57% of over 4 year-olds.

Conclusion/Relevance: Our study demonstrates that the under 2 years age groups makes up a large proportion of referrals with relatively low ARF rate. We propose that vision screeners either adopt age-based referral criteria or patients under the age of 2 that fail a vision screen be grouped as "borderline" and rescreened as they age.

References: 1. Donahue SP, Lorenz S, Johnson T. Photo screening around the world: Lions Club International Foundation experience. Semin Ophthalmol. 2008 Sep-Oct;23(5):294-7. doi: 10.1080/08820530802506078. PMID: 19085430.
2. Berry BE, Simons BD, Siatkowski RM, Schiffman JC, Flynn JT, Duthie MJ. Preschool vision screening using the MTI-Photoscreener. Pediatr Nurs. 2001 Jan-Feb;27(1):27-34. PMID: 12025144.
Further references to follow

Poster #C74
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Comparison of Two Photo-Screeners in a Population of Syrian Refugee Children

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Introduction: The Za'atari refugee camp in Jordan is home to approximately 80,000 Syrian refugees. We evaluated children in the refugee camp to better understand the prevalence of ocular pathology. Additionally, we compared two photoscreening devices to evaluate their utility.

Methods: Families at the Syrian American Medical Society Clinic were offered vision screening for children aged 1-18 years. Participants were offered visual acuity measurement and photoscreening with two devices approved for use in the United States. If visual acuity in either eye was worse than 20/40 or either photoscreening device indicated possible pathology, a complete eye examination was performed with cycloplegic refraction and dilated examination. This research was approved by Emory University's Institutional Review Board and conformed to the tenets of the Declaration of Helsinki.

Results: 91 participants completed the screening protocol. The average age of participants who completed the study was 7.8 years. 28 participants (30.8%) failed at least one screening component. In this population, the following pathology was identified: astigmatism (12.1%), esotropia (9.9%), amblyopia (9.9%), hyperopia (7.7%), exotropia (3.3%), myopia (1.1%). The Plusoptix had a sensitivity of 100% for the identification of amblyopia and 85% specificity. The GoCheck kids had a sensitivity of 66.67% for the identification of amblyopia and 94% specificity. The positive predictive value for the Plusoptix and the Gocheck kids device for the detection of amblyopia risk factors were both 77%.

Conclusion/Relevance: The high rate of ophthalmic pathology identified in this study reinforces the urgent need for vision services in this population.

References: 1. United Nations High Commissioner for Refugees, Fact Sheet Jordan - Za'atari Refugee Camp. April 2018, https://data2.unhcr.org/en/documents/download/63051

Poster #C75
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Outcomes of Pediatric Photoscreening for Children with Diabetes Mellitus

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Introduction: Studies in children with type 1 diabetes mellitus (DM) have recommended screening eye examinations at age 15 or 5 years after diagnosis, whichever occurs later. The role of diabetic eye screening in children remains unclear. This study investigates teleretinal screening in asymptomatic children with DM.

Methods: A prospective REDCap database review was approved by the Institutional Review Board at Children's Hospital of Wisconsin (CHW). Subjects with DM Type 1 or 2 were referred by CHW Pediatric Endocrinology for retinal screening between 2017 and 2020. A pediatric ophthalmologist or optometrist reviewed all ultra-widefield fundus photography and optical coherence tomography (OCT).

Results: A total of 245 subjects (mean age 14.3+/-3.2 years; range 4.0-21.5) had 306 exams with 611 eyes examined. Time since DM diagnosis was 5.1+/-3.6 years (range -0.2-16.0). All 32 subjects with an abnormal screening result were advised to return for a clinic visit. Six subjects were referred for evidence of diabetic retinopathy (DR); all had only mild non-proliferative DR. One additional subject had bilateral macular edema on OCT. Another subject had unilateral findings suggestive of DR versus retinal vasculitis. The average age for DR was 17.3+/-1.8 years (range 13.8-19.1). The remainder of the abnormalities were incidental findings. Statistically significant findings for those subjects with DR were race, older age, and higher hemoglobin A1c.

Conclusion/Relevance: DR is rare in children. In our population, 13.1% of subjects had abnormal findings, with only 3.3% of all subjects screened having diabetic retinopathy. Teleretinal fundus photography may allow for efficient and cost-effective access to DR screening for more children.

References: 1. Geloneck MM, Forbes BJ, Shaffer J, Ying G-S, Binenbaum G. Ocular Complications in Children with Diabetes Mellitus. *Ophthalmology*. 2015;122(12):2457-2464. doi:10.1016/j.ophtha.2015.07.010.
2. Lueder GT. Screening for Retinopathy in the Pediatric Patient With Type 1 Diabetes Mellitus. *Pediatrics*. 2005;116(1):270-273. doi:10.1542/peds.2005-0875.

Poster #C76
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Utilization and Barriers of Eye Care Services following Pediatric Vision Screening within Public Schools

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Introduction: In August 2018, Ontario introduced the Child Visual Health and Vision Screening Protocol outlining school-based senior kindergarten vision screening. (1,2) Screening implementation relies on individual public health units. (3) While there is a post-screening notification process, there is no obligation for families to comply. We evaluated the impact of screening in our region.

Methods: Vision screening data (gender, HOTV, Randot, Autorefractor) was collected for the 2018-2019 and 2019-2020 school years; data for 2019-2020 was incomplete due to COVID. Follow-up phone calls to guardians of n = 252 "refer" and n = 249 “pass” children were conducted to determine whether an optometry visit occurred, glasses were prescribed, and potential barriers to accessing eye-care. Schools were categorized according to pre-defined dental screening risk.

Results: Of the 1127 children screened, 363 were identified as refer (32.6%). The average age of children screened was 6.11 years A significant relationship was found between increasing school risk and receiving a refer X^2 (2, N = 1127) = 29.94, $p < .005$. The response rate for phone follow-up was 31.7% (n = 158). Of those followed-up by phone, n = 92 children were referred and 70.6% (n=65) of these had sought follow-up with an eye-care specialist.

Conclusion: Follow-up phone call also revealed a high proportion of children sought out follow-up care after being referred. Despite universal province-wide yearly optometric pediatric eye exam coverage, children at high-risk schools are more frequently referred. Considerations into implementing follow-up for refers from higher risk schools and underserved communities may be warranted.

References: 1. Nishimura, M., Wong, A., Dimaras, H., & Maurer, D. Feasibility of a school-based vision screening program to detect undiagnosed visual problems in kindergarten children in Ontario. CMAJ 2020;192(29):E822-E831.
2. Child Visual Health and Vision Screening Protocol. Available at: http://health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/protocols_guidelines/Child_Visual_Health_and_Vision_Screening_Protocol_2018_en.pdf. Published 2018. Accessed October 5, 2020.
3. Mema SC, McIntyre L, Musto R. Childhood vision screening in Canada: public health evidence and practice. Canadian Journal of Public Health 2012;103(1):40-5.

Poster #C77
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Age Does Not Influence the Positive Predictive Value of Vision Screening to Detect Amblyopia Risk Factors

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Introduction: The United States Preventative Services Task Force (USPSTF) recommends vision screening for children 3-5 years old, but not for younger children, citing insufficient evidence[1]. We compared the positive predictive value (PPV) of vision screening to detect Amblyopia Risk Factors (ARF) for children <3 compared to 3-5 years old.

Methods: We hypothesized that PPV of vision screening to detect ARF is lower for children <3 compared to 3-5 years old. A retrospective chart review of all children 0-5 years old receiving comprehensive eye examination (CEE) between 11/1/2017-3/1/2020 following a failed vision screening was conducted. Children were excluded if they had previous CEE, or if their cycloplegic retinoscopy or strabismus exam was incompletely documented. Demographics (age, race, ethnicity, gender) and eye exam data were collected. AAPOS' criteria for refractive and strabismic ARF[2] were used to determine PPV of vision screening. Pearson's and logistic regression analyses assessed for associations between PPV of vision screening and demographics.

Results: 3970 children had CEE after FVS, 3114 of whom met inclusion criteria.
PPV of vision screening was 60.5% (95%CI: 58.1%-63.0%) for children <3 years old and 59.5% (95%CI: 57.1%-62.0%) for children 3-5 years old. The unadjusted and adjusted difference between PPV for the two age groups (OR=0.959, 95%CI: 0.831-1.107; OR=1.028, 95%CI: 0.839-1.260) was not statistically significant (p=0.568; p=0.790).

Conclusion/Relevance: PPV of vision screening to detect ARF is similar for children <3 compared to 3-5 years old. Accordingly, the USPSTF recommendation should be changed to reflect the efficacy of vision screening in younger children.

References:

1. Grossman DC, Curry SJ, Owens DK, et al. Vision screening in children aged 6 months to 5 years: US preventive services task force recommendation statement. *JAMA - J Am Med Assoc*. 2017. doi:10.1001/jama.2017.11260
2. Donahue SP, Arnold RW, Ruben JB. Preschool vision screening: What should we be detecting and how should we report it? Uniform guidelines for reporting results of preschool vision screening studies. *J AAPOS*. 2003. doi:10.1016/S1091-8531(03)00182-4

Poster #C78
Sunday, April 11, 2021
11:30 AM – 12:30 PM

Detection of Strabismus with a Vision Screening Device in a Statewide Vision Screening Program

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Introduction: Vision screening devices have been successfully used for many years in the detection of amblyogenic risk factors, including refractive errors, media opacities, and strabismus. The purpose of this study was to demonstrate the ability of a digital vision screening device to detect strabismus accurately and effectively.

Methods: Data with a digital device from the Iowa KidSight program between January 1, 2012 to June 30, 2018 was collected. The number and type of referral was reviewed. Subjects referred for strabismus were further analyzed to determine ophthalmic professional seen as well as correlation to presence and degree of strabismus on ophthalmic examination at the University of Iowa.

Results: 236,271 children were screened with the digital screening device. 16,909 children were referred. 3,096 were already under care, leaving 13,813 children requiring follow up. 9,501 children (69%) had follow- up data, 309 of those were referred for strabismus (3.2%). 33 (10.6%) of these children received full comprehensive examination by a pediatric ophthalmologist and orthoptist at the University of Iowa. All patients referred for strabismus were found to have either a constant (29) or intermittent strabismus (4) producing a specificity for constant deviations of 87.87%.

Conclusion/Relevance: This digital screening device demonstrated that it was an effective screening tool in detecting strabismus in children.

References: Kennedy RA, Thomas DE. Evaluation of the iScreen digital screening system for amblyogenic factors. Can J Ophthalmol. 2000;35:258-62

Peterseim MM, Davidson JD, Trivedi R, Wilson ME, Papa CE, Cheesman EW. Detection of strabismus by the Spot Vision Screener. Journal of AAPOS 2015:19:512-514

Loudon SE, Rook CA, Nassif DS, Piskun, Hunter DG. Rapid, high-accuracy detection of strabismus and amblyopia using the Pediatric Vision Scanner. Investigative Ophthalmology & Visual Science. 2011:52(8);5043-5048.

Workshops

Workshop #1
Friday, April 9, 2021
3:00 PM – 4:15 PM

Evaluating Optic Nerve Head Elevation

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Purpose/Relevance: The clinical and diagnostic evaluation of optic nerve head elevation remains one of the pediatric ophthalmologist's most common and daunting challenges. The purpose of this workshop is to discuss a step-wise approach to diagnostic testing that may reduce the need for unnecessary, and sometimes, invasive procedures.

Target Audience: Pediatric ophthalmologists, imaging specialist.

Current Practice: Depending on location/practice setting, a pediatric ophthalmologist may not have access to the requisite imaging modalities or knowledge of their analysis to properly evaluate a child with suspected optic nerve head elevation. Even when 'state of the art' equipment is available, many young children are unable to cooperate with testing. Also, some practices may not have access to specialists skilled in evaluating and managing children with suspected optic nerve head elevation.

Best Practice: Pediatric ophthalmologists should be equipped to use commonly available imaging modalities, in a step-wise approach, to determine if the child has true optic nerve head swelling and thus needs referral to a specialist.

Expected Outcomes: Upon completion of the workshop, participants will be empowered to use and analyze diagnostic imaging for optic nerve head elevation and will understand the benefits and limitations of each test. The knowledge gained will help reduce unnecessary testing, clarify the significance of certain results and optimize referral to specialty providers.

Format: Didactic lectures, case presentations, and question/answer period.

Summary: This workshop will describe the rationale, acquisition and interpretation of the most commonly used imaging techniques to evaluate optic nerve head elevation including B-scan ultrasonography, fluorescein angiography, autofluorescence and optical coherence tomography. Conditions mimicking or causing optic nerve head elevation, unrelated to elevated intracranial pressure, will be discussed as their diagnostic approach can be much different. Lastly, the workshop will describe how to incorporate MRI and lumbar puncture findings along with input from consultants into your evaluation and management of children with suspected optic nerve head elevation.

References: Chang MY, Velez FG, Demer JL et al., Accuracy of Diagnostic Imaging Modalities for Classifying Pediatric Eyes as Papilledema Versus Pseudopapilledema Ophthalmology. 2017 Dec;124(12):1839-1848.
Avery RA. Interpretation of lumbar puncture opening pressure measurements in children. J Neuroophthalmol. 2014;34(3):284-7
Gise R, Gaier ED, Heidary G. Diagnosis and Imaging of Optic Nerve Head Drusen. Semin Ophthalmol. 2019; 34:256-263.

Workshop #2
Friday, April 9, 2021
3:00 PM – 4:15 PM

Innovative Techniques Enhancing the Treatment of Complex Strabismus

Linda R. Dagi, MD; Federico G. Velez, MD; Sean P. Donahue, MD, PhD; Matthew S. Pihlblad, MD

Boston Children's Hospital; Harvard Medical School; Duke Ophthalmology; Vanderbilt University Medical Center; University of Pittsburg Medical Center
Boston, Massachusetts; Durham, North Carolina; Nashville, Tennessee; and Pittsburgh, Pennsylvania

Purpose/Relevance: To describe and provide the indications for newer innovative techniques for the management of specific complex strabismus disorders.

Target Audience: Strabismus Surgeons

Current Practice: Strabismus surgeons often rely on a diverse array of classic surgical procedures introduced during fellowship training. A number of innovative options have been recently described and merit consideration as alternative interventions for of a variety of complex strabismus disorders.

Best Practice: Adopting a new technique requires familiarity with the specific surgical steps, as well as an appreciation of the outcomes and risks that might be anticipated with its application. Diagnostic innovations should be evaluated for value added, and cost. We will introduce adjustable graded augmentation for superior rectus transposition; modified SO tendon transposition as well as lateral rectus extirpation for 3rd nerve palsy; mono-rectus transposition for monocular elevation deficit; inferior rectus transposition; and intra-operative OCT. Indications for use, and limitations of each in comparison to recognized alternatives, as appropriate, will be covered.

Expected Outcomes: Participants will become familiar with the technical steps required to perform these newer techniques and appropriate indications for use.

Format: Video or photographic description of each technique will be provided along with a discussion of the circumstancing favoring consideration of each innovation. Panel discussion and audience questions will follow, time permitting.

Summary: Adoption of an innovation to manage a complex strabismus disorder requires both a familiarity with the steps of the procedure as well as an informed perspective on the why the technique was developed. Video or photographic description of adjustable graded augmentation for superior rectus transposition; modified SO tendon transposition and lateral rectus extirpation for 3rd nerve palsy; mono-rectus transposition for monocular elevation deficit; inferior rectus transposition, and intra-operative OCT will be shown. Indications for use, and limitations of each in comparison to recognized alternatives will be discussed.

References: Dagi, LR and Elhusseiny, AM. Adjustable graded augmentation of superior rectus transposition for treatment of abducens nerve palsy and Duane syndrome. JAAPOS 2020.DOI:https://doi.org/10.1016/j.jaapos.2020.05.013
Velez FG, Chang MY, Pineles SL. Inferior Rectus Transposition: A Novel Procedure for Abducens Palsy. Am J Ophthalmol. 2017 May;177:126-130.
Pihlblad MS, Troia A, Tibrewal S, Shah PR. Pre-, Intra-, and Post-Operative Evaluation of Extraocular Muscle Insertions Using Optical Coherence Tomography: A Comparison of Four Devices. J Clin Med. 2019 Oct 19;8(10):1732.

Workshop #3
Friday, April 9, 2021
3:00 PM – 4:15 PM

Challenges in Pediatric Uveitis: Update on Systemic Management of Pediatric Non-infectious Uveitis (NIU) and Family Perspective

Virginia A. Miraldi Utz, MD; Melissa A. Lerman, MD, PhD; Erin D. Stahl, MD; Stefanie L. Davidson, MD; Iris Kassem, MD; Jennifer Jung, MD; Alex Levin, MD, MHSc, FAAP, FAAO, FRCSC; Charlie, Catherine & Sarah Dehne

Additional Contributors: Kara LaMattina, MD; Bharti Gangwani, MD; Sheila Angeles-Han, MD, MSc; Ashley M. Cooper, MD; Jing Jin, MD, PhD; Mays El-Dairi, MD; Brenda Bohnsack, MD, PhD

AAPOS Pediatric Uveitis Committee

Purpose/Relevance: The availability of biologic agents for the systemic treatment of pediatric uveitis has altered practice patterns for noninfectious pediatric uveitis management. A basic understanding is vital to prevent severe complications and vision loss. Sixty-five percent of AAPOS member survey respondents requested additional education on the basics of biologic therapy. The purpose of this course is to provide an update on uveitis management and a family's perspective.

Target Audience: Pediatric ophthalmologists, fellows, residents

Current Practice: Pediatric ophthalmologists are uncertain about the timing and appropriateness of systemic treatment in pediatric uveitis. Knowledge of conventional and biologic immunosuppressant agents is often limited. Optimal communication does not always exist among providers and the family, leading to poor control of inflammation and ocular complications.

Best Practice: The ideal management of pediatric uveitis involves a basic understanding of biologic treatment, mainly TNF-alpha inhibitors and newer biologic agents. Pediatric ophthalmologists must be familiar with the updated clinical guidelines in the U.S. and Europe to address treatment initiation, monitoring, tapering, and changing therapy after treatment failure. Coordinated, shared-decision making among providers and families fosters understanding and trust, timely treatment, promotes medication adherence, and ultimately disease quiescence.

Expected Outcomes: Clinicians will develop an evidence-based approach to the management of pediatric uveitis, including 1) an overview of the basics of immunomodulatory agents, 2) update on clinical guidelines for initiating systemic treatment, monitoring disease, defining treatment failure, and changing or discontinuing therapy, 3) develop a better understanding of parent perspective on immunosuppression.

Format: Didactic, case presentations, rheumatology, ophthalmology, and parent panel discussion with audience participation

Summary: Multi-disciplinary faculty will present the basics of immunosuppressive agents and treatment guidelines and apply them to clinical vignettes. A parent will provide perspective on family concerns on systemic immunosuppression. A multi-disciplinary approach that includes the family is often required to achieve optimal vision outcomes.

References: 1. AAPOS Pediatric Uveitis Task Force Survey, 2018 (not published, but available for review).
2. 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 & rheumatology (Hoboken, NJ). 2019.
3. Constantin T, Foeldvari I, Anton J, et al. Consensus-based recommendations for the management of uveitis associated with juvenile idiopathic arthritis: the SHARE initiative. Ann Rheum Dis. 2018;77(8):1107-1117.

Workshop #4
Friday, April 9, 2021
3:00 PM – 4:15 PM

ROP: A Team Approach

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Purpose/Relevance: ROP is a highly complex disease that can have visual ramifications throughout life. Diagnosis and treatment of acute disease is within the realm of the surgeon, but this does not occur in a vacuum. Many professionals are involved in successful management of acute ROP. Cicatricial ROP and the associated later complications are also complex and can benefit from a team approach.

Target Audience: Orthoptists, Pediatric/Retinal Ophthalmologists

Current Practice: All NICUs have an administrative protocol to ensure 100% appropriate screening. Ophthalmologists examine (some remotely) and treat. Ophthalmologists and orthoptists may manage the post-acute complications and side-effects.

Best Practice: A foolproof team approach with enunciated responsibilities is necessary for the management of acute disease. Subsequent follow-up and management of potential refractive error, anisometropia, amblyopia, strabismus, cataract, glaucoma, late R.D. as well as cortical visual impairment and the accompanying psychosocial/low vision needs are also best managed as a team.

Expected Outcomes: Attendees will participate in and learn how to maximize resources in this condition.

Format: Presentation, moderator-led discussion.

Summary: ROP management is a team game. Screening, treatment, and management of later developments ideally involve many professionals. The workshop will roughly cover three phases:

- Screening
- Acute ROP Management
- Management of associated conditions

References: Stahl A, Lepore D, Fielder A, Fleck B, Reynolds JD, Chiang MF, Li J, Liew M, Maier R, Zhu Q, Marlow N. 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 Oct 26;394(10208):1551-1559. doi: 10.1016/S0140-6736(19)31344-3. Epub 2019 Sep 12.

Kennedy KA, Mintz-Hittner HA. Medical and developmental outcomes of bevacizumab versus laser for retinopathy of prematurity. J AAPOS 2018; 22:61-65.

Workshop #5
Friday, April 9, 2021
4:30 PM – 5:45 PM

AAPOS Genetic Eye Disease Committee Workshop – Hiding in Plain Sight: Genetic Disorders in Routine Pediatric Practice

Alina V. Dumitrescu, MD; Virginia Miraldi Utz, MD; Mary C. Whitman, MD, PhD; Deborah Alcorn, MD; Natario L. Couser, MD; Arif O. Khan, MD; Alex V. Levin, MD, MHSc; I. Christopher Lloyd, MBBS, FRCOphth; Melanie A. Schmitt, MD; Wadih M. Zein, MD; Aaron Nagiel, MD, PhD; Kathryn M. Haider, MD; Jefferson J. Doyle, MBBCH, MHS, PhD; Janice Lasky Zeid, MD; Arlene V. Drack, MD

Purpose/Relevance: Response to a AAPOS member poll overwhelmingly showed that pediatric ophthalmologists see genetic eye disorder patients at least once a week; however, only 18% of AAPOS members responded to the poll. Many members may not realize they are seeing genetic eye disorders, although they are common in pediatric ophthalmology practice. In the molecular genetic era, early recognition of these genetic disorders in everyday practice is important.

Target Audience: Pediatric ophthalmologists, residents, fellows

Current Practice: Pediatric ophthalmologists have variable experience with recognizing and evaluating genetic eye disorders. Although knowledge has expanded exponentially over the past 10 years, practitioners may approach patients with common conditions in the same way as in the past, missing opportunities to diagnose and treat early with knowledge of the molecular genetic basis.

Best Practice: Recognizing when a disorder, even a common one, may be genetic is the first step toward diagnosis and treatment. Once recognized, appropriate clinical testing with ERG, OCT, VEP and molecular genetic testing can be pursued. Coordination of care with genetic eye disease specialists, genetic counselors or medical geneticists is vital.

Expected Outcomes: (1) Clinicians will become familiar with disorders seen in general pediatric ophthalmology clinic that may have a genetic basis. (2) Clinicians will be able to devise a workup utilizing ERG, OCT, VEP, molecular genetic testing, and referral to specialists.

Format: The workshop will begin with an overview of commonly used testing modalities like ERG, OCT, VEP and genetic testing. Case-based vignettes of common clinical presentations that may have a genetic basis will be reviewed. The cases will be including: high refractive errors, reduced best-corrected visual acuity, photophobia and esotropia with nystagmus. Confirmatory molecular genetic testing and use of ancillary clinical testing will be discussed for each case.

Summary: This workshop will provide techniques for recognizing and evaluating patients with unsuspected genetic eye disorders hiding in plain sight.

References: 1. Miraldi Utz V, Pfeifer W, Longmuir SQ, Olson RJ, Wang K, Drack A V. Presentation of TRPM1-associated congenital stationary night blindness in children. JAMA Ophthalmol. 2018;136(4):389-398. doi:10.1001/jamaophthalmol.2018.0185
2. Bertsch M, Floyd M, Kehoe T, Pfeifer W, Drack A V. The clinical evaluation of infantile nystagmus: What to do first and why. Ophthalmic Genet. 2017;38(1):22-33. doi:10.1080/13816810.2016.1266667

Workshop #6
Friday, April 9, 2021
4:30 PM – 5:45 PM

What's New and Important in Pediatric Ophthalmology and Strabismus

Tina Rutar, MD; Euna Koo, MD; Kimberly G. Yen, MD; Jasleen K. Singh, MD; Marina A. Eisenberg, MD; Ilana B. Friedman, MD; Sharon S. Lehman, MD; Gena Heidary, MD, PhD; Phoebe D. Lenhart, MD; Laryssa A. Huryn, MD; Emily McCourt, MD

Purpose/Relevance: The authors will review the literature for articles of interest to the sub-specialty of pediatric ophthalmology and strabismus for the time period February 2020-February 2021. Ophthalmic journals are prioritized but journals from other specialties such as pediatrics, neurology and general medicine will be included. The authors will summarize the key findings in the major topics of vision screening, amblyopia, refractive error, neuro-ophthalmology, retinopathy of prematurity, strabismus, cataract, glaucoma, genetics, retina, oculoplastics, uveitis and practice management. The presentations in these topic areas will give key take home points to audience members that have implications for clinical practice.

Target Audience: Pediatric ophthalmologists and strabismus specialists, orthoptists

Current Practice: Pediatric ophthalmology is a rapidly evolving sub-specialty. It is difficult to remain current with all of the literature in this field.

Best Practice: The authors will summarize, analyze and present the new and important information from more than 20 medical journals. This will allow the audience to have an overview of the most current and important literature.

Expected Outcomes: The audience will understand the most current published information in this sub-specialty.

Format: A series of didactic lectures.

Summary: More than 20 medical journals will be reviewed for relevant new findings in the sub-specialty of pediatric ophthalmology and strabismus from February 2020-February 2021. The material presented will educate ophthalmologists and orthoptists in new research.

References: A comprehensive reference list will be provided.

Workshop #7
Friday, April 9, 2021
4:30 PM – 5:45 PM

Pediatric Eye Trauma Primer for the On-Call Ophthalmologist

Ankoor S. Shah; Natalie C. Weil; Kara M. Cavuoto; Casey J. Beal

Boston Children's Hospital and Harvard Medical School
Boston, MA

Purpose/Relevance: This course prepares attendees to evaluate pediatric eye injuries both on-call and in the sub-acute period.

Target Audience: Pediatric ophthalmologists

Current Practice: Over 1 million eye injuries led to emergency room visits in the United States between 2001 and 2007 (1), and approximately 250,000 serious eye injuries occur worldwide each year (2). Thus, eye injuries are prevalent, but training in medical and surgical eye trauma is limited with 83% of ophthalmology residents reporting doing less than 10 open-globe injury surgical cases during their training (3).

Best Practice: Perceived preparedness and competence in ocular trauma is associated with case discussion, structured curriculum, and expert discussion (3). This course presents case-based approaches to eyelid trauma, orbital trauma, and open- and closed-globe eye injury outlining algorithmic approaches to incorporated readily by attendees.

Expected Outcomes: After attending this workshop, participants will be prepared to evaluate, diagnose, and perform initial management of common eye injuries.

Format: This workshop will be interactive between panelists and audience members. Panelists will present cases. Audience members will be polled and encouraged to use the chat function during case presentation. Panelists will show outcomes and provide evidence-based literature on each topic. The last 15 minutes of the session will be an open discussion between panelists and audience.

Summary: Panelists will present the most common pediatric eye injuries as cases, focus on a single teaching point, and ask the audience to participate through interactive questions, polls, and open discussion. The audience will leave with a handout listing evidence-based guidelines on how to evaluate, diagnose, and initially manage these cases.

References: 1. Armstrong GW, Kim JG, Linakis JG, Mello MJ, Greenberg PB. Pediatric eye injuries presenting to United States emergency departments: 2001-2007. Graefes Arch Clin Exp Ophthalmol. 2013;251:629-36.
2. Abbott J, Shah P. The epidemiology and etiology of pediatric ocular trauma. Surv Ophthalmol. 2013;58:476-85.
3. 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.

Workshop #8
Friday, April 9, 2021
4:30 PM – 5:45 PM

Pediatric Cataract Surgery – Techniques and Strategies for 2021 and Beyond

M. Edward Wilson, MD; Erick Bothun, MD; David Morrison, MD; David Plager, MD; Serena Wang, MD

Storm Eye Institute, Medical University of South Carolina
Charleston, SC, USA

Purpose/Relevance: Pediatric Cataract Surgery continues to evolve as technology improves. As pediatric surgeons, we are interested in simplicity and safety but must also be aware of the emergence of innovative techniques designed for adult eyes and know when it is appropriate to modify them for our unique purposes or reject them as potentially harmful to kids' eyes. ||In this video-based workshop, each of the authors will present brief videos of what they do now and what they believe they will be doing more of in 2021 and beyond. Interaction between panelists and the audience will provide debate on what to start doing differently in 2021 and what to be cautious about in your OR back home.

Target Audience: Pediatric cataract surgeons

Current Practice: Many pediatric cataract surgeons stay with the comfortable techniques they learned in fellowship or developed in their practice. While this may be appropriate, surgeons are constantly evaluating what new approaches we should adopt and which we should reject, to get the best possible surgical results. In addition, we all seek guidance about how to handle rare and complicated surgeries.

Best Practice: Best practice is to be careful but innovative. This can be a difficult balance. When it's time to buy new surgical equipment or choose IOLs to stock, we all want to benefit from each other's experience and recommendations. How can we help our patients now and what will become the standard in the future? These will all be debated by the panel and we will answer submitted audience questions as well.

Expected Outcomes: As a result of this workshop, surgeons in the audience will be able to describe new surgical techniques and strategies that will improve their pediatric cataract surgery outcomes now and in the future.

Format: Surgical videos will stimulate panel debate and discussion. Current and emerging technology will be also be debated as it relates to the future of pediatric cataract surgery.

Summary: The authors will answer, using surgical videos, 'What am I doing more of?' and 'What am I doing less of?' as we move through 2021 and beyond. We will also debate which existing or emerging technologies will have the greatest impact on pediatric cataract surgery in the future.

References: Van Looveren J, Ni Dhubhghaill S, Godts D, Bakker E, De Veuster I, Mathysen DG, et al. Pediatric bag-in-the-lens intraocular lens implantation: long-term follow-up. J Cataract Refract Surg. 2015;41(8):1685-92.
Fung, SSM, Brookes J, Wilkins MR, Adams GGW. Mobile femtosecond laser platform for pediatric cataract surgery. Eur J Ophthalmol 2018;28(2):246-250.

Workshop #9
Saturday, April 10, 2021
2:00 PM – 3:15 PM

Complicated Strabismus Management

Rosario M. Gomez de Liano, MD; Jan Tjeerd De Faber, MD; Mohamad S. Jaafar, MD; Seyhan B. Özkan, MD; David A. Plager, MD; Miho Sato, MD

ISA (International Strabismological Association)
Indianapolis

Purpose/Relevance: To summarize the collective experience of our panel in the management of Difficult Problems in Strabismus, in a case-based format. This workshop will address difficult strabismus cases secondary to cranial nerve palsy, restrictive strabismus or prior strabismus surgery, to fill a potential knowledge gap for the practicing ophthalmologist.

Target Audience: Pediatric Ophthalmologists, Strabismus Specialists, Ophthalmology Residents, Fellows, and Orthoptists.

Current Practice: Strabismus presents surgical dilemmas given the myriad of potential etiologies. Strabismus surgeons should understand the indications for various strabismus surgical techniques in the management of these difficult cases. Primary research in this area is limited. Practitioners utilize strategies and surgical techniques taught in fellowship or addressed at professional meetings, on the listserve, in journals, and 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 complemented enhancing with the opportunity to discuss with the audience.

Expected Outcomes: At the conclusion of the extensive discussion, the audience and the panel will have shared their experiences and strategies for the diagnosis and management of challenging cases. Exposure is designed to enhance future practice by enabling participants to apply new concepts presented.

Format: The workshop will consist of case-based panel format presentations with short expositions focused on the management of these patients. Panelists will discuss the differential diagnosis and potential treatment options. Audience questions and participation will be encouraged, time permitting.

Summary: All panel participants are internationally recognized experts in the field of strabismus. Each expert will present a difficult case for discussion by the others in an open forum format.

References: Strabismus Surgery. Basic and Advanced Strategies. Ophthalmology Monographs 17. The American Academy of Ophthalmology, Oxford University Press. 2004
Coats DK.Strabismus Surgery and Its Complications. Springer Verlag 2007.
Kuschner BJ. Strabismus: Practical Pearls You Won't Find in Textbooks. Springer Verlag 2017.
Ludwig I. Strabismus Surgery: Innovative and Classic Approaches. Thieme 2020.

Workshop #10
Saturday, April 10, 2021
2:00 PM – 3:15 PM

What Kept Me Up at Night:Strategies for Surgical Complications

Justin D. Marsh, MD; Jennifer D. Davidson, MD; Courtney L. Kraus, MD; Scott E. Olitsky, MD; Evan Silverstein, MD; Sasha Strul, MD; Donny W. Suh, MD; Laura A. Torrado, MD

Purpose/Relevance: In discussions with young ophthalmologists, it is repeatedly clear that diagnosis and management of surgical complications is a major stressor during the transition from fellowship training to independent practice. While there may be some exposure to surgical complications during residency and fellowship, these events tend to be infrequent, and trainees typically do not carry the full burden of diagnosis and proper management of surgical complications. The young ophthalmology committee recommends a workshop detailing how to handle these situations.

Target Audience: Any ophthalmologist interested in learning how various complications are managed by colleagues.

Current Practice: Because certain complications are rare, current practice may vary across physicians.

Best Practice: Best practice may not be established scientifically, but case presentations may help deliver lessons learned from the experiences of others.

Expected Outcomes: We expect the audience to gain the information required to successfully manage various surgical complications in their own practice and learn tools to regain confidence after facing challenging cases and patient situations.

Format: The workshop will be divided into several sections, with a mix of young ophthalmologists and more experienced ophthalmologists detailing complications and subsequent treatment course in their own practice

Summary:
General Concepts:
Informed consent and preparation prior to surgery
Wrong site surgery
Interacting with the family immediately after a complication

Strabismus Surgery:
Unexpected post operative alignment
Post operative infection

Anterior Segment Complications:
Unexpected surgical outcome
Post operative infection/inflammation

ROP Complications:
Inflammatory complications
Retinal detachment

Taking Care of the Doctor:
Malpractice insurance
Coping with complications in the immediate post operative period
How complications affect care of future patients
How complications affect the physician
References: None

Workshop #11
Saturday, April 10, 2021
2:00 PM – 3:15 PM

Pediatric Ophthalmology at the Cutting Edge: 2021

Stacy L. Pineles, MD; Maan Alkharashi; Anat Zipori Bachar; Steven Brooks; Saurabh Jain; Eedy Mezer; Tamara Wygnanski-Jaffe; Michael Yang; Alejandra de Alba Campomanes

AAPOS Research Committee

Purpose/Relevance: Pediatric ophthalmologists must stay abreast of current research both within the field of pediatric ophthalmology and strabismus as well as in the global ophthalmology research community at large.

Target Audience: Pediatric Ophthalmologists

Current Practice: Pediatric ophthalmologists may not be aware of the newest areas of research especially within other subspecialties. New and exciting research has been reported in areas that include teleophthalmology, gene therapy, corneal crosslinking, control of myopia and refractive surgery, control of vascular malformations, dichoptic amblyopia therapy, and optic neuritis.

Best Practice: We must continue to review current literature and synthesize new research to incorporate it into our practice.

Expected Outcomes: Workshop participants will have a further understanding into new research as it relates to our practice as pediatric ophthalmologists. Physicians will understand best practices from recent randomized controlled trials and have the ability to discuss new technologies from adult ophthalmology literature with their patients and families.

Format: The format will include didactic lectures and panel discussions.

Summary: Our workshop will consist of multiple presentations that summarize recent research in ophthalmology. We will describe and appraise the literature in areas that include gene therapy, teleophthalmology, treatment of refractive error, corneal cross linking, refractive surgery in children, amblyopia treatment, optic neuropathies, and treatment of neoplasms that affect our patients. A question and answer session will be held at the end of the workshop.

References: 1. Nelson LB. Telemedicine in Pediatric Ophthalmology. J Pediatr Ophthalmol Strabismus 2020; 57:282.
2. PEDIG. A randomized trial of binocular dig rush game treatment for amblyopia in children aged 7 to 12 years. Ophthalmology 2019;126:456.
3. Ku CA, Pennesi ME. The new landscape of retinal gene therapy. Am J Med Genet C Seminary's Med Genet 2020; 184:846.

Workshop #12
Saturday, April 10, 2021
2:00 PM – 3:15 PM

Pressure's On: Challenging Cases and Considerations in Pediatric Glaucoma Treatment

Deborah K. VanderVeen, MD; Raymond G. Areaux, MD; Ta Chen Peter Chang, MD; Bibiana Jin Reiser, MD; Faruk Orge, MD

Boston Children's Hospital
Boston MA

Purpose/Relevance: This workshop will focus on the decision-making process and options to consider when choosing a glaucoma procedure for pediatric patients, and provide tips to enhance success.

Target Audience: Pediatric ophthalmologists

Current Practice: Management of pediatric glaucoma can be daunting, and decisions about which surgical procedure to use may be complex. Patient and eye characteristics, glaucoma type, surgical pros and cons, and available resources all play a role in decision making. Even after successful surgery, long-term failure rates are high, so staged management must be considered.

Best Practice: Glaucoma surgeons must be committed to long-term care of pediatric patients, recognize when surgery is needed, and be familiar with surgical options. Often several choices are reasonable and provide good outcomes, and classic and newer techniques or instrumentation may be utilized. Consensus opinion is useful to help guide decision making. Engaging in collaboration and consensus opinion allows the practitioner to manage challenging cases with contemporary tools and techniques.

Expected Outcomes: Panelists will present cases that represented a challenge in management in children with glaucoma, with discussion of how the presenter thought about the condition and chose the course of management. Different surgical techniques will be discussed, with video demonstration. Panelists will provide tips for improved surgical techniques, and discuss how to avoid and manage complications.

Format: A panel will present and discuss cases. The audience will have the opportunity to participate by polling or chat, depending on the format option for the virtual presentation.

Summary: This workshop will use case-based presentations highlighting different pediatric glaucoma diagnoses and treatment modalities, with video demonstration. Panelists will discuss why a procedure was chosen as the optimal treatment for their patient, with a review of pros and cons of the procedure, and consensus opinion. Discussion will cover practical tips for good surgical technique, as well as how to avoid and deal with complications. Both traditional and innovative new devices and techniques will be discussed.

References: Weinreb RN, Grajewski A, Papadopoulos M, Grigg J, Freedman S. Childhood Glaucoma, WGA Consensus Series 9. Amsterdam, The Netherlands: Kugler Publications; 2013.

Workshop #13
Saturday, April 10, 2021
3:30 PM – 4:45 PM

IPOSC Workshop: Nightmares in Strabismus

Faruk H. Orge, MD; Jonathan M. Holmes; Sonal Farzavandi; Jan Tjeerd deFaber; Tamara Wygnanski; Derek Sprunger; Eedy Mezer

IPOSC

Purpose/Relevance: Although strabismus surgeries are commonly performed, surgeons often encounter complicated cases or unpredicted findings. We seek to share experiences and different approaches to such cases via discussion by expert strabismus surgeons.

Target Audience: Pediatric ophthalmologists and strabismus surgeons

Current Practice: Ophthalmologists may not be familiar with strategy, surgical pearls, tips and tricks to handle nightmares in strabismus cases. Sharing various experiences can teach us to expect, be aware, avoid and plan for complications, if /when they should occur in order to avoid further surgeries and poor outcome.

Best Practice: Ophthalmologists should be familiar with possible complications, plan to avoid or appropriately deal with these situations. Strabismus surgeons should also be familiar with particularly complex cases and be able to plan surgical approaches to be able to adequately help their patients.

Expected Outcomes: Through many case presentations and expert panel discussion, the attendee will be able to familiarize themselves with complex strabismus cases to enhance their surgical skills and management.

Format: Members of the panel will present surgical cases with management dilemmas followed by a question/answer period from the panel and the audience.

Summary: The workshop will focus on nightmares in strabismus surgery either due to underlying conditions (i.e. thyroid orbitopathy, neuropathies, complex strabismus), previous surgeries or significant complications during strabismus surgeries. Several topics will be led by one of the authors with a case presentation followed by a panel discussion and author's approach and outcome presentations. There will be a dedicated time for attendee questions and contributions.

References: none

Workshop #14
Saturday, April 10, 2021
3:30 PM – 4:45 PM

Best Practice Patterns: How to Effectively Use OCT in Pediatric Ophthalmology

Leah G. Reznick, MD; Pete Campbell, MD; Beth Edmunds, MD; Annie Kuo, MD; Lorri B. Wilson, MD

Oregon Health & Science University
Portland, OR

Purpose/Relevance: As Optical Coherence Tomography (OCT) technology has advanced, and become more widely available, it is being used more commonly in pediatric ophthalmology. As the technology demonstrates value as an integral part of the evaluation of the pediatric eye, it is critical for pediatric ophthalmologists to understand how to incorporate OCT into their clinical flow, interpret results, and make clinical decisions based on OCT findings. The purpose of this workshop is to review basic OCT interpretation and discuss recent advances in OCT technology, including OCT angiography. We will discuss the pearls and pitfalls in utilizing OCT in the evaluation and management of pediatric glaucoma, genetics, and retina.

Target Audience: Pediatric Ophthalmologists, Researchers

Current Practice: There are unique challenges to the application of OCT technology in the pediatric practice and few resources to help pediatric ophthalmologists apply novel technology to the clinical care of children. By educating pediatric ophthalmologists about OCT, children will benefit from the diagnostic and management information provided by this valuable resource.

Best Practice: With pediatric ophthalmologists being educated by experts in OCT, a standard of practice will be developed for integrating OCT into clinical care of pediatric ocular problems.

Expected Outcomes: Participants will understand how to interpret OCT findings of the optic nerve and macula. With these intrepretative skills, ophthalmologists can accurately and effectively incorporate OCT into patient management.

Format: 1) Panel presentations (60 minutes) -- Each presenter on the panel will provide didactic training as well as an interactive case discussion for the audience to evaluate their understanding and ability to interpret OCT's.
2) Open question and answer forum (15 minutes).

Summary: This workshop will discuss: 1) fundamentals of OCT interpretation 2) OCT pediatric normative data 3) OCT for genetic disorders 4) OCT for managing pediatric glaucoma, and 5) OCT for understanding retinal pathology.

References:

Campbell JP, Nudleman E, Yang J, et al. Handheld Optical Coherence Tomography 1. Angiography and Ultra-Wide-Field Optical Coherence Tomography in Retinopathy of Prematurity. JAMA Ophthalmol. 2017;135(9):977-981.

Ely AL, El-Dairi MA, Freedman SF. Cupping reversal in pediatric glaucoma--evaluation of the retinal nerve fiber layer and visual field. Am J Ophthalmol. 2014;158(5):905-915.

Yanni, SE, Wang J, Cheng CS, Locke KI, Wen Y, Birch DG, Birch EE. 'Normative Reference Ranges for Retinal Nerve Fiber Layer, Macula, Retinal Layer Thicknesses in Children.' Am J Ophthalmol. 2013:155:354-360.

Workshop #15
Saturday, April 10, 2021
3:30 PM – 4:45 PM

Pediatric Anterior Segment Problems You Don't Want to Miss

Federico G. Velez, MD; Deborah VanderVeen, MD; Kamiar Mireskandari, MD, PhD; Phoebe Lenhart, MD; Monte Del Monte, MD; Christopher J. Lyons, MD

Duke University, Boston Children Hospital, SickKids Hosptial, Emory University, Kellogg Eye Center, Vancouver Children's Hospital
Durham NC, Boston MA, Toronto ON, Atlanta GA, Ann Arbor MI, Vancouver BC

Purpose/Relevance: Familiarize pediatric ophthalmologists with uncommon systemic etiologies that are rarely associated with relatively common anterior segment findings. Despite being rare, the systemic etiologies to be discussed should not be missed as they are typically associated with high levels of morbidity and even mortality.

Target Audience: Pediatric Ophthalmologists, Fellows and Specialists

Current Practice: Serious and complex ocular and systemic diseases may affect the anterior segment in children. Several anterior segment findings that are commonly seen by pediatric ophthalmologists can rarely be caused by a more systemic condition. These conditions are rare and usually managed only by experts at tertiary centers.

Best Practice: Basic and advanced disussion.

Expected Outcomes: Participants will be familiarized with uncommon anterior segment findings of conditions that are associated with serious ocular and systemic comorbidity.

Format: Video/text and case presentations.

Summary: Panelist will present and discuss rare cases and conditions affecting the anterior segment with significant ocular and systemic implications. Audience participation will be expected and encouraged.

References: 1. Pillai GS, Radhakrishnan N. Ocular Manifestations of Pediatric Systemic Diseases. Indian J Pediatr. 2018 Mar;85(3):217-227
2. Gawdat G, El-Fayoumi D, Marzouk H, Farag Y. Ocular Manifestations in Children with Juvenile-Onset Systemic Lupus Erythematosus. Semin Ophthalmol. 2018;33(4):470-476.
3. Sadiq MA, Vanderveen D. Genetics of ectopia lentis. Semin Ophthalmol. 2013 Sep-Nov;28(5-6):313-20.
4. Poll-The BT, Maillette de Buy Wenniger-Prick LJ, Barth PG, Duran M. The eye as a window to inborn errors of metabolism. J Inherit Metab Dis.2003;26(2-3):229-44.

Workshop #16
Saturday, April 10, 2021
3:30 PM – 4:45 PM

Pediatric Eye in the Wild Blue Yonder

Daniel T. Weaver, MD; Katherine Lee, MD; Donny Suh, MD; Robert Arnold, MD

Billings Clinic
Billings, Montana

Purpose/Relevance: This workshop will discuss the unique challenges of establishing and maintaining a practice in pediatric ophthalmology in a location far from an academic center. Emphasis will be placed on clinical situations encountered in remote locations and on some of the solutions employed by a panel of experienced clinicians. Remote approaches have become especially relevant for pediatric ophthalmologists since the onset of the COVID-19 pandemic .

Target Audience: Pediatric ophthalmologists and trainees||

Current Practice: Pediatric ophthalmology is a multifaceted subspecialty which frequently interfaces with other pediatric specialists typically located in an academic center. Current standard of care mandates timely and accurate diagnosis and treatment regardless of geographic location. Establishing vision screening protocols, ROP coverage, genetic counseling, and post-operative care are but a few of the challenges in non-academic practice settings.

Best Practice: Pediatric ophthalmologists will benefit from discussion of approaches to medical and surgical challenges that present in remote practice locales. Many of these same problems are encountered by practitioners in urban settings, when performing mission eye care, and more recently during COVID.

Expected Outcomes: At the conclusion of the workshop members of the audience can be expected to learn from the collective experience of the panelists. Many of these innovative approaches are applicable to the practice of pediatric ophthalmology in any setting, thus improving patient outcomes.

Format: Didactic lecture, case presentation, and open question and answer forum.

Summary: This workshop will present innovative approaches to common problems encountered by pediatric ophthalmologists. These approaches are applicable to remote locations, many urban settings, mission eye care, and patient care during the current coronavirus pandemic.

References: Weaver DT, Murdock TJ. Telemedicine detection of type 1 ROP in a distant neonatal |intensive care unit. J AAPOS 2012; 16:229-233
Arnold RW, Gionet EG, Jastrzebski AI, et al. The Alaska Blind Child Discovery project: |rational, methods and results of 4000 screenings. Alaska Med 2000; 42(3): 58-72
Bloomberg JD, Suh DW. The accuracy of the plusoptiX A08 photoscreener in detecting |risk factors of amblyopia in children 0 to 5 in central Iowa. J AAPOS 2013; 17:301-304

Workshop #17
Saturday, April 10, 2021
5:00 PM – 6:15 PM

Demystifying Dyslexia: Hints for the Ophthalmologist

D. M. Alcorn, MD; Laura Heinmiller, MD; Melinda Rainey, MD; Sheryl Handler, MD; Tammy Yanovitch, MD;
Learning Disabilities Committee

Purpose/Relevance: Response to a recent AAPOS member survey demonstrated that many members are not entirely comfortable evaluating a child with learning disabilities/dyslexia. A majority felt they did not receive specific education regarding learning disabilities in their training. Appropriate concern/recognition, evaluation and referral for learning disabilities should be an integral part of the ophthalmologist's regiment.

Target Audience: Medical students, residents, fellows, ophthalmologists, orthoptists

Current Practice: Pediatric ophthalmologists have varied experience and training in evaluating/recognizing those children at risk for learning disabilities/dyslexia, though we are often referred these patients for a vision assessment. Though pediatric ophthalmologists are aware that dyslexia is a learning disorder and not a visual disorder, more specific information and evaluation must be provided to patients and families.

Best Practice: Learning Disorders/dyslexia can be recognized in young children while there is still brain plasticity and when interventions are more likely to be effective. Pediatric ophthalmologists should be aware of the tools and diagnostics available to enable them to best evaluate these children at risk for dyslexia. They should provide appropriate referrals and references for the children at risk and be aware of the associated comorbidities.

Expected Outcomes: Clinicians will become familiar with:
1. Better understanding of dyslexia and recent advances in dyslexia research
2. Evidence based and practical strategies for identification of learning disorders
3. Increased awareness of learning disabilities and their comorbidities so as to better evaluate and advocate for patients and families.

Format: Updated didactic lecture with question/answer forum and panel discussion.

Summary: This workshop will aid the provider with a better understanding of dyslexia, its comorbidities and social implications and provide helpful clinical hints for identification and evaluation for those at risk. Recent advances in dyslexia research will be discussed as well as updated resources and references.

References: Joint Statement: Learning Disabilities, Dyslexia and Vision; AAP, AAO, AAPOS, AACO peds. 2009

Munzer T, Hussain K, Soares N. Dyslexia: Neurobiology, Clinical Features, Evaluation and Management; Transl Pediatr. 2020 Feb;9(Suppl 1):S36-S45.

Sanfilippo J, Ness M, Petscher Y, et al. Reintroducing dyslexia: early identification and implications for pediatric practice. Pediatrics. 2020;146(1):e20193046

Workshop #18
Saturday, April 10, 2021
5:00 PM – 6:15 PM

Surgical Techniques in Strabismus: An International Masterclass

Saurabh Jain; Faruk Orge; Jan Tjeerd de Faber; Miho Sato; Anthony Vivian; Derek Sprunger; Sonal Farzavandi; Rosario Gomez de Liano

Purpose/Relevance: Strabismus (surgery) is a discipline that seems at times more an art form than a science. In this workshop a panel of experts will signpost techniques perfected during their years of practice that have helped them negotiate this terrain and also point out potential pitfalls that may lead to an adverse outcome.

Target Audience: Anyone who manages patients with strabismus

Current Practice: In spite of best efforts, it has been very difficult to standardise the evaluation and management of strabismus. This is because of the heterogeneous nature of conditions that present with an ocular deviation and the varying complexity of surgical management. For example, not all vertical strabismus can or should be treated by operating on the vertical muscles, procedures on the obliques can induce torsion in bifoveal patients and recessing the vertical recti can cause lid malposition unless addressed. Transposing the vertical recti horizontally can induce torsion and recessing a rectus muscle cause increased effect in it's directions of action , both phenomena that the savvy strabismus surgeon may use to their advantage. We will aim to address these and other management dilemmas in this workshop.|

Best Practice: Maybe more than other surgical subspecialties within Ophthalmology, strabismus is learnt by observing expert surgeons. Developments in current thinking have meant that commonly performed procedures have been redesigned. Certain techniques may only be encountered in fellowship or not at all unless the strabismus surgeon is called upon to suddenly perform them. This workshop will give delegates the tools to develop robust surgical algorithms and techniques to assist in this eventuality. |

Expected Outcomes: We anticipate that the case based approach in this workshop will assist delegates by introducing them to different surgical scenarios, develop assessment and management strategies to manage these patients and change their surgical practice where applicable.|

Format: Case presentation, Videos , Audience quiz and Skills transfer

Summary: Strabismus assessment and management is a specialised skill that is complicated by the heterogeneous nature of the presentation and underlying diagnoses
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 delegates in evaluating and refining their own practice.

References: 1.Gesite-de Leon B, Demer JL. Consecutive exotropia: why does it happen, and can medial rectus advancement correct it?. J AAPOS. 2014;18(6):554-558.
2.Kelkar JA, Gopal S, Shah RB, Kelkar AS. Intermittent exotropia: Surgical treatment strategies. Indian J Ophthalmol. 2015;63(7):566-569. doi:10.4103/0301-4738.167109

Workshop #19
Saturday, April 10, 2021
5:00 PM – 6:15 PM

Lessons from Our Retirement

John W. Simon, MD; Al W. Biglan, MD; John D. Baker, MD; Constance E. West, MD; Steven E. Rubin, MD

AAPOS Senior Pediatric Ophthalmologist Group
San Francisco, California

Purpose/Relevance: To help members transition into a successful retirement.

Target Audience: All AAPOS members, especially those approaching or recently beginning retirement, as well as younger members planning for their future.

Current Practice: Retirement may be a frightening or an enticing prospect for each of us. For us all, there are important decisions to be made.

Best Practice: Early planning can enhance the success and enjoyment of this transition.

Expected Outcomes: Members will address key issues so they can better plan individual lifestyle and financial strategies.

Format: Panelists will draw on their own experiences and dialog with the audience through their questions.

Summary: Members still working and those already into their retirement journey need to undertake some planning: accumulating resources, planning a practice exit strategy, and identifying personal goals to embrace when retired. Adjustments must be anticipated as our interests change and our health and other circumstances dictate. Finances in preparation and during retirement will be discussed.

References: https://www.mayoclinic.org/healthy-lifestyle/healthy-aging/basics/healthy-retirement/hlv-20049407

Workshop #20
Saturday, April 10, 2021
5:00 PM – 6:15 PM

New Technologies in Pediatric Ophthalmology: A View from the Inside

Tamara Wygnanski-Jaffe, MD; Robert W. Arnold, MD; Michael Chiang, MD; Joseph Demer, MD; David Hunter, MD
Cynthia A. Toth, MD; Paul Yang, MD

Goldschleger Eye Institute, Sheba Medical Center
Tel Hashomer, Israel

Purpose/Relevance: New technologies are rapidly emerging in all fields, especially in COVID-19-era, including pediatric ophthalmology. These technologies are widely disseminated in diverse areas such as screening, diagnostics, treatment, device production, genetics, and artificial intelligence. Some provide low-cost, simple solutions to common problems, whereas others, are expensive and complex. The speakers will present several technologies, including retinal polarizing scanning for screening of amblyopia and traumatic brain injury, smart phone photo screening for amblyopia risk factors, artificial intelligence, optical coherence tomography angiography, hand-held OCT, gene therapy, and eye tracking technology for diagnostics and treatment of amblyopia.

Target Audience: Pediatric and Comprehensive ophthalmologists, Orthoptists, Residents, and Students.

Current Practice: Technologies are rapidly evolving, making it difficult to stay updated and exposed to all the innovations. Some clinicians are eager to explore new concepts, some may have limited exposure, whereas others may refrain from utilizing up-and-coming new technologies.

Best Practice: Understanding the limitations and benefits of new technologies and bringing basic scientific knowledge and better solutions to existing clinical challenges in order to fulfill unmet diagnostic and therapeutical needs. The presenters will summarize seven technologies, which will focus on providing affordable screening as well as high-volume and high-quality eye care and innovative technologies.

Expected Outcomes: The audience will be exposed to an in-depth analysis of new technological modalities in screening, informatics, diagnostics, and treatment options in pediatric ophthalmology.

Format: The workshop will include an overview of different clinically available technologies pertaining to pediatric ophthalmology. Each speaker, either an innovator or at the center of development or dissemination of these technologies, will provide a didactic lecture that will be followed by questions from the panel and audience, along with a discussion on the technologies' effectiveness and clinical relevance.

Summary: In a rapidly changing world of technologies,and healthcare, this workshop will provide an overview of several existing innovations in pediatric ophthalmology.

References: 1. Silverstein E, Williams JS, Brown JR, et al. Teleophthalmology: Evaluation of phone-based visual acuity in a pediatric population. Am J Ophthalmol. 2020;s0002-9394(20)30426-8.
2. Ting DSW, Peng L, Varadarajan AV, et al. Deep learning in ophthalmology; The technical and clinical consideration. Pediatr Neonatol.2019;72:100759.

Workshop #21
Sunday, April 11, 2021
12:30 PM – 2:00 PM

2021 Difficult Non-Strabismus Problems

Laura B. Enyedi, MD; David Rogers, MD; Brenda Bohnsack, MD, PhD; Yasmin Bradfield, MD; Stacy Pineles, MD; Erin Stahl, MD

Duke University
Durham, NC

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 opthalmology 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 ophtalmology 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: Ashworth JL, Biswas S, Wraith E & Lloyd IC (2006): The ocular features of the mucopolysaccharidoses. Eye 20: 553- 563.

Workshop #22
Sunday, April 10, 2021
2:30 PM – 4:00 PM

Difficult Problems in Strabismus

David Wallace; Steve Brooks; Steve Christiansen; Linda Dagi; Jane Edmond; Nandini Gandhi; David Plager; Erin Schotthoefer

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 listserve, 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.

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. 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: N/A

Workshop #23
On Demand (1 hour)

2021: Private Equity and Ophthalmology in the Era of Covid-19

K. David Epley, MD; Gary Lelli, MD; Shira Robbins, MD; Eric Packwood, MD

Purpose/Relevance: Private equity firms, hospitals and other companies are buying ophthalmology practices in large numbers these days. Pediatric ophthalmology practices are being sought for varying reasons. This workshop will review the state of private equity purchasing in ophthalmology and outline key trends in acquisitions and details practices should consider in making the decision to sell to another firm while taking into consideration changes brought about by the Covid-19 pandemic.

Target Audience: Ophthalmologists, medical directors, office administrators and managers.

Current Practice: This wave of private equity purchases has many pediatric ophthalmologists wondering if they should sell and what the pros and cons of such a practice sale are for the practice, the physicians (partners and associates), and their staff.

Best Practice: Strategies for negotiation and how to critically evaluate an offer will be discussed. Pre and post-acquisition issues will be discussed so the attendee can have proper expectations for the transition. Trends related to successful and unsuccessful purchases will be reviewed. Timing of acquisition and the effects of Covid-19 on the market will be discussed.

Expected Outcomes: This workshop will teach the attendees about the state of private equity and will educate the attendees how to critically evaluate a purchase offer. The workshop will discuss evaluation of the purchasing company, specifics of the negotiation process, expectations pre- and post-merger and preparations for change to the practice.

Format: Didactic lecture moderated by panelists; typical question and answer period will be replaced by the moderators asking expected questions in a pre-recorded video-chat format given the virtual, pre-recorded nature of workshops for 2021.

Summary: Sales to private equity companies, hospital systems, and other large physician services entities continue to be strong. Understanding how to evaluate these companies and the changes these companies bring can help practices decide if such a sale will be worthwhile. The effects of the Covid-19 pandemic on market forces in private equity acquisitions will be reviewed. This workshop will cover these details and more to help the attendee be able to critically evaluate a purchase offer.

References: 1. Physicians First HealthCare Partners White Paper on The Current State of Private Equity in Ophthalmology: https://cdn2.hubspot.net/hubfs/3461437/White%20Papers/White%20Paper%20-%20The%20Current%20State%20of%20Private%20Equity%20in%20Ophthalmology%20Practices%20and%20Surgery%20Centers.pdf
2. Patel, Groth, Sternberg. The emergence of private equity in ophthalmology. JAMA Ophthalmol. 2019;137(6):601-602. doi:10.1001/jamaophthalmol.2019.0964
3. Harrison. Ophthalmologists debate selling to private equity firms. Ophthalmology Times. 2019. https://www.ophthalmologytimes.com/article/ophthalmologists-debate-selling-private-equity-firms
4. Kent. Is a private equity deal right for you? Review of Ophthalmology. 2018: https://www.reviewofophthalmology.com/article/is-a-private-equity-deal-right-for-you
5. MacArthur H, Elton G, Rainey B. The impact of Covid-19 on private equity. Bain & Company, 4/9/20. https://www.bain.com/insights/the-impact-of-covid-19-on-private-equity/
6. Drean A. Ten predictions for how Covid-19 will transform private equity. Forbes, 5/15/20. https://www.forbes.com/sites/antoinedrean/2020/05/15/ten-predictions-for-how-covid-19-will-transform-private-equity/#2b416f8d4753
7. Covid-19 and the private equity industry. https://www.pwc.com/us/en/library/covid-19/coronavirus-private-equity.html
8. Lacher R, Rogers S, Aziz Z, Sherian J. Insight: Impact of Covid-19 on middle-market private equity M & A. Bloomberg, 7/13/20. https://news.bloombergtax.com/financial-accounting/insight-impact-of-covid-19-on-middle-market-private-equity-m-a

Workshop #24
On Demand (1 hour)

Idiopathic Intracranial Hypertension Claims

Christie L. Morse, MD; Robert Wiggins, MD; Linda Harrison, PhD

OMIC (Ophthalmic Mutual Insurance Company)
San Francisco, CA

Purpose/Relevance: OMIC has settled 8 claims alleging failure to diagnose and treat idiopathic intracranial hypertension (IIH), also known as pseudotumor cerebri (PTC). These patients, some of whom were minors, suffered significant vision loss.

Target Audience: Pediatric ophthalmologists

Current Practice: The IIH claims show that ophthalmologists do not always recognize when the patient's condition is an emergency and do not ensure timely follow up with other specialists.

Best Practice: Ophthalmologists will use an IIH checlist to identify important aspects of the patient's history, exam, and management that might be missed, particularly by practitioners who do not encounter these patients frequently in clinical practice.
Ophthalmologists will ensure timely coordination of immediate and ongoing care.

Expected Outcomes: Patients with suspected IIH will be promptly referred for treatment.

Format: Malpractice case studes
Presentation of an IIH checklist
Discussion of referral and follow-up methods

Summary: OMIC Committee Member Christie Morse, MD, OMIC Board Member Robert Wiggins, MD and OMIC Director of Risk Management Linda Harrison, PhD, will discuss several IIH claims, review a checklist to ensure careful workup, and propose ways to coordinate and track care.

References: Tan et al. Drug-induced intracranial hypertension. A Systemic Review and Critical Assesment of Drug-Induced Causes. Clin Dermatol. 2020 Apr;21(2):163-17).
Kilgore et al. A Population-based, case-controlled evaluation of the association between hormonal contraceptives and idiopathic intracranial hypertension. AJO. 2019 Jan;197:74-79.).

Workshop #25
On Demand (1.5 hours)

Documentation and Coding Updates for the Pediatric Practice in 2021

Sue J. Vicchrilli, COT, OCS, OCSR; Michael Bartiss, OD, MD, FAAO, FAAP; Traci Fritz, COE;
Robert S. Gold, MD, FAAP; Shira L. Robbins, MD, FAAO, FAAP; Lance M. Siegel, MD, FAAO, FAAP

American Academy of Ophthalmology
San Francisco, CA

Purpose/Relevance: To successfully emerge from the pandemic, pediatric practices must be familiar with these key issues and objectives:

1. Adopt the significant new E/M documentation guidelines
2. Implement a strategic plan of when to submit an Eye visit code vs. E/M code using 2021 documentation requirements plus its impact on scheduling.
3. Documentation requirements and code options for exams performed out-side the office, such as hospital and emergency department visits.
4. Recognize what aspects of telemedicine continue to exist including hybrid examples of two visits with home dilation.
5. Discover answers to the top 10 pediatric coding questions.

As a bonus, content from previous years' courses will be included in the appendix.

Target Audience: Pediatric ophthalmologists, administrators, billers, coders, orthoptists, technicians and scribes

Current Practice: The biggest change in exam documentation occurs in 2021

Best Practice: Best practices are aware of the 2021 Evaluaton and Management documentation changes

Expected Outcomes: Practices will know when to submit an Eye visit code vs an E/M code based either on medical decision making or time included prolonged time.

Format: Lecture, panel discussion, audience polling.

Summary: 1. Adopt the significant new E/M documentation guidelines
2. Implement a strategic plan of when to submit an Eye visit code vs. E/M code using 2021 documentation requirements plus its impact on scheduling.
3. Documentation requirements and code options for exams performed out-side the office, such as hospital and emergency department visits.
4. Recognize what aspects of telemedicine continue to exist including hybrid examples of two visits with home dilation.
5. Discover answers to the top 10 pediatric coding questions.

References: CPT 2020 vs. CPT 2021
Academy's Health Policy Committee
AAPOS Practice Management Section