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AAPOS Past Presidents

Marshall M. Parks, MD	1974-75	Lake Tahoe
Robert D. Reinecke, MD	1975-76	Bermuda
Jack C. Crawford, MD	1976-77	San Francisco
Robison D. Harley, MD	1977-78	Williamsburg
David S. Friendly, MD	1978-79	Toronto
Phillip Knapp, MD	1979-80	San Diego
Webb Chamberlain, MD	1980-81	Orlando
Arthur Jampolsky, MD	1981-82	Monterey
Alfred G. Smith, MD	1982-83	Vancouver
John A. Pratt-Johnson, MD	1983-84	Vail
Eugene R. Folk, MD	1984-85	Puerto Rico
Thomas D. France, MD	1985-86	Maui
Gunter K. von Noorden, MD	1986-87	Scottsdale
Arthur L. Rosenbaum, MD	1987-88	Boston
William E. Scott, MD	1988-89	Kiawah
Eugene M. Helveston, MD	1989-90	Lake George
Henry S. Metz, MD	1990-91	Montreal
John T. Flynn, MD	1991-92	Maui
Forrest D. Ellis, MD	1992-93	Palm Springs
David L. Guyton, MD	1993-94	Vancouver
Malcolm L. Mazow, MD	1994-95	Orlando
John D. Baker, MD	1995-96	Snowbird
Earl A. Palmer, MD	1996-97	Charleston
John W. Simon, MD	1997-98	Palm Springs
Marilyn T. Miller, MD	1998-99	Toronto
Maynard B. Wheeler, MD	1999-2000	San Diego
Albert W. Biglan, MD	2000-01	Orlando
Jane D. Kivlin, MD	2001-02	Seattle
Joseph H. Calhoun, MD	2002-03	Hawaii
George S. Ellis, Jr., MD	2003-04	Washington DC
Susan H. Day, MD	2004-05	Orlando
Michael X. Repka, MD	2005-06	Keystone
Christie L. Morse, MD	2006-07	Seattle
Edward G. Buckley, MD	2007-08	Washington DC
Bradley C. Black, MD	2008-09	San Francisco
C. Gail Summers, MD	2009-10	Orlando
David A. Plager, MD	2010-11	San Diego
Steven E. Rubin, MD	2011-12	San Antonio
K. David Epley, MD	2012-13	Boston
Sharon F. Freedman, MD	2013-14	Palm Springs
Sherwin J. Isenberg, MD	2014-15	New Orleans
M. Edward Wilson, MD	2015-16	Vancouver

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**AAPOS thanks *Bausch + Lomb* for providing an
unrestricted educational grant for the
2017 AAPOS Annual Meeting**

AAPOS Lifetime Achievement Award

Oscar A. Cruz, MD
Mohamad S. Jaafar, MD
Scott R. Lambert, MD

Steven E. Rubin, MD
Derek T. Sprunger, MD

AAPOS Senior Honor Awards

Robert D. Gross, MBA, MD
Richard W. Hertle, MD
Amy K. Hutchinson, MD

Evelyn A. Paysse, MD
R. Michael Siatkowski, MD

AAPOS Honor Awards

Lisa S. Abrams, MD
Darron A. Bacal, MD
Mays A. El Dairi, MD
Walter M. Fierson, MD
Deborah S. Lenahan, MD

Richard Alan Lewis, MD, MS
I. Christopher Lloyd, MBBS, FRCOphth
Leonard B. Nelson, MD
Mitchell B. Strominger, MD

AAPOS Committee Meetings (All rooms are in the Omni Nashville Hotel)

Sunday, April 2, 2017

7:00 AM - 8:30 AM	Finance Committee	Cumberland 5
12:15 PM - 2:15 PM	Council of Committee Chairs	Cumberland 5
3:00 PM - 5:00 PM	Pediatric Low Vision Rehabilitation Committee	Music Row 6
3:30 PM - 4:30 PM	Fellowship Directors Committee	Cumberland 2
3:30 PM - 5:00 PM	Interorganizational Relations Committee	Cumberland 1
5:00 PM - 6:00 PM	Adult Strabismus Task Force	Music Row 4
5:00 PM - 5:30 PM	Membership Committee	Cumberland 2

Monday, April 3, 2017

2:30 PM - 3:30 PM	Vision Screening Committee	Music Row 3
2:30 PM - 4:00 PM	International Affairs Committee	Cumberland 1
2:30 PM - 4:00 PM	Subspecialty Training Task Force	Music Row 4
2:30 PM - 3:30 PM	Online Media Committee	Music Row 6
2:30 PM - 3:30 PM	Corporate Relations Committee	Music Row 5
3:00 PM - 4:00 PM	Young Ophthalmologist Committee	Cumberland 2
4:00 PM - 6:00 PM	Socioeconomic Committee	Music Row 3
4:00 PM - 5:30 PM	Public Information Committee	Music Row 6
4:00 PM - 5:00 PM	IPOSC	Music Row 5
4:30 PM - 5:30 PM	Professional Education Committee	Music Row 4

Wednesday, April 5, 2017

1:00 PM - 2:15 PM	J AAPOS Editorial Board Meeting	Cumberland 4
1:00 PM - 2:30 PM	Legislative Committee	Music Row 6
1:00 PM - 2:00 PM	Learning Disabilities and Vision Therapy Committee	Music Row 4
2:00 PM - 5:00 PM	International Program Committee	Music Row 3
2:00 PM - 3:00 PM	Research Committee	Cumberland 5
5:00 PM - 6:00 PM	Genetic Eye Disease Task Force	Music Row 4

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the American Academy of Ophthalmology and the American Association for Pediatric Ophthalmology and Strabismus. The American Academy of Ophthalmology is accredited by the ACCME to provide continuing medical education for physicians.

The American Academy of Ophthalmology designates this live activity for a maximum of 33.5 *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Overall Meeting Goals

Upon completion of this activity, participants will be able to:

- Describe recent medical advances in the diagnosis, management, and treatment of conditions encountered in the practice of pediatric ophthalmology and strabismus.
- Discuss improved techniques, compare/contrast methods, and review clinical research and advances in order to provide the best possible treatment options and care to patients.
- Describe aspects of professionalism that will assist in practice of pediatric ophthalmology and strabismus.
- Describe new techniques in select aspects of surgery pertinent to pediatric ophthalmology and strabismus.

Specific Learning Objectives

1. Cite most recent data from randomized controlled clinical trials in the diagnosis and management of amblyopia.
2. Describe new preoperative evaluation techniques and surgical strategies to improve outcomes in patients with comitant, non-paretic strabismus.
3. Compare new surgical techniques for complicated strabismus (restrictive, paretic, miswiring syndromes, scarring, incomitance, etc) to decrease reoperation rate.
4. Outline up-to-date patient selection criteria to identify children undergoing cataract surgery who should receive intraocular lenses.
5. Recognize new treatment techniques for pediatric glaucoma, retinal, and oculoplastic and orbital disease and make appropriate sub-specialty referrals for such cases.
6. Describe new treatment strategies to decrease the incidence of significant visual loss from high risk ROP.
7. Recognize pediatric ophthalmic disease of neurologic origin and describe the process for appropriate referrals to pediatric neurology.
8. Utilize the latest resources for discussion of visual development, epidemiology of pediatric eye disease, learning disabilities, vision screening strategies with other physicians and members of the lay community.
9. Identify current coding rules and regulations for pediatric eye diseases.
10. Recognize current laboratory research with potential translation applicability to pediatric ophthalmology.
11. Describe the role of OCT imaging in the diagnosis of optic nerve and retinal diseases.
12. Describe the ocular, neurologic and developmental manifestations of congenital infection with Zika virus.
13. Recognize concussion and its proper management
14. Describe the management of craniofacial syndromes through a multi-disciplinary approach.

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AAPOS Educational Mission Statement

The purpose of the American Association for Pediatric Ophthalmology and Strabismus' (AAPOS) educational activities is to present pediatric ophthalmologists and strabismologists with the highest quality lifelong learning opportunities that promote improvement and change in physician practices, performance, or competence through joint sponsorship with the American Academy of Ophthalmology (AAO), thus enabling such physicians to maintain or improve the competence and professional performance needed to provide the best possible eye care for their patients.

Due to the nature of the subspecialty, the largest component of AAPOS' educational program focuses on strabismus, amblyopia, visual development and binocular function. However, the content also emphasizes the other Practice Emphasis Areas (PEAs) that have been defined by the American Board of Ophthalmology (ABO) for their Maintenance of Certification (MOC) process with emphasis on these disease processes in children, and adults with strabismus and eye movement disorders. These include:

- Cataract and Anterior Segment
- Cornea and External Disease
- Glaucoma
- Neuro-ophthalmology and Orbit
- Oculoplastics and Orbit
- Refractive Management and Intervention
- Retina and Vitreous
- Uveitis

Additionally, AAPOS' educational program provides content for topics such as effective management of a pediatric ophthalmology practice, medical ethics, risk management, and other areas deemed relevant by the needs of the membership.

Types of educational activities provided at the annual AAPOS meeting include:

- Didactic lectures
- Original research in the form of free papers and posters
- In-depth focused workshops and symposia on specific topics
- Small-group discussion opportunities with speakers and researchers

All meeting content is reviewed by the AAPOS Program Committee and Secretary for Program with respect to education quality and utility. Members are routinely queried regarding their assessment of quality and content, as well as needs for future meetings, and comments are reviewed by the Program Committee and Board of Directors, with necessary changes incorporated into future programs.

The expected result of AAPOS' educational activities is a broad array of ophthalmic knowledge that contributes to the lifelong learning of members and advances physician performance or competence. Ongoing assessment of the impact of AAPOS' educational program is important in determining modifications to existing activities and the development of new activities. Specific expected results include increased knowledge across the ophthalmic community, activities designed to increase competence and performance with evidence-based standards, current practices, and methods of diagnosis, therapies, and disease prevention.

44th Annual Frank D. Costenbader Lecturer



Why Strabismus Surgery Works: The Legend of the Dose-Response Curve

Steven M. Archer, MD

Monday, April 3, 2017 - 8:20 - 8:45 am

The Costenbader Lecture is supported by the Children's Eye Foundation

Dr. Steven M. Archer was born in Washington D.C. but he moved at an early age to Salt Lake City, where he grew up hiking, climbing and skiing in the Wasatch mountains. He attended the University of Utah with an undergraduate degree in computer science in 1974. His M.D. degree was obtained at the University of Chicago in 1978. After an internship in internal medicine at the University of Arizona, he spent two years as a postdoctoral fellow in developmental neurobiology at the University of Colorado. He subsequently returned to the University of Chicago where he completed his ophthalmology residency in 1984. His fellowship training in pediatric ophthalmology and strabismus under the direction of Eugene Helveston and Daryel Ellis was at Indiana University, where he stayed on as faculty until moving to the University of Michigan in 1988 and is currently a Professor in the Department of Ophthalmology and Visual Sciences there.

Dr. Archer has served on the editorial board and was subsequently an associate editor for the Journal of AAPOS. He received a Lifetime Achievement Award from AAPOS in 2012 and a Senior Achievement Award from the American Academy of Ophthalmology in 2015. He is currently faculty for the Academy's Basic and Clinical Science Course section on Pediatric Ophthalmology and Strabismus. He has been elected to the American Ophthalmological Society and the Association for Research in Strabismus (Squint Club). He currently serves on the American Orthoptic Council and delivered the 2015 Richard G. Scobee Memorial Lecture. He and his long-time associate Monte Del Monte M.D. have trained over 50 fellows at the University of Michigan.

Often with a contrarian bent, Dr. Archer has interests in complex strabismus, physiological optics, retinoblastoma, retinopathy of prematurity and visual system evolution.

Steve and Carol, his wife of 36 years, have three children and one grandchild, so far.

The Frank D. Costenbader Lecture

The Frank D. Costenbader Lecture was inaugurated in 1974 at the Annual Meeting of the Costenbader Society to honor Dr. Costenbader. The American Association for Pediatric Ophthalmology, later the American Association for Pediatric Ophthalmology and Strabismus was created at this meeting. From its inception, AAPOS undertook to sponsor the Costenbader Lecture as the keynote presentation at its annual meeting. Due to failing health, Dr. Costenbader was unable to attend any of the lectures which honored him.

Dr. Costenbader was born and educated in Virginia and was a true Virginia Gentleman. He received his undergraduate education at Hampton-Sydney College, his medical degree from the University of Virginia and completed his residency at the Episcopal Eye, Ear and Throat Hospital in Washington, DC.

Dr. Costenbader started practice in 1932 in the depression and began a lifetime commitment to teaching, which set the stage for the tremendous influence he had on ophthalmology when he began to only see children. In 1933, Dr. Costenbader was appointed Instructor in Ophthalmology at Georgetown University and he became Special Lecturer and Conferee there in 1964. He also was on the faculty of George Washington University advancing to the rank of Clinical Professor. He was known for his enormous patience, generous with his time, always offering complete answers to even the weakest questions, and he rarely lost his equanimity. He changed the Children's Hospital Clinic from one of service only to teaching and clinical care. He committed a full day a week to teaching for many years, spending Tuesday afternoons at Children's and another half day a week at the Episcopal EET Hospital. In 1946, the Episcopal residents started rotating at Children's, and he was able to focus his teaching efforts there.

Dr. Costenbader is referred to as the Father of Pediatric Ophthalmology. That designation is because of his decision in 1943 to limit his practice to pediatric ophthalmology, and he was the first ophthalmologist to do so. He moved his office to a stately brownstone townhouse on 22nd Street in Washington, DC. His waiting room was referred to as Dr. Costenbader's living room by many of his young patients because of its small furniture. He had two exam rooms on the first floor, which he used, and there were additional exam rooms on the lower level for his orthoptist, Ms. Dorothy Bair, and associates, fellows and preceptors. It was a center for wonderful patient care and the first real education or training center for pediatric ophthalmology. His exam tools were limited. Dr. Costenbader had a picture of an airplane and a phone on a rotating box at the end of his room and kids would beg to come in and see his airplane and talk to him about it. The patient's examination chair was a kitchen chair placed on a small wooden platform.

When asked why he limited his practice to pediatrics, the first thing Dr. Costenbader would say was that kids are just so much more fun. He also was fascinated with the eye problems of children and at that time, ophthalmologists interested in strabismus were more interested in adults and older children and in cosmetic alignment.

Dr. Costenbader was an advocate for children. His concern for their health and the financial welfare of families in providing for the health of their children led him to establish and financially support the Eye Fund at Children's Hospital to pay for indigent patient surgery. This fund is now used to support the training program at the Children's National Medical Center in Washington, DC.

Continuing with his concern for providing for children's health care, he was co-founder of the Medical Service Plan (today Blue Shield) of the District of Columbia and was the first president from 1946 to 1951. He remained on the board for many years. In addition, he started having parents be with their child in the anesthesia induction room before surgery, he eliminated bandages on eyes following strabismus surgery, and he changed strabismus surgery from two inpatient nights to same-day surgery. Dr. Costenbader was Chief of Ophthalmology at Children's Hospital of Washington, DC, now The Children's National Medical Center from 1938 to 1965. He had a remarkable effect on children's eye care and children's health in general.

This lecture memorializes the man who had the foresight and the courage to begin a subspecialty in ophthalmology and the talent and dedication to train and mold the next generation according to his ideals.

Past Costenbader Lectures

1974	Los Angeles	Marshall M. Parks, MD	1996	Snowbird	Marilyn T. Miller, MD
1975	Lake Tahoe	Robert N. Shaffer, MD	1997	Charleston	Robert D. Reinecke, MD
1976	Bermuda	Lorenz E. Zimmerman, MD	1998	Palm Springs	David L. Guyton, MD
1977	San Francisco	T. Keith Lyle, MD	1999	Toronto	Malcolm L. Mazow, MD
1978	Williamsburg	Jules Francois, MD	2000	San Diego	David R. Stager, Sr., MD
1979	Toronto	Robison D. Harley, MD	2001	Orlando	Forrest Daryel Ellis, MD
1980	San Diego	David G. Cogan, MD	2002	Seattle	Creig S. Hoyt, MD
1981	Orlando	Philip Knapp, MD	2003	Hawaii	Burton J. Kushner, MD
1982	Monterey	Joseph Lang, MD	2004	Washington, DC	Arthur L. Rosenbaum, MD
1983	Vancouver	Jack C. Crawford, MD	2005	Orlando	Albert W. Biglan, MD
1984	Vail	Gunter K. von Noorden, MD	2006	Keystone	Earl A. Palmer, MD
1985	Puerto Rico	Arthur J. Jampolsky, MD	2007	Seattle	John D. Baker, MD
1986	Maui	Robert M. Ellsworth, MD	2008	Washington, DC	Edward G. Buckley, MD
1987	Scottsdale	John E. Wright, MD	2009	San Francisco	Richard A. Saunders, MD
1988	Boston	Alan B. Scott, MD	2010	Orlando, FL	A. Linn Murphree, MD
1989	Kiawah	Kenneth C. Swan, MD	2011	San Diego	Susan H. Day, MD
1990	Lake George	John T. Flynn, MD	2012	San Antonio	Michael X. Repka, MD
1991	Montreal	John A. Pratt-Johnson, MD	2013	Boston	M. Edward Wilson, MD
1992	Maui	Eugene M. Helveston, MD	2014	Palm Springs	John F. O'Neill, MD
1993	Palm Springs	Henry S. Metz, MD	2015	New Orleans	David S. Walton, MD
1994	Vancouver	William E. Scott, MD	2016	Vancouver	Edward L. Raab, MD, JD
1995	Orlando	Eugene R. Folk, MD			

2017 Apt Lecturer



Zika Virus: A New Kid on the Block of Ophthalmic Teratogens

Marilyn T. Miller, MD

Wednesday, April 5, 2017 - 8:05 – 8:25 am

Dr. Marilyn T. Miller is a Professor of Ophthalmology at the University of Illinois at Chicago (UIC) where she obtained her MD and MS degree and clinical training in ophthalmology and pediatric ophthalmology.

Her research in congenital anomalies and teratogens led her to Sweden where she later was awarded an honorary degree from the University of Göteborg (1998) for her involvement in clinical research in thalidomide embryopathy. Recently she has collaborated with a pediatric ophthalmologist in Brazil studying the ocular effect of misoprostol, a teratogenic drug that if taken in a certain period during pregnancy may cause Möbius syndrome.

She has longstanding participation in international ophthalmology including Nigeria, India, Asia and several South American countries. Dr. Miller was recognized for her many contributions to international service with the Humanitarian Award from the American Academy of Ophthalmology (AAO), and more recently the AAO International Blindness Prevention Award. She received the Howe Medal by the American Ophthalmological Society (AOS) for "distinguished service to ophthalmology." She also was on the AOS Council and was the president of this organization.

Dr. Miller has visited an eye clinic in rural Abak, Nigeria for over 25 years with a small non-governmental organization, FOCUS, Inc. Originally, the visits were focused on treating patients, but now the role has changed to more educational area and recently received a named lectureship from the Ophthalmologic Society of Nigeria.

Dr. Miller has served on advisory boards including the Advisory Committee of the World Health Organization, the Smith Kettlewell Eye Research Institute, the Bernadotte Foundation, the AAO, and the Foundation of the American Academy of Ophthalmology. She also served as the AAO representative to the International Agency for the Prevention of Blindness (IAPB).

Dr. Miller is a Charter member of AAPOS (American Association of Pediatric Ophthalmology and Strabismus) and had the honor of serving AAPOS as their president, a member of its board and chair of their International Affairs Committee. She was honored with the Lifetime Achievement Honor Award and the Marshal Park Bronze and Silver Medal from AAPOS and has given both the Costenbader and Scobee lectures.

She has been involved with many activities in the Asian Pacific region including participating in educational programs at Aravind Hospital in Madurai for which she received the Venketaswamy Oration Award and from the APAO the Jose Rizal award. For her work in a collaborative program between AAPOS and Tianjin Eye Hospital in China, she received the 2012 International Gold Award from the Chinese Ophthalmologic Society.

Her current area of interest is in training and education internationally in the field of pediatric ophthalmology and strabismus and teratology.

The Leonard Apt Lecture

The Leonard Apt Lecture was established and first presented in 2000 by the American Academy of Pediatrics (AAP) Section on Ophthalmology to honor Leonard Apt, MD, for his dedication and contribution in the fields of pediatrics and pediatric ophthalmology.

Dr. Apt was born in Philadelphia on June 28, 1922. He entered college at the age of 14 at the University of Pennsylvania, and trained in pediatrics after completing medical school at Jefferson Medical College in Philadelphia. Physicians everywhere will recall the “Apt Test” for detecting gastrointestinal bleeding in newborns, invented by young pediatrician Leonard Apt in 1955. Over the objections of leading physicians of the day who thought that pediatric ophthalmology was conceptually absurd, he then trained in ophthalmology at Harvard, the University of Cincinnati, and the National Institutes of Health. Dr. Apt became the first physician board-certified in both pediatrics and ophthalmology. As the first National Institutes of Health Special Fellow in Pediatric Ophthalmology mentored by Drs. Frank Costenbader and Marshall Parks, he organized the first formal training program for the new specialty.

Dr. Apt served as the first Research Fellow in Pediatric Ophthalmology at Wills Eye Hospital. In 1961, at UCLA, Dr. Apt established the first full-time service in pediatric ophthalmology at a United States medical school, predating both the AAP Section on Ophthalmology and AAPOS. For many years, Dr. Apt served as the principal ophthalmology consultant for the AAP. He organized local and national courses on pediatric eye topics and spoke at Annual Meetings of the AAP. Dr. Apt became a founding member of UCLA’s Jules Stein Eye Institute.

Every ophthalmologist owes an intellectual debt to Dr. Apt. This towering intellectual figure developed the coating that first enabled the use of synthetic absorbable sutures for ocular surgery. In 1963, Dr. Apt reported on the use of povidone-iodine as a potent, safe antiseptic on the eye and surrounding skin area. It eventually became the preferred method of ophthalmic surgical preparation. In recent years, Dr. Apt and his colleague, Dr. Sherwin Isenberg, used povidone-iodine in developing countries to prevent and treat blinding eye infections in infants and children.

Dr. Apt authored more than 300 scientific and medical publications. To his numerous honors from professional societies, Harvard, Jefferson Medical College, and the University of Pennsylvania have recently been added the 2009 UCLA Emeritus Professorship Award, the 2010 AAP Lifetime Achievement Award, and the 2010 Castle Connolly National Physician of the Year Award for Lifetime Achievement. Beyond medicine, Dr. Apt was active as a founder, board member, and major contributor to the arts, theater, music, humanities, and sports. His philanthropic gifts to UCLA have created the “Leonard Apt Fellowship in Pediatric Ophthalmology” and the Leonard Apt Chair in Pediatric Ophthalmology.”

Dr. Apt died of natural causes in Santa Monica, California, on February 1, 2013. The Leonard Apt Lecture pays continuing tribute to the late Dr. Leonard Apt not only for his monumental educational and scientific contributions, but also for his pioneering leadership in creation of pediatric ophthalmology as a medical subspecialty.

Past Apt Lectures

2000	San Diego	J. Bronwyn Bateman, MD
2001	Orlando	Bennett A. Shaywitz, MD & Sally E. Shaywitz, MD
2002	Seattle	Mark Siegler, MD
2003	Hawaii	Linda J. Mason, MD
2005	Orlando	Edwin M. Stone, MD, PhD
2007	Seattle	Carol D. Berkowitz, MD, FAAP
2009	San Francisco	Sherwin J. Isenberg, MD
2011	San Diego	Carol L. Shields, MD & Jerry A. Shields, MD
2013	Boston	Joseph L. Demer, MD, PhD
2015	New Orleans	Alex V. Levin, MD, MHSc, FAAP, FAAO, FRCSC

Participant Financial Disclosures

Category	Code	Description
Consultant/ Advisor	C	Consultant fee, paid advisory boards or fees for attending a meeting (for the past 1 year)
Employee	E	Employed by a commercial entity
Lecture Fees	L	Lecture fees (honoraria), travel fees or reimbursements when speaking at the invitation of a commercial entity (for the past 1 year)
Equity Owner	O	Equity ownership/stock options of publicly or privately traded firms (excluding mutual funds) with manufacturers of commercial ophthalmic products or commercial ophthalmic services
Patents/ Royalty	P	Patents and/or royalties that might be viewed as creating a potential conflict of interest
Grant Support	S	Grant support for the past 1 year (all sources) and all sources used for this project if this form is an update for a specific talk or manuscript with no time limitation

The following individuals have relevant financial interests to disclose:

AAPOS Program Committee

Donahue, Sean

C - *Retrophin, Welch Allyn, PEDIvision*

C, O - *Gobiquity*

Epley, David

C - *Nevakar, LLC*

O - *Abbott*

Paper #23

Tehrani, Nasrin

C - *Abbvie*

Paper #38

Chiang, Michael

C - *Clarity Medical Systems (unpaid member of Scientific Advisory Board)*

Poster #2

Traboulsi, Elias

C, L - *Retrophin*

C - *Sanofi*

C - *Spark Therapeutics*

Poster #9

Saunte, Jon Pieter

P - *The Squint Scope*

Poster #24

Chan, RV Paul

C - *Visunex*

Chiang, Michael

C - *Clarity Medical Systems (unpaid member of Scientific Advisory Board)*

Electronic Poster #25

Drack, Arlene

S - *Spark Therapeutics*

S - *Retrophin*

Electronic Poster #29

Silbert, David

C, L - *Kaneka*

Workshop #16
Hunter, David
C, O, P - *Rebiscan*

AAPOS considers only the presenter and the senior author to have control over CME content. Therefore, only their disclosures are reviewed, and any conflicts of interest are resolved. AAPOS collects disclosures from all authors but does not perform any other review or COI management.

Workshop #18
Drack, Arlene
S - *Spark Therapeutics*
S - *Retrophin*
Huang, David
O - *Optovue*
Traboulsi, Elias
C, L - *Retrophin*
C - *Sanofi*
C - *Spark Therapeutics*

All participants (presenters and senior authors) and AAPOS and AAO staff not listed have no relevant financial relationships to disclose.

Workshop #19
Chan, RV Paul
C - *Visunex*

Workshop #21
Drack, Arlene
S - *Spark Therapeutics*
S - *Retrophin*
Traboulsi, Elias
C, L - *Retrophin*
C - *Sanofi*
C - *Spark Therapeutics*

Workshop #27
Wethe, Jennifer
L - *King-Devick Test in Association with Mayo Clinic*

Workshop #29
Traboulsi, Elias
C, L - *Retrophin*
C - *Sanofi*
C - *Spark Therapeutics*

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Program Schedule






All scientific sessions and social events are held at the Omni Nashville Hotel unless otherwise noted.




Sunday, April 2, 2017

8:30 AM - 2:30 PM	Board of Directors Meeting	Cumberland #5
12:00 PM - 8:00 PM	AAPOS Registration	Broadway West Foyer
1:00 PM - 4:00 PM	Poster Set Up (First Set of Hard Board Posters)	Broadway West Foyer
4:00 PM - 6:00 PM	Poster Viewing (First Set of Posters & All E-Posters) ^{CME}	Broadway West Foyer
6:15 PM - 7:00 PM	International Attendees Reception	Music Row #5
7:00 PM - 9:00 PM	Opening Reception	Broadway Ballroom West

Monday, April 3, 2017




6:30 AM - 5:00 PM	Registration	Broadway West Foyer
6:30 AM - 7:55 AM	Poster Viewing (First Set of Posters & All E-Posters) ^{CME}	Broadway West Foyer
6:30 AM - 7:55 AM	Breakfast	Legends Ballroom
7:55 AM - 8:00 AM	Introduction and Welcome Sean P. Donahue, MD, PhD	Broadway Ballroom West
8:00 AM - 8:15 AM	President's Remarks, Honor Awards, Senior Honor Awards, Lifetime Achievement Awards, Champion for Vision Award Robert E. Wiggins, Jr., MD	Broadway Ballroom West
8:15 AM - 8:48 AM	Costenbader Lecture	Broadway Ballroom West
8:15 AM - 8:20 AM	Introduction of Costenbader Lecturer Erick D. Bothun, MD	
8:20 AM - 8:45 AM Paper #1	Costenbader Lecture (Supported by the Children's Eye Foundation) ^{CME} Why Strabismus Surgery Works: The Legend of the Dose-Response Curve Steven M. Archer, MD	
8:45 AM - 8:48 AM	Presentation Ceremony John D. Baker, MD	
8:50 AM - 10:00 AM	Moderators: Robert E. Wiggins, Jr., MD & Sean P. Donahue, MD, PhD	Broadway Ballroom West
8:50 AM - 9:29 AM	Scientific Session ^{CME} Horizontal Strabismus Surgery	Broadway Ballroom West
8:50 AM - 8:57 AM Paper #2	Surgical Outcomes Following Muscle Plication versus Resection Combined with Antagonist Muscle Recession for Basic Horizontal Strabismus Pamela A. Huston, CO Darren L. Hoover, MD	
8:57 AM - 9:04 AM Paper #3	Results of Horizontal Muscle Plication Compared to Muscle Resection Liesel M. Albrecht-Unger, MD Adam A. Goldenberg; David A. Plager, MD; Derek T. Sprunger, MD	
9:04 AM - 9:11 AM Paper #4	Wright Central Plication of Lateral Rectus versus Standard Medial Rectus Recession in Adult Divergence Insufficiency Esotropia Kenneth W. Wright, MD Giulia Corradetti, MD	
9:11 AM - 9:18 AM Paper #5	A Randomized Trial Comparing Bilateral Lateral Rectus Recession versus Unilateral Recess-Resect for Basic Type Intermittent Exotropia Sean P. Donahue, MD, PhD Danielle L. Chandler, MSPH; Jonathan M. Holmes, BM, BCh; David K. Wallace, MD, MPH; Raymond T. Kraker, MSPH; Aaron M. Miller, MD; Evelyn A. Paysse, MD; David B. Petersen, MD; Brian W. Arthur, MD	
9:18 AM - 9:22 AM	DISCUSSION OF PREVIOUS PAPER Burton J. Kushner, MD	

	9:22 AM - 9:29 AM Paper #6	Treatment of Intermittent Exotropia of the Convergence Insufficiency Type with Bupivacaine 0.75%: 5 Year Experience and Outcomes Matthew Josephson, MS Stephen A. Mathias, MD, MPH	
9:29 AM - 10:00 AM	Scientific Session  Extraocular Muscles		Broadway Ballroom West
	9:29 AM - 9:36 AM Paper #7	Inferior Rectus and Superior Rectus Displacement in Heavy Eye Syndrome (HES) and Saggy Eye Syndrome (SES) Megha L. Pansara, MD David B. Granet, MD; Michael Kinori, MD; Erika C. Acera, OC(C); Shira L. Robbins, MD	
	9:36 AM - 9:43 AM Paper #8	Combination of Anterior Segment Optical Coherence Tomography Modalities to Improve Accuracy of Rectus Muscle Insertion Location Carla J. Osigian, MD Michael J. Venincasa; Julia D. Rossetto, MD; Kara M. Cavuoto, MD; Hilda Capo, MD	
	9:43 AM - 10:00 AM	PANEL DISCUSSION All Presenters	
10:00 AM - 11:00 AM	Interactive Poster Session - Author Presentation and Q/A  First Set of Hard Board Posters (1-24) See Hard Board Poster Tab Section for Complete List of Posters Authors Present: Odd Numbered Posters from 10:00 - 10:35 AM Even Numbered Posters from 10:25 - 11:00 AM		Broadway West Foyer
10:00 AM - 11:00 AM	Electronic Poster Viewing - Author Presentation and Q/A  First Set of Electronic Posters (1-36) See Electronic Poster Tab Section for Complete List of Electronic Posters Authors Present: 1-12 from 10:05 - 10:20 AM; 13-24 from 10:25 - 10:40 AM; 25 - 36 from 10:45 - 11:00 AM		Broadway West Foyer
11:05 AM - 1:00 PM	Moderators: Jean E. Ramsey, MD, PhD & R. Michael Siatkewski, MD		Broadway Ballroom West
11:05 AM - 11:20 AM	Presentation of Parks Medals, Silver Medals and Children's Eye Foundation Update K. David Epley, MD		Broadway Ballroom West
11:20 AM - 11:38 AM	Scientific Session  Cataract		Broadway Ballroom West
	11:20 AM - 11:27 AM Paper #9	Contact Lens Adherence to Age of 5 Years in the Infant Aphakia Treatment Study Caroline H. Cromelin, MD Carolyn Drews-Botsch, PhD; Buddy Russell, COMT; Scott R. Lambert, MD	
	11:27 AM - 11:34 AM Paper #10	Long-Term Outcomes for Pediatric Patients Undergoing Trans-Scleral Fixation of the Capsular Bag with Intraocular Lens for Ectopia Lentis Julia M. Byrd Marielle P. Young; David B. Tate; Alan S. Crandall; Leah A. Owen	
	11:34 AM - 11:38 AM	DISCUSSION OF PREVIOUS PAPER Erin D. Stahl, MD	
11:38 AM - 11:59 AM	Scientific Session  Glaucoma		Broadway Ballroom West
	11:38 AM - 11:45 AM Paper #11	Long-Term Efficacy of Endoscopic Cyclophotocoagulation in the Management of Glaucoma Following Cataract Surgery in Children Adam J. Cantor, MD Jingyun Wang, PhD; Shanshan Li, PhD; Daniel Neely, MD; David Plager, MD	



	11:45 AM - 11:52 AM Paper #12	3D Reconstruction of UBM Images to Identify Anterior Segment Structures Richard W. Helms, PhD Faruk H. Orge, MD	
	11:52 AM - 11:59 AM Paper #13	Long Term Outcomes of Baerveldt Glaucoma Implant in Management of Glaucoma Associated with Struge-Weber Syndrome Bhamy Hariprasad Shenoy, MD, FICO Cecilia Fenerty, FRCOphth; Siddharth Agrawal, MS, FRCOphth; Vinod Sharma, MS, DNB, FRCSEd, FRCOphth	
11:59 AM - 12:55 PM	Scientific Session  Refractive Error - Amblyopia - Vision		Broadway Ballroom West
	11:59 AM - 12:06 PM Paper #14	Excimer Laser Refractive Surgery and Intraocular Lens Implantation Outcomes on Children with Neurological Impairment Nicholas Faron, BS James Hoekel, OD; Lawrence Tychsen, MD	
	12:06 PM - 12:13 PM Paper #15	Visual Improvement in Amblyopic Eye Following Radiation-Induced Vision Loss in Dominant Eye with Uveal Melanoma Aldo Vagge, MD Bruce M. Schnall, MD; Renelle P. Lim, MD; Jerry A. Shields, MD; Carol L. Shields, MD	
	12:13 PM - 12:17 PM	DISCUSSION OF PREVIOUS PAPER William V. Good, MD	
	12:17 PM - 12:24 PM Paper #16	Spectral Domain Optical Coherence Tomography Angiography in Children with Amblyopia Marcela Lonngi, MD Federico G. Velez, MD; Irena Tsui, MD; Mansour Rahimi, MD; Nopasak Phasukkijwatana, MD; Clarissa Chan; Melinda Chang, MD; David Sarraf, MD; Stacy L. Pineles, MD	
	12:24 PM - 12:28 PM	DISCUSSION OF PREVIOUS PAPER Michael X. Repka, MD, MBA	
	12:28 PM - 12:35 PM Paper #17	Slow Reading in Children with Anisometropic Amblyopia is Associated with Gaze Instability and Increased Saccades Krista R. Kelly, PhD Reed M. Jost, MS; Angie De La Cruz, BS; Lori Dao, MD; Cynthia L. Beauchamp, MD; David Stager, Jr., MD; Eileen E. Birch, PhD	
	12:35 PM - 12:42 PM Paper #18	Visual Function Assessment in Children with Congenital Zika Syndrome Liana O. Ventura, MD Luciene C. Fernandes, MD; Camila V. Ventura, MD; Natalia C. Dias, MD; Isabelle G. Vilar, MD; Adriana L. Gois, MD; Linda Lawrence, MD; Marilyn T. Miller, MD	
	12:42 PM - 12:55 PM	PANEL DISCUSSION All Presenters	
1:10 PM - 2:30 PM	AAPOS Business Meeting (Lunch Available for a Fee with Pre-Registration)		Broadway Ballroom West
2:45 PM - 4:00 PM	OMIC Risk Management Workshop: Consent, Documentation and Reporting  Chamblee, Reese, Pineda See Workshop Tab Section for Details		Broadway Ballroom West
3:00 PM - 4:00 PM	Interactive Poster Session - Review and Commentary from the Program Committee (First Set of Hard Board & Electronic Posters)  Nancy A. Hamming, MD & Scott A. Larson, MD		Broadway West Foyer
4:00 PM - 6:00 PM	Exhibitor Cocktail Reception		Legends Ballroom
5:30 PM - 6:30 PM	Administrators Meet & Greet		Cumberland #1 and #2
5:30 PM - 8:30 PM	Parks Medal Reception (by Invitation/Pre-Registration)		Country Music Hall of Fame



Tuesday, April 4, 2017

6:30 AM - 5:30 PM	Registration	Broadway West Foyer
6:30 AM - 8:00 AM	Poster Viewing (First Set of Posters & All E-Posters) 	Broadway West Foyer
6:30 AM - 8:00 AM	Breakfast	Legends Ballroom
8:00 AM - 4:00 PM	Practice Management Workshop - Administrators Program See Workshop Tab Section for Details	Cumberland #1 and #2
7:00 AM - 8:15 AM	Workshop Session A - See Workshop Tab Section for Details 	
	How Recent Technology Should Change Your Practice Patterns Bradfield, Kushner, Struck, Schmitt	Broadway Ballroom East A-D
	Interdisciplinary Management of Children with Craniofacial Malformations (Craniosynostosis) Flemmons, Bonfield, Dagi, Edmond, Kelly	Broadway Ballroom West F
	Tips for Understanding Pediatric Ocular Tumors Shields, Shields	Broadway Ballroom East E
	Management Pearls in Pediatric Uveitis Stahl, Utz, Davidson, Angeles-Han	Broadway Ballroom West G-K
8:30 AM - 9:45 AM	Workshop Session B - See Workshop Tab Section for Details 	
	Guidelines for Developing an Exit Strategy for Withdrawal from Practice and Entering Retirement Biglan, Baker	Broadway Ballroom West G-K
	AAPOS Genetic Task Force Workshop: Genetic Testing in Pediatric Ophthalmology, A Must or a Bust? Drack, Traboulsi, Utz, Costakos, Khan	Broadway Ballroom West F
	Strabismus Surgery in Complex Neurologic Disease: Surgical Strategy and Outcomes Heidary, Pineles, Peragallo, Strominger, Edmond, Dagi	Broadway Ballroom East E
	Teratogens, Neonatal Infections and the Visual System Mulvihill, Richards, Hamilton, Blaikie	Broadway Ballroom East A-D
9:45 AM - 10:30 AM	Refreshment Break and Exhibit Viewing	Legends Ballroom
10:30 AM - 11:45 AM	Workshop Session C - See Workshop Tab Section for Details 	
	Oculoplastics: Imaging and Surgical Pearls Elliott, Dagi, Freitag, Glass	Broadway Ballroom East A-D
	Appt Lecturer Workshop: The Zika Virus Epidemic from an Ophthalmologic Perspective Miller, Ventura, Ventura, Lawrence	Broadway Ballroom West F
	Case-Based Overview of the Management of Adult Strabismus Secondary to Ocular Surgery Pineles, Capo, de Alba Campomanes, Holmes, Kushner, Velez	Broadway Ballroom East E
	How to Afford to Practice Pediatric Ophthalmology Vicente, Epley, Wright, Greenberg	Broadway Ballroom West G-K
11:30 AM - 12:00 PM	Poster Removal (First Set of Hard Board Posters)	Broadway West Foyer
11:45 AM - 12:15 PM	Lunch Break - On Your Own	
12:15 PM - 1:00 PM	Pediatric Anesthetic Neurotoxicity and Complex Coordination of Care See Workshop Tab Section for Details 	Broadway Ballroom East E
	Kilkelly, Hays	





1:15 PM - 2:30 PM	Workshop Session D - See Workshop Tab Section for Details 	
	AOC/AAPOS Workshop: Controversies in Pediatric Ophthalmology and Orthoptics Christiansen, Bothun, Mickler, Hunter, Arnoldi, Pritchard, Biernacki, Hutchinson	Broadway Ballroom East E
	AAP Workshop: Gene Therapy for Inherited Retinal Diseases - Answers for Common Questions? Karr, Drack, Khan, Levin, Scanga, Traboulsi	Broadway Ballroom East A-D
	What Pediatric Ophthalmologists Need to Know about OCTs: Pearls and Pitfalls for Clinical Care Reznick, Loh, Campbell, Huang, Reiser, Edmunds	Broadway Ballroom West G-K
	Telemedicine for Retinopathy of Prematurity: Why and How VanderVeen, Chan, Chiang, Trese	Broadway Ballroom West F
2:45 PM - 4:00 PM	Workshop Session E - See Workshop Tab Section for Details 	
	What's New and Important in Pediatric Ophthalmology and Strabismus in 2017 Bacal, Rutar, Adamopoulou, Reznick, Herlihy, Motley, Capo, McCourt, Zein, Rotberg, Gianfermi	Broadway Ballroom East E
	Abusive Head Trauma: Primer and Mock Trial Binenbaum, Levin, Rubin, Forbes, Bishop	Broadway Ballroom East A-D
	Lessons Learned about Cataract Surgery from the Infant Aphakia Treatment Study Lambert, Traboulsi, Plager, Morrison, Freedman, Bothun, Drews-Botsch	Broadway Ballroom West F
	Corneal Collagen Crosslinking in Kids Lenhart, Stahl, Ali	Broadway Ballroom West G-K
3:45 PM - 4:15 PM	Poster Set Up (Second Set of Hard Board Posters)	Broadway West Foyer
4:00 PM - 4:30 PM	Pre-Symposium Refreshments	Broadway East Foyer
4:30 PM - 6:00 PM	Symposium: A Wandering Eye: Peripatetic Adventures of an Ophthalmic Epidemiologist - See Workshop Tab Section for Details  Alfred Sommer, MD, MHS	Broadway Ballroom East E
6:30 PM - 7:30 PM	Young Ophthalmologists, Senior Ophthalmologists and New Members Reception	Music Row #5

Wednesday, April 5, 2017

6:30 AM - 5:00 PM	Registration	Broadway West Foyer
6:30 AM - 8:00 AM	Poster Viewing (Second Set of Posters & All E-Posters) 	Broadway West Foyer
6:30 AM - 8:00 AM	Breakfast (Until 8:30 for Runners)	Legends Ballroom
6:30 AM	Seventh Annual AAPOS Run /Walk	Hotel Lobby
8:00 AM - 2:00 PM	Practice Management Workshop - Administrators Program	Cumberland #1 and #2
8:00 AM - 9:55 AM	Moderators: Stephen P. Christiansen, MD & Robert S. Gold, MD	Broadway Ballroom West
8:00 AM - 8:28 AM	Apt Lecture	Broadway Ballroom West
8:00 AM - 8:05 AM	Introduction of the Apt Lecturer Sherwin J. Isenberg, MD	
8:05 AM - 8:25 AM	Apt Lecture  Paper #19 Zika Virus: A New Kid on the Block of Ophthalmic Teratogens Marilyn T. Miller, MD	
8:25 AM - 8:28 AM	Presentation Ceremony Daniel J. Karr, MD	

8:30 AM - 9:20 AM	Scientific Session  Retina - Optic Nerve	Broadway Ballroom West
8:30 AM - 8:37 AM Paper #20	Evaluation of a Telemedicine Program for Pediatric Diabetic Retinopathy Sasha Strul, MD Sean Donahue, MD, PhD; Karishma Datye, MD; Willsim Russell, MD	
8:37 AM - 8:44 AM Paper #21	Accuracy of Ultrasonography, Fundus Photography, Autofluorescence (AF), Fluorescein Angiography (FA), and Optical Coherence Tomography (OCT) in Differentiating Pseudopapilledema from True Optic Disk Edema (ODE) in Children Melinda Chang Federico Velez; Joseph Demer; Laura Bonelli; Peter Quiros; Anthony Arnold; Alfredo Sadun; Stacy Pineles	
8:44 AM - 8:48 AM	DISCUSSION OF PREVIOUS PAPER Mays A. El-Dairi, MD	
8:48 AM - 8:55 AM Paper #22	Fundoscopic Examination and SD-OCT in Detecting Sickle Cell Retinopathy Among Pediatric Patients Jing Jin, MD, PhD Robin Miller, MD; Sharon Lehman, MD; Jonathan Salvin, MD; Dorothy Hendricks, MD; Amanda Friess, OD; Lauren Libfraind	
8:55 AM - 9:02 AM Paper #23	Is the Use of Systemic Immunosuppression in Juvenile Idiopathic Arthritis (JIA)-Related and Idiopathic Uveitis Associated with Fewer Ophthalmic Surgeries? Crystal S. Cheung Kamiar Mireskandari; Asim Ali; Earl Silverman; Nasrin N. Tehrani	
9:02 AM - 9:09 AM Paper #24	Incidence of Occult Retinal Vasculitis Revealed on Fluorescein Angiography in Clinically Quiescent Pediatric Posterior Uveitis Ashley Abraham, MD Ujwala S. Saboo, MD; Cristiana Ronconi, MD; Bruna L. Ducca, MD; Araceli T. Lawand, MD; Jennifer H. Cao, MD	
9:09 AM - 9:16 AM Paper #25	Intra-Arterial Chemotherapy versus Intravenous Chemotherapy for Unilateral Retinoblastoma. Who Wins? Carol L. Shields, MD Rodrigo Gorge, MD, PhD; Emil A. Say, MD; Ann M. Leahey, MD; Pascal Jabbour, MD; Jerry A. Shields, MD	
9:16 AM - 9:20 AM	DISCUSSION OF PREVIOUS PAPER Anthony Daniels, MD	
9:20 AM - 9:55 AM	Scientific Session  Oculoplastics	Broadway Ballroom West
9:20 AM - 9:27 AM Paper #26	Ocular Melanocytoma in Children. Analysis of 25 Cases Jerry A. Shields, MD Carol L. Shields, MD, PhD	
9:27 AM - 9:34 AM Paper #27	Telecanthus and Ptosis Repair for Blepharophimosis Syndrome in Children: Staging and Timing Lama Khatib, MD Karen Revere, MD; William R. Katowitz, MD, MSCE; James A. Katowitz, MD	
9:34 AM - 9:41 AM Paper #28	Rate of Resolution in Congenital Nasolacrimal Duct Obstruction Saraniya Sathiamoorthi Ryan Frank; Brian G. Mohney	
9:41 AM - 9:55 AM	PANEL DISCUSSION All Presenters	

9:55 AM - 10:55 AM	Interactive Poster Session - Author Presentation and Q/A  Second Set of Posters (25-48) See Hard Board Poster Tab Section for Complete List of Posters Authors Present: Odd Numbered Posters from 9:55 - 10:30 AM Even Numbered Posters from 10:25 - 10:55 AM	Broadway West Foyer
9:55 AM - 10:55 AM	Electronic Poster Viewing - Author Presentation and Q/A  Second Set of Electronic Posters (37-72) See Electronic Poster Tab Section for Complete List of Electronic Posters Authors Present: 37-48 from 10:00 - 10:15 AM; 49-60 from 10:20 - 10:35 AM; 61-72 from 10:40 - 10:55 AM	Broadway West Foyer
11:00 AM - 1:00 PM	Moderators: Sean P. Donahue, MD, PhD & Derek T. Sprunger, MD	Broadway Ballroom West
11:00 AM - 11:25 AM	Updates	Broadway Ballroom West
11:00 AM - 11:04 AM	J AAPOS Update William V. Good, MD	
11:04 AM - 11:08 AM	MOC Update Julia L. Stevens, MD	
11:08 AM - 11:12 AM	ESA Update John J. Sloper, FRCOphth	
11:12 AM - 11:16 AM	American Academy of Pediatrics Update Daniel J. Karr, MD	
11:16 AM - 11:20 AM	Surgical Scope Fund Update Kenneth P. Cheng, MD	
11:20 AM - 11:23 AM	IPOSC Update Frank J. Martin, MD	
11:23 AM - 11:25 AM	International Meetings Update Derek T. Sprunger, MD	
11:25 AM - 12:04 PM	Scientific Session  Strabismus - Strabismus Surgery	Broadway Ballroom West
11:25 AM - 11:32 AM Paper #29	Evaluation of High Definition Video Glasses for Telemedicine Strabismus Consultations Tiffany C. Ho, MD Talia Kolin, MD; Mark Borchert, MD; Carly Stewart, MHA; Kathleen McGovern, MS; Thomas C. Lee, MD; Sudha Nallasamy, MD	
11:32 AM - 11:39 AM Paper #30	Are We Underestimating Superior Oblique Involvement in Restrictive Strabismus from Thyroid Eye Disease (TED)? Lana del Porto, MBBS (Hons), FRANZCO Anne-Marie Hinds, MBBS, FRCOphth; Naz Raoof, BMBCh, FRCOphth; Christen Barras, MBBS (Hons), PhD, FRANZCR; Indran Davagnanam, MBBCh, BAO, BMedSci, FRCR; Gillian G. Adams, FRCS(Ed), FRCOphth	
11:39 AM - 11:43 AM	DISCUSSION OF PREVIOUS PAPER Scott A. Larson, MD	
11:43 AM - 11:50 AM Paper #31	Securing Extraocular Muscles in Strabismus Surgery: A Laboratory Analysis of Biomechanical Parameters Steven Brooks	
11:50 AM - 11:57 AM Paper #32	One- vs Two-Muscle Surgery for Unilateral Fourth Nerve Palsy David L. Nash David A. Leske; Erick D. Bothun; Brian G. Mohney; Michael C. Brodsky; Jonathan M. Holmes	

	11:57 AM - 12:04 PM Paper #33	Adjustable Bilateral Superior Oblique Advancements for Bilateral Fourth Nerve Palsy Bashar M. Bata, MD Jonathan M. Holmes, BM, BCh	
12:04 PM - 1:00 PM	Scientific Session  Retinopathy of Prematurity		Broadway Ballroom West
	12:04 PM - 12:11 PM Paper #34	A Prediction Model for Retinopathy of Prematurity: Primary Results from the Postnatal Growth and ROP (G-ROP) Study Gil Binenbaum James Shaffer; Lauren Tomlinson; Gui-shuang Ying	
	12:11 PM - 12:18 PM Paper #35	Retinopathy of Prematurity Twin Concordance in the G-ROP Study Lauren A. Tomlinson Gui-shuang Ying; Gil Binenbaum	
	12:18 PM - 12:25 PM Paper #36	Phase 1 Dose-Finding Study of Bevacizumab for Retinopathy of Prematurity David K. Wallace, MD, MPH Raymond T. Kraker, MSPH; Sharon F. Freedman, MD; Eric R. Crouch, MD; Amy K. Hutchinson, MD; Amit R. Bhatt, MD; Michael B. Yang, MD; David L. Rogers, MD; Kathryn M. Haider, MD; R. Michael Siatkowski, MD; Deborah K. VanderVeen, MD; Trevano W. Dean, MPH; Roy W. Beck, MD, PhD; Mike X. Repka, MD, MBA; Lois Smith, MD, PhD; Willaim V. Good, MD; Jonathan M. Holmes, BM, BCh; Lingkun Kong, MD; Mary Elizabeth Hartnett, MD	
	12:25 PM - 12:32 PM Paper #37	Treatment of Retinopathy of Prematurity in Infants Weighing Less Than 500 Grams at Birth Anne M. Floyd, MD, MS Eugenia White, BA; Alan B. Richards, MD; Graham E. Quinn, MD	
	12:32 PM - 12:39 PM Paper #38	Plus Disease in ROP: Why Do Experts Disagree, and How Can We Improve Diagnosis? John P. Campbell Jayashree Kalpathy-Cramer; Deniz Erdogmus; Susan Ostmo; Ryan Swan; Kemal Sonmez; RV Paul Chan; Michael F. Chiang	
	12:39 PM - 12:46 PM Paper #39	Treatment of Retinopathy of Prematurity after Hospital Discharge Anne K. Jensen Gui-shuang Ying; Lauren A. Tomlinson; Gil Binenbaum	
	12:46 PM - 1:00 PM	PANEL DISCUSSION All Presenters	
2:00 PM - 3:15 PM	SEC Contracting and Benchmarking Workshop: Developing Contracts and Safety Nets for Retinopathy of Prematurity Care (SEC Administrators Program & AAPOS attendees)  Bohra, Robbins, Gold, Sands-Braverman, Chamblee, Bartiss, Wiggins See Workshop Tab Section for Details		Broadway Ballroom West
3:15 PM - 4:15 PM	Interactive Poster Session - Review and Commentary from the Program Committee (Second Set of Hard Board Posters)  Scott E. Olitsky, MD & Tina Rutar, MD		Broadway West Foyer
3:30 PM - 5:30 PM	Coding: A Day in the Life of the Pediatric Ophthalmologist 2017  (Separate Registration - Additional Fee for non-administrators/managers) Vicchilli, Bartiss, Dunn, Gold See Workshop Tab Section for Details		Broadway Ballroom West
7:00 PM - 10:00 PM	Closing Reception		Broadway Ballroom West

Thursday, April 6, 2017

6:30 AM - 12:00 PM	Registration	Broadway West Foyer
6:30 AM - 8:00 AM	Poster Viewing (Second Set of Posters & All E-Posters) 	Broadway West Foyer
6:30 AM - 8:00 AM	Breakfast	Legends Ballroom
7:00 AM - 11:45 AM	Scientific Session Moderator: Sean P. Donahue, MD, PhD	Broadway Ballroom West
7:00 AM - 8:00 AM	Heads Up! Concussion: Current Trends in Diagnosis and Management Benegas, Solomon, Sills, Wethe, Schall	
8:10 AM - 8:20 AM	Young Investigator Award Presentation	Broadway Ballroom West
8:10 AM - 8:11 AM	Introduction of the Young Investigator Award Winner Graham E. Quinn, MD	
8:11 AM - 8:19 AM	Young Investigator Award Presentation  Paper #40 Big Data on a Small Scale for Pediatric Ophthalmology Research Gil Binenbaum, MD, MSCE	
8:19 AM - 8:20 AM	Presentation Ceremony Graham E. Quinn, MD	
8:25 AM - 9:25 AM	Video Demonstrations of Signs, Diseases, and Complex Surgical Procedures in Pediatric Ophthalmology and Strabismus  Freedman, Bothun, El-Dairi, Farzavandi, Gomez de Liano, Morrison See Workshop Tab Section for Details	Broadway Ballroom West
9:35 AM - 10:35 AM	Difficult Non-Strabismus Problems in Pediatric Ophthalmology  Traboulsi, Freedman, Ghasia, Khan, Utz See Workshop Tab Section for Details	Broadway Ballroom West
10:45 AM - 11:45 AM	Difficult Problems Strabismus  Dagi, Kekunnaya, Kowal, Molinari, Morad, Pineles See Workshop Tab Section for Details	Broadway Ballroom West
11:45 AM	End of 2017 Meeting	
11:45 AM - 12:00 PM	Poster Removal (Second Set of Hard Board Posters)	Broadway West Foyer

 Indicates CME designated activities

Notes

**Why Strabismus Surgery Works:
The Legend of the Dose-Response Curve**
Steven M. Archer, M.D., University of Michigan

Paper 1
Monday
8:20 - 8:45 am

Introduction: Understanding the dose-response relationship has historically been regarded as an important approach to improve the success of strabismus surgery. Paradoxically, studies generally confirm the initial dose-response curve assumption, even when each author's assumption is different.

Purpose: To explore the role of pre-operative deviation as an independent predictor of the response to strabismus surgery and how this makes any dose-response assumption, to some extent, a self-fulfilling prophecy.

Methods: Strabismus surgery dose-response data from a variety of sources is analyzed using multivariate regression techniques that include both the pre-operative deviation and the surgical dose as predictors. The p values and partial correlations from these regressions are used to investigate the relative contribution of each factor.

Results: In spite of the confounding effect of strong covariance, these analyses consistently show that the pre-operative deviation is statistically a better predictor of the response to surgery than the amount of surgery. In two historical data sets where one factor is constant and the effect the other can be analyzed in isolation, the pre-operative deviation alone accounts for 78% and the amount of surgery alone accounts for 46% of the surgical response.

Discussion: The importance of pre-operative deviation as an independent predictor implies a biologic response to strabismus surgery that tends to produce more change in alignment when the deviation is large and less when it is small. While the amount of surgery is also, to some extent, an independent predictor, much of its apparent relationship to the surgical outcome in many studies may simply be secondary to its being a function of the pre-operative deviation. Because of its lesser role as an independent predictor, precise titration of the amount of surgery by meticulous measurement of the pre-operative deviation, refinement of the dose-response curve or adjustable sutures may be less important to the surgical outcome than generally believed.

Surgical Outcomes Following Rectus Muscle Plication versus Resection Combined with Antagonist Muscle Recession for Basic Horizontal Strabismus

Pamela A. Huston, CO; Darren L. Hoover, MD
Everett and Hurite Ophthalmic Association, Pittsburgh, PA

Paper 2
Monday
8:50 - 8:57 am

Introduction: To evaluate change in ocular alignment and surgical success of rectus muscle plication versus resection when coupled with antagonist muscle recession for basic esodeviations and exodeviations.

Methods: Retrospective review of all patients with basic horizontal strabismus who underwent a rectus muscle plication or resection combined with a known amount of antagonist muscle recession from January 2009-June 2016 by one surgeon. We assessed changes in ocular alignment and surgical success at 4 to 16 weeks after surgery, and reoperation rates for plication compared to resection. Success was defined as distance ocular alignment of 10 PD or less of undercorrection and 4 PD or less of overcorrection.

Results: We identified 162 patients with basic esotropia (88 Lateral Rectus plications, 74 LR resections) and 60 patients with basic exotropia (31 Medial Rectus plications, 29 MR resections). At 4 to 16 weeks after surgery, changes in ocular alignment were similar for the plication and the resection groups for both esotropia and exotropia when coupled with comparable amounts of antagonist muscle recession. Success rates at 4 to 16 weeks after surgery were 95.5% for LR plication, 89.2% for LR resection, 77.4% for MR plication, and 96.6% for MR resection. Reoperation rates were low for all groups (range 3.2-5.4%).

Discussion: See Results

Conclusion: Rectus muscle plication produced similar changes in ocular alignment and surgical success compared to rectus muscle resection at 4 to 16 weeks after surgery when coupled with comparable amounts of antagonist muscle recession for basic horizontal strabismus.

References: 1. 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. 2. Wright KW, Lanier AB. Effect of a modified rectus tuck on anterior segment circulation in monkeys. *J Pediatr Ophthalmol Strabismus.* 1991;28(2):77-81. 3. Oltra EZ, Pineles SL, Demer JL, Quan AV, Velez FG. The effect of rectus muscle recession, resection, and plication on anterior segment circulation in humans. *Br J Ophthalmol.* 2015;99(4):556-560.

Paper 3
Monday
8:57 - 9:04 am

Results of Horizontal Muscle Plication Compared to Muscle Resection

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Derek T. Sprunger, MD

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Indianapolis, Indiana

Introduction: Muscle strengthening by resection is a commonly employed technique in the surgical correction of strabismus. Plication is less commonly utilized but has been proposed as a less invasive and reversible alternative. This retrospective study examines the effectiveness over time of muscle plication compared to muscle resection in correction of horizontal deviations in strabismus patients.

Methods: Comparison of preoperative and postoperative measurements of 42 plication and 62 resection patients with strabismus who underwent muscle revision surgery of one or two horizontal muscles from January 1, 2014 to Sept 5, 2016. The plication and resection patients were seen at the initial postoperative visit and followed for a mean of 140.2 and 244.9 days, respectively.

Results: The plication and resection groups had a mean preoperative horizontal deviation at distance/near of 28.6PD/29.94PD and 30.1PD/30.3PD. The initial success rate of plication was 74% compared to 73% for resection. At the most recent postoperative visit, the success rate for plication was 80% compared to 68% for resection.

Discussion: The results suggest that plication is effective in the short and long term correction of strabismus. Benefits of preserved anterior segment circulation and decreased tissue trauma have been demonstrated in previous studies. To date, this is the largest scale comparison of the two techniques.

Conclusion: The results of eye muscle plication and resection are comparable and plication technique can be successfully used to correct similar amounts of deviation for which horizontal muscle resection is commonly used.

References: 1. 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. doi:10.1001/jamaophthalmol.2013.8188. 2. Oltra, E. Z., Pineles, S. L., Demer, J. L., Quan, A. V., & Velez, F. G. (2015). The effect of rectus muscle recession, resection and plication on anterior segment circulation in humans. *British Journal of Ophthalmology*, 99(4), 556-560. 3. Mojon, D. S. (2009). A modified technique for rectus muscle plication in minimally invasive strabismus surgery. *Ophthalmologica*, 224(4), 236-242.

Paper 4
Monday
9:04 - 9:11 am

Wright Central Plication of Lateral Rectus versus Standard Medial Rectus Recession in Adult Divergence Insufficiency Esotropia

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Introduction: Wright central plication is a new minimally invasive tightening procedure. We compare outcomes of lateral rectus central plication (LRCP) to standard medial rectus recession (MRR) in the treatment of diplopia associated with adult divergence insufficiency esotropia (ADIE).

Methods: Retrospective review on 30 consecutive patients with diagnosis of ADIE, who underwent either LRCP or MRR between 2010 and 2015. Inclusion criteria: \geq 45 years old, LRCP or MRR surgery, esotropia (ET) at least 10 prism diopters (PD, \wedge) greater for distance than near, subjective diplopia at distance, fusion at near fixation, follow up of at least 6 months. Primary outcome was elimination of diplopia and secondary outcome was postoperative deviation $<$ 5 PD.

Results: 28 patients met inclusion criteria (15 female, 13 male): 15 had LR central plication and 13 MR recession. Primary outcome of no diplopia was not significantly different with the LRCP group 93.34 % versus MRR group 92.31%. ($P >$ 0.01). The secondary outcome of a deviation $<$ 5 PD was better in the LRCP group (15/15) than the MRR group (11/13) ($P <$ 0.001). One patient in LRCP group had an early overcorrection but was corrected by in-office suture lysis.

Discussion: Both procedures had excellent primary outcomes eliminating diplopia in over 90% of cases. The LRCP group had statistically better secondary outcome of alignment less than 5 PD.

Conclusion: The Wright lateral rectus central plication has the advantage over the MRR because it is minimally invasive, semi-reversible, vessel sparing, and can be done with topical anesthesia important in this elderly population.

References: 1. Mittelman D. Age-related distance esotropia. *J AAPOS* 2006; 10:212-213. 2. Leenheer RS, Wright KW. Mini-plication to treat small-angle strabismus: a minimally invasive procedure. *J AAPOS*. 2012;16(4):327-30. 3. Breidenstein BG, Robbins SL, Granet DB, Acera EC. Comparison of the Efficacy of Medial Rectus Recession and Lateral Rectus Resection for Treatment of Divergence Insufficiency. *J Pediatr Ophthalmol Strabismus*. 2015;52(3):173-6

A Randomized Trial Comparing Bilateral Lateral Rectus Recession versus Unilateral Recess-Resect for Basic Type Intermittent Exotropia

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David K. Wallace, MD, MPH⁴; Raymond T. Kraker, MSPH²; Aaron M. Miller, MD⁵;
Evelyn A. Paysse, MD⁶; David B. Petersen, MD⁷; Brian W. Arthur, MD⁸; on behalf of the
Pediatric Eye Disease Investigator Group (PEDIG)

¹Vanderbilt Eye Center, Nashville, TN, ²Jaeb Center for Health Research, Tampa, FL, ³Mayo Clinic, Rochester, MN, ⁴Duke Eye Center, Durham, NC, ⁵Houston Eye Associates, The Woodlands, TX, ⁶Texas Children's Hospital, Houston, TX, ⁷Rocky Mountain Eye Care Associates, Salt Lake City, UT, ⁸Children's Eye Research Center, Kingston, ON

Paper 5
Monday
9:11 - 9:18 am

Introduction: There is no consensus on the preferred surgical treatment for intermittent exotropia (IXT) in children. **Methods:** 197 children, age 3-<11 years, with basic type IXT, largest deviation by Prism and Alternate Cover Test at any distance 15-40Δ, and near stereoacuity of at least 400 arc-seconds, were randomized to bilateral lateral rectus recession (BLRc) or unilateral recess-resect (R/R). The primary outcome measure was the proportion of subjects with "suboptimal surgical outcome," defined as: exotropia ≥10Δ at distance or near using Simultaneous Prism and Cover Test (SPCT), constant esotropia ≥6Δ at distance or near using SPCT, or loss of ≥2 octaves (≥0.6 logarc-seconds) stereoacuity from baseline, at ANY of the masked examinations performed every 6 months between 6 months and 3 years. Reoperation was allowed, at investigator discretion, only after meeting suboptimal surgical outcome criteria; reoperation without meeting criteria was counted as a suboptimal surgical outcome for analysis.

Results: The cumulative probability of suboptimal surgical outcome occurring at ANY masked examination up to and including 3 years after surgery was 45.9% (43 of 101) in the BLRc group compared with 37.3% (33 of 96) in the R/R group (treatment group difference = 8.6%; 95% CI = -5.8% to 23.0%). Surgeons elected to reoperate by 3 years in 9 (9.8%) subjects in the BLRc group (8 met suboptimal surgical outcome criteria; 1 did not), and in 4 (4.6%) subjects in the R/R group (3 met suboptimal surgical outcome criteria; 1 did not) (treatment group difference = 5.2%; 95% CI = -2.3% to 12.7%). Among subjects who completed a full 3 years of follow up, 29.1% (25 of 86) in the BLRc group, and 16.9% (13 of 77) in the R/R group underwent reoperation or met suboptimal surgical outcome criteria at the 3 year visit (treatment group difference = 12.8%; 95% CI = -2.8% to 28.0%); this lower rate is primarily because several subjects in each group with suboptimal outcomes at earlier visits did not meet these criteria at 3 years.

Discussion: We did not find a statistically significant difference in suboptimal surgical outcomes by 3 years between children treated with BLRc compared with R/R; both treatment groups had a relatively high proportion with such outcomes although few patients underwent reoperation.

Conclusion: Given that there does not appear to be a clear advantage to either R/R or BLRc within the first 3 postoperative years, both techniques are reasonable surgical approaches.

Treatment of Intermittent Exotropia of the Convergence Insufficiency Type with Bupivacaine 0.75%: 5 Year Experience and Outcomes

Matthew Josephson, MD; Stephen A. Mathias, MD, MPH
Danbury Eye Physicians & Surgeons, PC
Danbury, Connecticut

Paper 6
Monday
9:22 - 9:29 am

Introduction: Bupivacaine has been shown to stimulate ocular muscle growth after injection into ocular muscles. Bupivacaine 0.75% has been utilized in the treatment of strabismus to alter ocular alignment by strengthening an ocular muscle. This study is designed to compare 5 year outcomes after bupivacaine injection with traditional surgery as reported in the literature.

Methods: A retrospective chart review of all bupivacaine treated strabismus patients with symptomatic intermittent exotropia of the convergence insufficiency type from 2009 through 2016.

Results: At a 5 year outcome, success rate was 90%. Success was measured as resolution of symptoms. Outcome was the same at 2 months vs 5 years unless a new secondary problem occurred (TAED, CVA, CN palsy, CVA). In older patients, a significant number (10%) of patients developed a second acquired form of strabismus. There were no significant complications and minimal secondary esotropia after injection.

Discussion: Treatment of convergence insufficiency with bupivacaine (90%) has a higher rate of success than traditional resection (85%). There appears to be a predictable dose response curve. Older patients need to be informed of the incidence of secondary strabismus causing recurrence of symptoms.

Conclusion: At 5 years outcome, bupivacaine 0.75% offers a simple alternative therapy for intermittent exotropia of the convergence insufficiency type strabismus patients with little risk and less expense than traditional resection surgery without the overcorrections.

References: 1. Scott AB, Miller JM, Shieh KR. Treating strabismus by injecting the agonist muscle with bupivacaine and the antagonist with botulinum toxin. *Trans Am Ophthalmol Soc.* 2009 Dec;107:104-9. 2. Miller JM, Scott AB, Danh KK, Strasser D, Sane M. Bupivacaine injection remodels extraocular muscles and corrects comitant strabismus. *Ophthalmology.* 2013 Dec;120(12):2733-40. 3. Josephson, ME, Mathias, SA. "Bupivacaine treatment of intermittent exotropia of the convergence insufficiency type" *Journal of American Association for Pediatric Ophthalmology and Strabismus* 2011 Feb;15(1):e4.

Paper 7
Monday
9:29 - 9:36 am

Inferior Rectus and Superior Rectus Displacement in Heavy Eye Syndrome (HES) and Saggy Eye Syndrome (SES)

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Introduction: Connective tissue may play a role in eye movements with abnormalities resulting in strabismus.^{1,2} This study was performed to characterize the displacement of the IR and SR on the nasal-temporal axis in myopic (HES) and aging (SES) forms of esotropia.

Methods: The first MRI image anterior to scleral-optic nerve junction where extraocular muscles were clearly defined on coronal fat suppressed sequences of subjects and controls were analyzed by 3 examiners. The right eye of each participant was used in the study

Results: Twenty-six patients, 16 with SES and 8 with high myopia along with 24 age matched controls were retrospectively reviewed. The SR of patients with HES and SES was more nasally displaced from the midline compared to age matched controls ($p=0.04$, $p=0.03$, respectively). The IR of patients with HES but not with SES was more nasally displaced from the midline compared to age matched controls ($p=0.04$, $p=0.62$, respectively).

Discussion: A shift in the IR would be additive to the changes previously described for the SR. It would also have implications, when present, for surgical repair.

Conclusion: There is significant nasal displacement of the SR in HES and SES and IR in HES. The observed IR displacement is a new finding and may explain why the deviation in HES is generally greater and more difficult to correct and why surgical intervention may have varying results.

References: 1) Demer JL. Pivotal role of orbital connective tissues in binocular alignment and strabismus: the Friedenwald lecture. Invest Ophthalmol Vis Sci. 2004;45:729-38; 8. 2) Kono R, Poukens V, Demer JL. Quantitative analysis of the structure of the human extraocular muscle pulley system. Invest Ophthalmol Vis Sci. 2002;43:2923-32. 3) Chaudhuri Z, Demer JL. Sagging eye syndrome: connective tissue involution as a cause of horizontal and vertical strabismus in older patients. JAMA Ophthalmol. 2013;131:619-25.

Paper 8
Monday
9:36 - 9:43 am

Combination of Anterior Segment Optical Coherence Tomography Modalities to Improve Accuracy of Rectus Muscle Insertion Location

Carla J. Osigian, MD; Michael J. Venincasa; Julia D. Rossetto, MD;
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Bascom Palmer Eye Institute, Miami, Florida

Introduction: A reliable test to identify the extraocular muscle (EOM) insertion location is valuable when planning strabismus surgery. We aimed to determine if combining different anterior segment optical coherence tomography (AS-OCT) modalities to locate the muscle insertion improved the accuracy of measurements.

Methods: Masked retrospective evaluation of AS-OCT images of EOM insertions was performed. The muscle insertion location was determined using the standard grayscale modality alone and then in conjunction with the color modality. The measurements were compared to intraoperative measurements. Measurements within 1 mm were considered accurate.

Results: A total of 139 AS-OCT images were reviewed, including 60 medial (19 reoperations), 61 lateral (11 reoperations), 10 superior and 8 inferior rectus muscles. The difference between the image AS-OCT and the intraoperative measurement was <1 mm in 77% of muscles using grayscale alone, and increased to 87% ($p=0.03$) with both modalities. In primary surgeries, 83% of measurements were <1 mm with grayscale, which significantly increased to 94% using both modalities ($p=0.01$). Although not statistically significant in re-operations, using both modalities improved the number of measurements within 1 mm from 53% to 60% ($p=0.60$).

Discussion: This is the first study that evaluates the AS-OCT color modality in the identification of rectus muscle insertions.(1-3) Using the grayscale and color modalities together improves the accuracy of the insertion location in muscles with or without prior surgery.

Conclusion: The combination of AS-OCT grayscale and color modalities may be clinically useful when assessing muscle insertions pre-operatively, particularly when planning strabismus surgery in re-operations.

References: 1. De-Pablo-Gomez-de-Liano L, Fernandez-Vigo JI, Ventura-Abreu N, Morales-Fernandez L, Fernandez-Perez C, Garcia-Feijoo J, Gomez-de-Liano R: Spectral domain optical coherence tomography to assess the insertion of extraocular rectus muscles. Journal of AAPOS : the official publication of the American Association for Pediatric Ophthalmology and Strabismus / American Association for Pediatric Ophthalmology and Strabismus 2016, 20(3):201-205. 2. de-Pablo-Gomez-de-Liano L, Fernandez-Vigo JI, Ventura-Abreu N, Morales-Fernandez L, Garcia-Feijoo J, Gomez-de-Liano R: Agreement between intraoperative measurements and optical coherence tomography of the limbus-insertion distance of the extraocular muscles. Archivos de la Sociedad Espanola de Oftalmologia 2016. 3. Pihlblad MS, Erenler F, Sharma A, Manchandia A, Reynolds JD: Anterior Segment Optical Coherence Tomography of the Horizontal and Vertical Extraocular Muscles With Measurement of the Insertion to Limbus Distance. Journal of pediatric ophthalmology and strabismus 2016, 53(3):141-145.

Contact Lens Adherence to Age of 5 Years in the Infant Aphakia Treatment Study

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Paper 9
Monday
11:20 - 11:27 am

Introduction: While contact lenses (CL) have been used for decades to optically correct children, there has never been a prospective study looking at CL adherence in young children following cataract surgery.

Methods: Fifty-seven of the 114 infants in the Infant Aphakia Treatment Study (IATS) were randomized to CL wear; all were followed until age 5 years. A 48 hour recall telephone interview was completed every 3 months to assess CL adherence starting 2 months after surgery. A traveling examiner assessed visual acuity at age 4.5 years.

Results: A total of 238 telephone interviews were completed. Mean percentage of waking hours spent wearing contact lenses was 84 ± 21 . Although there was some variance in CL adherence at different ages, the differences were not statistically significant. While visual acuity outcomes (20/32 or better, 20/40-20/200, worse than 20/200) were not related to CL adherence ($p=0.08$), there was a trend for better adherence with better visual outcomes. There was no statistically significant effect of gender, private insurance or age at cataract surgery.

Discussion: Contact lens use in young children is challenging and requires a consistent effort by caregivers. This study confirms that it is possible to achieve a consistently high level of CL adherence over a 5 year period. Surprisingly, CL adherence was not significantly related to visual outcome, suggesting that lack of adherence to prescribed CL use did not limit visual acuity in most of these children.

Conclusion: Excellent CL adherence can be consistently achieved in infants following unilateral cataract surgery to age five years.

References: 1. Lambert SR, Buckley EG, Drews-Botsch C et al. The infant aphakia treatment study: design and clinical measures at enrollment. *Arch Ophthalmol* 2010;128:21-27. 2. Russell B, DuBois L, Lynn M et al. The infant aphakia treatment study contact lens experience to age of 5 years. Epub ahead of print July 27, 2016. *Eye and Contact Lenses*.

Long-Term Outcomes for Pediatric Patients Undergoing Trans-Scleral Fixation of the Capsular Bag with Intraocular Lens for Ectopia Lentis

Julia M. Byrd; Marielle P. Young; David B. Tate; Alan S. Crandall; Leah A. Owen
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Paper 10
Monday
11:27 - 11:34 am

Introduction: There is no consensus regarding surgical management of ectopia lentis. Trans-scleral fixation techniques in children are controversial and long-term outcomes unclear.

Methods: We conducted a retrospective analysis of pediatric patients with ectopia lentis who underwent trans-scleral fixation of the capsular bag with intraocular lens (IOL) placement using a capsular tension ring (CTR).

Results: We identified 39 patients, 70 eyes, who underwent trans-scleral fixation of the capsular bag with use of single or double eyelet CTR fixated with 9-0 or 10-0 polypropylene or 8-0 Gore-Tex from 2006-2016. The mean age at time of surgery was 6.9 years (2-18) and mean follow-up was 42.6 months (1-120). BCVA was significantly improved post-operatively ($p<.01$) and 60% saw better than 20/50 at final exam. In the immediate post-operative period one eye developed a hyphema and one eye underwent IOL repositioning at POM3. Long-term complications included posterior capsule opacity in 35 eyes (50%) and uveitis-glaucoma-hyphema syndrome in 2 eyes (2.8%); no other patients developed glaucoma. Three eyes (4%) required IOL repositioning for spontaneous delayed IOL dislocation; 2 sutured with 8-0 Gore-Tex at POM8 and POY3 and 1 sutured with 9-0 polypropylene at POY7.

Discussion: We report the largest cohort of pediatric patients to date undergoing trans-scleral fixation of the capsular bag with IOL. We did not find a high rate of late spontaneous dislocation or other complication. The most common adverse event was posterior capsule opacification.

Conclusion: Trans-scleral fixation of the capsular bag using a CTR offers improved vision and IOL stability in pediatric patients with ectopia lentis.

References: 1. Vasavada V, Vasavada VA, Hoffman RO, Spencer TS, Kumar RV, Crandall AS. Intraoperative performance and postoperative outcomes of endocapsular ring implantation in pediatric eyes. *J Cataract Refract Surg*. 2008 Sep;34(9):1499-508. 2. Kim EJ, Berg JP, Weikert MP, Kong L, Hamill MB, Koch DD, et al. Scleral-fixated capsular tension rings and segments for ectopia lentis in children. *Am J Ophthalmol*. 2014 Nov;158(5):899-904. 3. Buckley EG. Safety of transscleral-sutured intraocular lenses in children. *J AAPOS Off Publ Am Assoc Pediatr Ophthalmol Strabismus Am Assoc Pediatr Ophthalmol Strabismus*. 2008 Oct;12(5):431-9.

Paper 11
Monday
11:38 - 11:45 am

Long-Term Efficacy of Endoscopic Cyclophotocoagulation in the Management of Glaucoma Following Cataract Surgery in Children

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Introduction: Endoscopic cyclophotocoagulation (ECP) has been effective in the management of a variety of difficult pediatric and adult glaucomas. This study reports long-term efficacy and safety of ECP in pediatric glaucoma following cataract surgery (GFCS).

Methods: ECP was performed on 35 eyes of 24 patients under 16 years of age with GFCS. Patients were followed for a minimum of 2 years. Treatment failure was defined as consecutive postoperative intraocular pressures (IOP) of >24 mm Hg, alternative glaucoma procedure following ECP, or occurrence of visually significant complications. Analysis was performed to estimate risk factors for failure.

Results: Success rate was 54% (19 out of 35 eyes). 27 aphakic and 8 pseudophakic eyes were included in this study. Pretreatment IOP averaged 33.9 ± 7.9 mmHg. Average degrees of treatment per procedure was 218° . Final IOP after a mean follow-up period of 7.2 years was 18.9 ± 8.8 mmHg ($p < 0.001$). Patients with single ECP demonstrated significant improvement in visual acuity from baseline to most recent follow up. 62% of eyes received one treatment only. Failure rate was not increased in pseudophakic patients relative to aphakic patients. Estimated risk factors for treatment failure include increased IOP at first measurement following cataract extraction, increased baseline IOP prior to ECP, and increased time between first IOP measurement following cataract extraction and first ECP.

Conclusion: Analysis of longitudinal IOP and visual acuity data demonstrates that ECP remains a successful tool in the treatment of pediatric GFCS and has a low rate of visually significant complications.

References: Carter BC, Plager DA, Neely DE, Sprunger DT, Sondhi N, Roberts GJ. Endoscopic diode laser cyclophotocoagulation in the management of aphakic and pseudophakic glaucoma in children. J AAPOS. 2007 Feb;11(1):34-40.

Paper 12
Monday
11:45 - 11:52 am

3D Reconstruction of UBM Images to Identify Anterior Segment Structures

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Introduction: There is currently no tool available which allows convenient, noninvasive 3D imaging of the eye that can penetrate the iris and visualize structures such as Schlemm's canal and the ciliary body. We present modification of a standard 2D ophthalmic ultrasound to create 3D images of the anterior eye.

Methods: Our device uses a Quantel 50 MHz Ultrasound Biomicroscope (UBM) (Quantel Medical Inc., Bozemen MT) attached to a precision translation stage. The entire device is attached to an arm which allows careful placement over the patient's eye. With software which coordinates the video capture of the UBM and the motion of the probe, we capture several hundred sections along an axis perpendicular to the plane of the UBM. These images are combined and processed to produce a 3D image of the anterior segment.

Results: We have used our device to record 3D images of patient eyes in the operating room. The abundance of data allows easy filtering to remove ultrasound noise and motion of the instrument/patient and images are available in almost real-time.

Discussion: Our 3D images allow visualization of the trabecular meshwork along with structures behind the iris.

Conclusion: 3D images show more detail and provide greater insight into pathologies of the eye structures than can be achieved with 2D ultrasound and is available at a fraction of the cost and complexity of CT or MRI. For providers already using 2D ultrasound, this is a simple, affordable upgrade which promises to improve diagnosis and treatment planning.

References: Kirchhoff A, Stachs O, Guthoff R. Three-dimensional ultrasound findings of the posterior iris region. Graefes Arch Clin Exp Ophthalmol. 2001;239(12):968-71.

Long Term Outcomes of Baerveldt Glaucoma Implant in Management of Glaucoma Associated with Sturge-Weber Syndrome

Bhamy Hariprasad Shenoy, MD, FICO; Cecilia Fenerty, FRCOphth;
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Manchester Royal Eye Hospital, Manchester, United Kingdom

Paper 13
Monday
11:52 - 11:59 am

Introduction: Conventional surgery for SWS-associated glaucoma is associated with increased risk of serious intra and post-operative complications and lower success rates. Glaucoma drainage devices are relatively safe however, long-term outcomes are not well studied. Aim of this study was to assess long-term outcomes of BGI in management of SWS-associated glaucoma in children.

Methods: Retrospective case series of children with SWS-associated glaucoma who underwent BGI with minimum of 2-years post-operative follow-up. Success was defined as intra-ocular pressure (IOP) of <21mmHg without additional procedure and intra/ post-operative complications.

Results: 14 eyes (6 unilateral 4 bilateral) of 10 patients underwent BGI at 100.1±58.63 months of age (range 3.5-182 months). Mean age at diagnosis was 12.5±14.8 months. Mean IOP pre-operatively was 26.07±2.4 mmHg and reduced to 15.4±3.65 mmHg at last follow-up. Mean duration of follow-up was 54.14±18.14 months (range 27-80 months). No. of anti-glaucoma medications reduced from 3.64±0.63 pre-operatively to 1.5±1.3 at last follow-up. Twelve of the 14 eyes had undergone glaucoma procedure (range 1-3) prior to BGI. One eye developed hypotony and underwent stenting of the tube and one eye underwent bleb needling during follow-up. All patient maintained an IOP <21mmHg during the follow-up period and there were no complications intra-operatively or post-operatively.

Discussion: Current study demonstrates the safety profile and efficacy of BGI in managing SWS-associated glaucoma. Current study benefits from being the largest series with longest mean duration of follow-up.

Conclusion: BGI is relatively safe and effective procedure for managing SWS-associated glaucoma in children and may be considered as the primary intervention.

References: 1. Amini H, Razeghinejad MR, Esfandiarpour B. Primary single-plate Molteno tube implantation for management of glaucoma in children with Sturge-Weber syndrome. *Int Ophthalmol.* 2007 ;27(6):345-50. 2. Hamush NG1, Coleman AL, Wilson MR. Ahmed glaucoma valve implant for management of glaucoma in Sturge-Weber syndrome. *Am J Ophthalmol.* 1999;128(6):758-60. 3. Budenz DL, Sakamoto D, Elleizer R, Varma R, Heuer DK. Two-staged Baerveldt glaucoma implant for childhood glaucoma associated with Sturge-Weber syndrome. *Ophthalmology.* 2000;107(11):2105-10.

Excimer Laser Refractive Surgery and Intraocular Lens Implantation Outcomes on Children with Neurological Impairment

Nicholas Faron, BS; James Hoekel, OD; Lawrence Tychsen, MD
St. Louis Children's Hospital at Washington University School of Medicine
St. Louis, Missouri

Paper 14
Monday
11:59 - 12:06 pm

Introduction: Reports of using the excimer laser and phakic intraocular lens (phiOL) to treat myopic & hyperopic refractive errors in children with neurodevelopmental disorders (NDD) have been limited. We analyze outcomes in a large cohort of NDD children who were noncompliant with spectacle or contact lens wear.

Methods: Clinical outcome data (refractive error, visual acuity, binocular fusion) were collected prospectively in children (n=910) with a variety of NDD, e.g. Angelman Syndrome, Asperger Syndrome, Autism, Cerebral Palsy, Down Syndrome, and Epilepsy. The mean age at refractive surgery was 11.3 years (range 3 to 20 years); mean follow-up was 3.6 years (range 1-13 years).

Results: Averaged for all NDD groups treated with the excimer laser, the spherical error of the hyperopic children was corrected from +3.75 ± 0.6 to 0.81 ± 0.4 D. For myopic NDD children, the spherical correction was from -4.78 ± 0.8 to -0.02 ± 0.3 D. Correction in children treated with a phiOL was from -14.38 ± 2.7 to -0.22 ± 0.5 D.

Uncorrected distance visual acuity (UDVA) improved from an average of 0.50 ± 0.13 to 0.29 ± 0.14 logMAR in the hyperopic children, and from an average 0.74 ± 0.1 to 0.27 ± 0.1 logMAR in myopic children. With a phiOL, the UDVA improved from an average 1.4 ± 0.3 to 0.59 ± 0.3 logMAR. In the majority of children UDVA was limited by visuomotor co-morbidities.

Discussion/Conclusion: Excimer laser surgery and phakic intraocular lens implantation are effective means for improving visual function and quality of life in children with NDD who have difficulties wearing spectacles. Visual acuity and refractive error improved substantially.

Paper 15

Monday

12:06 - 12:13 pm

Visual Improvement in Amblyopic Eye Following Radiation-Induced Vision Loss in Dominant Eye with Uveal Melanoma

Aldo Vagge, MD; Bruce M. Schnall, MD; Renelle P. Lim, MD; Jerry A. Shields, MD;
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Wills Eye Hospital, Philadelphia (PA)

Introduction: Visual improvement in amblyopic eyes of adults can occur following visual loss in the dominant eye. The purpose of this study is to determine the frequency and amount of this improvement.

Methods: Retrospective review of adult patients with visual loss following radiotherapy for uveal melanoma with a history of amblyopia in the fellow eye. Best corrected visual acuity (BCVA) of treated and amblyopic eye were examined over time. BCVA improvement was defined as ≥ 2 logMAR lines. The patients were divided into 2 groups dependent on the severity of visual loss in the treated melanoma eye (BCVA melanoma eye $>$ or \leq amblyopic eye).

Results: Twenty-one patients meet the inclusion criteria. Mean age at presentation was 56 years (range 39-73). Fourteen patients had BCVA loss in the melanoma eye to the level of the amblyopic eye or worse. BCVA improved in the amblyopic eye in 8 /14 (57%; 95%CI 29-82%). Mean improvement was 4.5 logMAR lines with all 8 eyes improving to a BCVA of 20/25 or 20/20. BCVA in the melanoma eye was reduced but remained better than that of the amblyopic eye in 7 patients. Two of these 7 (29%; 95%CI 4-71%) amblyopic eyes had BCVA improvement (3 and 6 logMAR lines) achieving a final acuity of 20/200 and 20/100.

Discussion: BCVA of amblyopic eyes can improve in some adults.

Conclusion: Approximately half of amblyopic eyes in adults will have a substantial improvement in visual acuity following significant visual loss in the dominant eye.

References: 1) Karatza EC, Shields CL, Shields JA. Visual improvement in an adult amblyopic eye following radiation-induced visual loss in the contralateral eye. Arch Ophthalmol. 2004 Jan;122(1):126-8

Paper 16

Monday

12:17 - 12:24 pm

Spectral Domain Optical Coherence Tomography Angiography in Children with Amblyopia

Marcela Lonngi, MD; Federico G. Velez, MD; Irena Tsui, MD; Mansour Rahimi, MD;
Nopasak Phasukkijwatana, MD; Clarissa Chan; Melinda Chang, MD; David Sarraf, MD;
Stacy L. Pineles, MD
Jules Stein Eye Institute, University of California Los Angeles
Los Angeles, California, USA

Introduction: Amblyopic patients have thicker choroid and increased retinal outer segment layer thickness on optical coherence tomography (OCT). There are no studies comparing blood flow in the retinal capillary layers in amblyopic children versus controls using non-invasive OCT-angiography (OCT-A).

Methods: Prospective study of children with amblyopia and normal controls. Parameters studied included macular vessel density (MVD), foveal avascular zone (FAZ) area in the superficial retinal capillary plexus (SCP) and deep retinal capillary plexus (DCP), and foveal thickness. T-tests and a linear regression (LR) to accounting for age and refractive error were utilized.

Results: 11 amblyopes and 46 controls were included. Mean age was 10.1 years (range 5-17). Mean MVD of the SCP was 49.5% for the amblyopes and 51.1% for controls (LR, $p=0.049$). MVD of the DCP was 54.43% and 59.06%, respectively (LR, $p=0.013$). FAZ at the SCP and DCP was 0.26 mm² and 0.35 mm² vs 0.27 mm² and 0.34 mm² in amblyopes and controls, respectively ($p=0.565$ and 0.848). Foveal thickness was similar in the groups ($p=0.787$).

Discussion: OCT-A shows a statistically significant lower retinal vessel density in patients with amblyopia. Unlike previous studies, we did not detect a difference in the in the foveal thickness. The size of the FAZ was also similar between both groups.

Conclusion: Amblyopes display a reduced retinal capillary density on OCTA. The clinical significance of this finding should be explored in future studies. In our population of amblyopes, there was no difference in the FAZ nor foveal thickness compared to controls.

References: 1. Li J, Ji P, Yu M. Meta-analysis of retinal changes in unilateral amblyopia using optical coherence tomography. Eur J Ophthalmol. 2015;25(5):400-409. 2. Nishi T, Ueda T, Hasegawa T, Miyata K, Ogata N. Retinal thickness in children with anisohypermetropic amblyopia. Br J Ophthalmol. 2015;99(8):1060-1064. 3. Guo L, Tao J, Xia F, Yang Z, Ma X, Hua R. In vivo optical imaging of amblyopia: Digital subtraction autofluorescence and split-spectrum amplitudedecorrelation angiography. Lasers Surg Med. 2016;(March):1-8.

Slow Reading in Children with Anisometropic Amblyopia is Associated with Gaze Instability and Increased Saccades

Krista R. Kelly, PhD; Reed M. Jost, MS; Angie De La Cruz, BS; Lori Dao, MD;
Cynthia L. Beauchamp, MD; David Stager, Jr., MD; Eileen E. Birch, PhD
Retina Foundation of the Southwest, Dallas, TX

Paper 17

Monday

12:28 - 12:35 pm

Introduction: Previous studies have reported slow reading in strabismic amblyopia. We recently identified amblyopia, not strabismus, as the key factor in slow reading in children (Kelly et al., 2015). To date, no studies have focused on reading in amblyopic children without strabismus. Here, we assessed whether amblyopic eye visual acuity, stereoacuity, and eye movements were related to slow reading in children with anisometropic amblyopia.

Methods: Reading was assessed in anisometropic children age 7-12 years and age-similar normal controls. Children silently read a grade-appropriate paragraph during binocular viewing while fitted with the ReadAlyzer, an eye movement recording system. Reading rate (words/min) and number of forward and regressive saccades (per 100 words) were recorded. Amblyopic eye best-corrected visual acuity (BCVA), stereoacuity and binocular gaze stability (EyeLink 1000) were also obtained.

Results: Amblyopic anisometropic children read slowly ($n=24$; mean \pm standard deviation= 148 ± 43 words/min) compared with non-amblyopic anisometropic children ($n=13$; 206 ± 79 words/min, $p=0.0007$) and controls ($n=24$; 195 ± 64 words/min, $p=0.009$). Non-amblyopic anisometropic children read at a comparable rate to controls ($p=0.599$). Slow reading in amblyopic anisometropic children was correlated with increased forward saccades ($r=-0.83$, $p<0.001$), increased regressive saccades ($r=-0.80$, $p<0.001$), and fellow eye gaze instability ($r=-0.51$, $p=0.023$). No relationships were found with BCVA ($p=0.52$) or stereoacuity ($p=0.57$).

Discussion: Slow reading in school-age children with anisometropic amblyopia is associated with impaired oculomotor function, including increased frequency of saccades and gaze instability.

Conclusion: Anisometropic amblyopia is associated with slow reading and may hinder academic success. Academic accommodations could alleviate this limitation.

References: Kelly KR, Jost RM, De La Cruz A, Birch EE. Amblyopic children read more slowly than controls under natural, binocular reading conditions. *J AAPOS*; 2015;19(6):515-20.

Visual Function Assessment in Children with Congenital Zika Syndrome

Liana O. Ventura, MD; Luciene C. Fernandes, MD; Camila V. Ventura, MD;
Natalia C. Dias, MD; Isabelle G. Vilar, MD; Adriana L. Gois, MD; Linda Lawrence, MD;
Marilyn T. Miller, MD

Fundacao Altino Ventura, Recife, Pernambuco, Brazil

Introduction: To identify the visual function in children with congenital Zika syndrome (CZS).

Methods: This cross-sectional analytical study investigates the visual function of infants with congenital Zika syndrome. IgM MAC-ELISA for ZIKV was performed in the cerebrospinal fluid. Toxoplasmosis, rubella, cytomegalovirus, syphilis and human immunodeficiency virus were ruled out in all patients.

Eligible subjects, were examined according to Lea grating visual acuity, strabismus, and retina and optic nerve findings. The existence of statistical significance was assessed using the Fisher's exact test, considering a significance level of 10% in the statistical analysis.

Results: Congenital Zika syndrome was diagnosed in 114 infants, age ranging from 6,0 to 13,0 months ($8,47\pm 1,21$ months), 43,9% were male, 69.6% had microcephaly, 66.3% had cerebral calcifications. Abnormal visual acuity found by Lea Grating Test in 92 eyes (40,4%) and strabismus in 84,8% infants. A total of 228 eyes were examined, 65 eyes (28,5%) had retinal findings and 46 eyes (20,2%) had optic nerve findings.

Discussion: Abnormal visual function was seen in the majority of the infants, mainly associated with optic nerve and retinal findings, and occipitofrontal head circumference below the third centile or more than 2 standards deviations below the age and sex were found. Brain abnormalities were the main cause of visual impairment.1 The association of neurological and ocular findings were commom.2

Conclusion: CZS's ocular and neurological findings result in a visual function development impairment, adversely affecting life's quality. This study was designed to promote scientific advancement in the treatment of this syndrome and guidance on various forms of medical intervention.

References: 1. de Fatima VAM, van der Linden V, Brainer-Lima AM, Coeli RR, Rocha MA, Sobral da Silva P, Durce CGCM, van der Linden A, Cesario HA, Valenca MM. Clinical features and neuroimaging (CT and MRI) findings in presumed Zika virus related congenital infection and microcephaly: retrospective case series study. *Epub Apr 13, 2016 BMJ*. 2016 ;353:i1901. 2. Ventura CV, Maia M, Bravo-Filho V, Gois AL, Belfort Jr R. Zika virus in Brazil and macular atrophy in a child with microcephaly. *Epub Jan 8, 2016. Lancet*. 2016 ;387(10015):228.

Paper 18

Monday

12:35 - 12:42 pm

Paper 19
Wednesday
8:05 - 8:25 am

2017 Apt Lecture

Zika Virus: A New Kid on the Block of Ophthalmic Teratogens

Marilyn T. Miller, MD

Introduction: There are a number of viruses such as rubella, toxoplasmosis, and others that are known teratogens (environmental agents that cause a permanent change on the developing fetus). A new addition to the list is the Zika virus that has been proven to cause severe microcephaly, neurologic, limb, ocular and other malformations. Although Zika infections have been described in the 1960s, only since the French Polynesian outbreak in 2013 have the neurologic disorders been reported in the offspring of mothers known to have had the Zika infection or those in which the infection had been suspected. In 2016 Ventura¹ et al noted chorioretinal atrophy and optic nerve malformations in an infant with microcephaly and presumed Zika virus syndrome (CZS). This observation was subsequently described in other infants^{2,3}.

Methods: Literature review and description of a Brazilian cohort of infants with systemic and ophthalmologic findings associated with a maternal history of presumed Zika virus infection.

Discussion: Zika virus is a mosquito borne flavivirus which usually causes mild or unrecognized illness. Although when pregnant women contract the disease very serious malformations may occur in the fetus especially the developing nervous system. Adults may manifest Guillain-Barré syndrome. There are two common strains of the Zika virus, the African and Asian strains. The Polynesian outbreak which spread to northeastern Brazil was caused by the Asian strain. There has been a rapid spread of infection in South America by locally acquired mosquito-borne cases and in other areas by travel-associated transmission. In early November 2016, the CDC reported 3,988 travel associated cases and 139 locally acquired cases in the USA. Most ophthalmologic findings have been reported in association with microcephaly or neurologic findings but further studies will determine as to whether the eye findings could occur in apparent isolation.

Conclusion: The Zika virus is capable of causing severe systemic and ophthalmologic malformations in the developing fetus even when the maternal infection may go unnoticed. In a small percentage of adults neurologic sequelae may also occur.

References: 1. Ventura CV, Maia M, Bravo-Filho V, Gois AL, Belfort Jr R. Zika virus in Brazil and macular atrophy in a child with microcephaly. *Lancet* 2016;387 (10015):228. 2. de Paula Freitas B, de Oliveira Dias JR, Prazeres J. et al. Ocular findings in infants with microcephaly associated with presumed Zika virus congenital infection in Salvador, Brazil. *JAMA Ophthalmol* 2016; 134(5):529-535. 3. Ventura CV, Maia M, Dias N, Ventura LO, Belfort R Jr. Zika neurological and ocular findings in an infant without microcephaly. *Lancet* 2016; 387(10037):2502 determine as to whether the eye findings could occur in apparent isolation.

Paper 20
Wednesday
8:30 - 8:37 am

Evaluation of a Telemedicine Program for Pediatric Diabetic Retinopathy

Sasha Strul, MD; Sean Donahue, MD, PhD; Karishma Datye, MD; William Russell, MD
Vanderbilt University, Nashville, TN

Introduction: Annual screening for pediatric diabetic retinopathy (DR) is recommended by the ADA for type 1 diabetes starting at age 10, once duration of diabetes is over 3-5 years, and starting at diagnosis of type 2. We instituted a telemedicine program for pediatric DR and analyzed epidemiologic and disease factors of screened children.

Methods: Retrospective chart review.

Results: Over 1 year, 494 children meeting ADA criteria for ophthalmic evaluation had non-mydriatic fundus screening in the diabetes clinic in an ongoing program. Prevalence of diabetic retinopathy was 8.3%. The first twenty-nine patients with abnormal results were compared to 35 randomly selected normals. Duration of diabetes (median of 12 and 7 years in the abnormal and normal groups respectively, P=0.003) and age (median of 17 and 16 respectively, P=0.04) were different in univariate analysis (Wilcoxon test). Average A1c, duration of disease, age and sex showed some importance as predictors of an abnormal screening, but none reached statistical significance in a penalized logistic regression model, likely due to limited power.

Discussion: The prevalence of diabetic retinopathy in children screened is substantially higher than that previously reported from retrospective reviews of eye clinic records, likely due to poor compliance of most-at-risk children with formal eye examination. This program has decreased the number of children needing eye exams by 90% compared to ADA recommendations.

Conclusion: Telemedicine is an attractive and cost-effective means of evaluating children at risk for diabetic retinopathy.

References: 1. Lueder, G. and Silverstein, J. Screening for Retinopathy in the Pediatric Patient with Type 1 Diabetes Mellitus. *Pediatrics* 2005; 116:270 2. Diagnosis of retinopathy in children younger than 12 years of age: implications for the diabetic eye screening guidelines in the UK 3. Geloneck, MM. et al. Ocular Complications in Children with Diabetes Mellitus. *Ophthalmology* 2015;122:2457-2464

Accuracy of Ultrasonography, Fundus Photography, Autofluorescence (AF), Fluorescein Angiography (FA), and Optical Coherence Tomography (OCT) in Differentiating Pseudopapilledema from True Optic Disk Edema (ODE) in Children

Paper 21
Wednesday
8:37 - 8:44 am

Melinda Chang; Federico Velez; Joseph Demer; Laura Bonelli; Peter Quiros;
Anthony Arnold; Alfredo Sadun; Stacy Pineles
UCLA Stein Eye Institute-Doheny Eye Institute, Los Angeles, CA

Introduction: Differentiation between pseudopapilledema and true optic disk edema (ODE) in children is challenging because drusen, the most common cause of pseudopapilledema, are often buried and non-calcified at this age. The optimal method for differentiating pseudopapilledema from ODE in children is unknown.

Methods: We prospectively recruited children (5 to 18 years old) diagnosed with pseudopapilledema or ODE. All patients underwent imaging with: b-scan ultrasonography, fundus photography, autofluorescence (AF), fluorescein angiography (FA), optical coherence tomography (OCT) of the retinal nerve fiber layer (RNFL), spectral-domain OCT (SD-OCT) of the optic nerve, and enhanced-depth imaging OCT (EDI-OCT) of the optic nerve. Image interpretations by three masked neuro-ophthalmologists were compared to the clinical diagnosis to compute the sensitivity and specificity of each imaging modality for detecting ODE.

Results: Twenty-one eyes (17 with pseudopapilledema and 4 with ODE) of 11 patients were included. Consistency of image interpretation by intraclass correlation coefficient ranged from -0.21 (ultrasonography) to 0.83 (FA). FA had the highest sensitivity (100%) and specificity (100%) for detection of ODE. Fundus photography had 75% sensitivity and 71% specificity. The other imaging modalities had low sensitivity (0 to 50%) but moderate specificity (75 to 88%).

Discussion: FA was the best imaging modality for differentiating pseudopapilledema from ODE in children. The other imaging techniques, except for fundus photography, had low sensitivity for identifying ODE, due to irregularities in the images suggestive of drusen rather than ODE.

Conclusion: Pseudopapilledema and ODE in children are best differentiated with FA. Other ancillary tests have substantial likelihood of missing ODE.

References: 1. Chang MY, Pineles SL. Optic disk drusen in children. *Surv Ophthalmol*. 2016 Mar 29. Epub ahead of print. 2. Pineles SL, Arnold AC. Fluorescein angiographic identification of optic disc drusen with and without optic disc edema. *J Neuroophthalmol*. 2012 Mar;32(1):17-22.

Fundoscopy Examination and SD-OCT in Detecting Sickle Cell Retinopathy Among Pediatric Patients

Paper 22
Wednesday
8:48 - 8:55 am

Jing Jin, MD, PhD; Robin Miller, MD; Sharon Lehman, MD; Jonathan Salvin, MD;
Dorothy Hendricks, MD; Amanda Friess, OD; Lauren Libfraud
Nemours Alfred I. duPont Hospital for Children
Wilmington, Delaware

Introduction: Sickle retinopathy occurs in up to 50% of individuals with Sickle Cell Disease (SCD), often beginning during childhood, and left untreated can lead to significant visual impairment. We studied retinal changes in children with SCD using both fundoscopic examination and optic coherence tomography (OCT).

Methods: Complete ophthalmologic examination and OCT images of the macula were obtained from both eyes of each patient.

Results: 60 patients age 5-20, 31 male and 29 female with SCD (23 SC, 30 SS, 5 Sβ+ and 2 Sβ0 thalassemia) presented for routine eye examinations. None of the patients had visual complaints, visual acuity range was 20/20 – 20/40. Among the eyes, 16/120 (13.3%) showed signs of retinopathy by fundoscopy, while 73/113 (64.6%) showed inner retina thinning in watershed zone temporal to the fovea in OCT. OCT failed to detect changes in 2 cases with positive fundoscopic findings. One of the 2 had a small hemorrhage along the inferior vascular arcades and another with a pigmented scar outside of the scanned area. 60/73 eyes with OCT diagnosed retinopathy had normal appearing retina.

Discussion: Both methods have strengths and weaknesses. Fundoscopy visualizes peripheral retina where it is not easily imaged by OCT. Some of the visible retinal change may be transient. OCT detects irreversible inner retinal thinning due to ischemia in the absence of visible hemorrhage, sea-fan or black sunburst spots.

Conclusion: The fundoscopic examination and OCT complement each other in diagnosis of sickle cell retinopathy. Compared to fundoscopy, OCT has a much greater detection rate and offers earlier diagnosis.

References: 1. Hoang et al: Central macular splicing and outer retinal thinning in asymptomatic sickle cell patients by spectral domain optical coherence tomography. *Am J Ophthalmol* 2011; 151(6):990-994 2. Mathew et al: Spectral domain optical coherence tomography in patients with sickle cell disease. *Br J Ophthalmol* 2015; 99:96-97 3. Brasileiro et al: Macular and peripapillary spectral domain optical coherence tomography changes in sickle cell retinopathy. *Retina* 2015; 35: 257-263

Paper 23
Wednesday
8:55 - 9:02 am

Is the Use of Systemic Immunosuppression in Juvenile Idiopathic Arthritis (JIA)-Related and Idiopathic Uveitis Associated with Fewer Ophthalmic Surgeries?

Crystal S. Cheung; Kamiar Mireskandari; Asim Ali; Earl Silverman; Nasrin N. Tehrani
Hospital for Sick Children, Toronto, Canada

Introduction: There has been increasing use of systemic immunosuppressants to manage refractory uveitis in recent years. We wished to investigate whether this reduced complications requiring surgery.

Methods: Retrospective chart review at single center from 1988 to 2016. Patients were divided into 3 groups: 1) Methotrexate (Group 1; n=17), 2) Methotrexate and systemic biologic, in which uveitis was diagnosed before 2007 (Group 2; n=16) and after 2007 (Group 3; n=20).

Results: Fifty-three patients were included; eye with worse uveitis was analyzed. The mean age at uveitis diagnosis was 7.9+4.3 years. JIA uveitis comprised 52.8% (28/53) of the cohort. The time interval between uveitis onset and initiating methotrexate was 19.5+6.8 months for Group 1, 15.8+7.5 months for Group 2, and 7.3+3.5 months for Group 3 (p=0.52). The interval between uveitis onset and initiating systemic biologic was 64.5+11.1 months for Group 2 and 17.9+5.3 months for Group 3 (p=0.0014). The average number of ophthalmic surgeries was 0.8+0.32 for Group 1, 1.6+0.5 for Group 2, and 0.3+0.1 for Group 3 (p=0.006). The average duration of administration of topical prednisone >3 times daily was 37.3+12.8 months for Group 1, 63.9+8.2 months for Group 2 and 9.5+1.6 for Group 3 (p<0.001). Uveitis grading at last follow-up was 0.6+0.4 for Group 1, 0.3+0.6 for Group 2 and 0.1+0.3 for Group 3 (p=0.38).

Discussion: Earlier introduction of biologics was associated with fewer ocular surgeries (p=0.006) and reduced dependence on prolonged topical corticosteroids¹ (p<0.001).

Conclusion: Earlier introduction of biologics with methotrexate was associated with fewer ophthalmic surgeries in patients with JIA- and idiopathic uveitis.

References: Thorne JE, Woreta FA, Dunn JP. Risk of cataract development among Children with Juvenile idiopathic arthritis-related uveitis treated with topical corticosteroids. *Ophthalmology* 2010;117:1436-1441.

Paper 24
Wednesday
9:02 - 9:09 am

Incidence of Occult Retinal Vasculitis Revealed on Fluorescein Angiography in Clinically Quiescent Pediatric Posterior Uveitis

Ashley Abraham, MD; Ujwala S. Saboo, MD; Cristiana Ronconi, MD;
Bruna L. Ducca, MD; Araceli T. Lawand, MD; Jennifer H. Cao, MD

University of Texas Southwestern Medical Center, Childrens Medical Center, Dallas, TX

Introduction: The study purpose is to evaluate the utility of fluorescein angiogram (FA) studies in children with apparently quiescent posterior uveitis on clinical examination.

Methods: Retrospective chart review of pediatric patients evaluated in the uveitis clinic between September 2015 and May 2016.

Results: The charts of 42 pediatric patients with non-infectious posterior uveitis were analyzed. Of these, 19 patients(45%) were diagnosed with Pars planitis and 23 patients(54%) with Panuveitis. All(17) patients with apparently quiescent posterior uveitis on clinical examination underwent further evaluation with an FA to assess for occult inflammation. Of those patients determined to be controlled on clinical examination alone, 82% were found to have additional evidence of occult retinal vasculitis on FA.

Discussion: Posterior uveitis accounts for 40% of pediatric uveitis cases with complications from cataract to maculopathy and it remains a serious cause of vision loss in children(1). The blinding nature of this condition necessitates prompt and sufficient medical control of all inflammation. This study suggests that a large percentage(82%) of patients deemed quiescent on clinical examination alone will demonstrate subclinical inflammation on FA requiring augmentation in the patients immunosuppressive therapy to obtain full disease control.

Conclusion: Fluorescein angiography is a critical tool for evaluation of pediatric posterior uveitis. We recommend FA studies on all pediatric patients with posterior uveitis to assess for occult retinal vasculitis that may not be apparent on clinical examination. Failure to adequately control occult retinal vasculitis may be a contributing factor to "recalcitrant" cases, inability to wean off immunosuppressive therapy, and long-term complications leading to poor prognosis.

References: 1 Kump, Leila I., René A. Cervantes-Castañeda, Sofia N. Androudi, and C. Stephen Foster. "Analysis of Pediatric Uveitis Cases at a Tertiary Referral Center." *Ophthalmology* 112.7 (2005): 1287-292.

Intra-Arterial Chemotherapy versus Intravenous Chemotherapy for Unilateral Retinoblastoma. Who Wins?

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Ocular Oncology Service at Wills Eye Hospital, Philadelphia, PA 19107

Paper 25
Wednesday
9:09 - 9:16 am

Introduction: To compare outcomes following intravenous chemotherapy (IVC) versus intra-arterial chemotherapy (IAC) for unilateral retinoblastoma.

Methods: Retrospective comparative interventional case series of patients with unilateral retinoblastoma managed with either IVC using vincristine, etoposide, and carboplatin versus IAC using melphalan and with minimum 1 year follow up. The primary outcome measure was globe salvage.

Results: Of 91 patients with unilateral retinoblastoma, IVC was employed in 42 cases and IAC in 49. By comparison (IVC vs IAC), patients in IAC group showed statistical difference with greater mean tumor diameter (14 vs 18 mm, $p < 0.001$) and thickness (7 vs 10 mm, $p = 0.001$), greater percentage with active vitreous seeds (29% vs 55%, $p = 0.01$), and greater total retinal detachment (10% vs 43%, $p < 0.001$). Regarding outcomes (IVC vs IAC), globe salvage was not significantly different in Groups B, C, or E, but there was significantly improved globe salvage with IAC for Group D (48% vs 91%, $p = 0.004$). Regarding specific tumor outcomes (IVC vs IAC), control was significantly better with IAC for solid tumor (62% vs 92%, $p = 0.002$), subretinal seeds (31% vs 86%, $p = 0.006$), and vitreous seeds (25% vs 74%, $p = 0.006$). There were no patients with pinealoblastoma, second cancer, metastasis, or death in either group.

Discussion: Most cases of unilateral retinoblastoma are either Group D or E, and IAC provides better control than IVC.

Conclusion: For unilateral retinoblastoma, IAC provided significantly superior globe salvage (compared to IVC) for group D eyes. Additionally, IAC provided significantly superior control for solid tumor, subretinal, and vitreous seeds.

References: 1. Shields CL, Lally SE, Leahey AM, Jabbour PM, Caywood EH, Schwendeman R, Shields JA. Targeted retinoblastoma management. When to use intravenous, intra-arterial, periocular, and intravitreal chemotherapy. *Curr Opin Ophthalmol* 2014;25:374-85. 2. Shields CL, Jorge R, Say EAT, Magrath G, Al Set A, Leahey AM, Caywood E, Jabbour P, Shields JA. Unilateral retinoblastoma managed with intravenous chemotherapy versus intra-arterial chemotherapy. Outcomes based on the International Classification of Retinoblastoma. *Asia Pac J Ophthalmol* 2016;5:97-103.

Ocular Melanocytoma in Children. Analysis of 25 Cases

Jerry A. Shields, MD; Carol L. Shields, MD, PhD

Ocular Oncology Service at Wills Eye Hospital, Philadelphia, PA, 19107

Paper 26
Wednesday
9:20 - 9:27 am

Introduction: Ocular melanocytoma is a type of magnocellular nevus that can closely resemble melanoma. It can occur in the uvea or optic disc as a circumscribed pigmented lesion, typically in adults. In this report, we describe the clinical variations and outcomes of this rare tumor in children.

Methods: Retrospective chart review of children (<21 years) with ocular melanocytoma.

Results: The melanocytoma mainly involved iris (n=12) or optic disc (n=13). Of the 12 children with iris melanocytoma, mean age at diagnosis was 12 years, race was Caucasian (n=11), and features included symptoms of spot on iris (n=6), blurred vision (n=1), photophobia (n=1), and findings of a black iris mass with granular surface (n=12) of mean 4 mm diameter ciliary body extension (n=2), oculo(dermal) melanocytosis (n=2), and stromal (n=8) and angle (n=7) seeding. There was no case of secondary glaucoma. Outcomes included tumor enlargement (n=5) by mean 1 mm, vision loss (n=2), and development of melanoma (n=2) at mean 16 months follow up. Of those 13 with optic disc melanocytoma, mean age was 14 years, race was Caucasian (n=8), and features included symptoms of chronic headache (n=2), blurred vision (n=2), photopsia (n=1), and findings of oculo(dermal) melanocytosis (n=5), pigmented optic disc tumor (n=13) of median diameter of 2 mm, and disc edema/pallor (n=5). Outcomes included tumor enlargement (n=2) by mean 0.5 mm, vision loss (n=2) and no case of retinal vascular obstruction or development of melanoma. There was 1 case of iris/optic disc melanocytoma with massive choroidal melanocytoma in a child with ocular melanocytosis.

Discussion: Ocular melanocytoma can be associated with congenital ocular melanocytosis and both can predispose to melanoma even at a young age.

Conclusion: Ocular melanocytoma can occur in the iris, ciliary body, choroid, and optic disc and can lead to vision loss with rare transformation into melanoma.

References: 1. Shields JA, Shields CL. Melanocytoma of the optic disc and posterior uvea. In Shields JA, Shields CL. *Intraocular tumors. An Atlas and textbook* ed 3, Philadelphia, Wolters Kluwer. pp 81-94. 2. Shields JA, Shields CL. Congenital uveal lesions. Ocular melanocytosis. In Shields JA, Shields CL. *Intraocular tumors. An Atlas and textbook* ed 3, Philadelphia, Wolters Kluwer. Pp 6-14.

Paper 27
Wednesday
9:27 - 9:34 am

Telecanthus and Ptosis Repair for Blepharophimosis Syndrome in Children: Staging and Timing

Lama Khatib, MD; Karen Revere, MD; William R. Katowitz, MD, MSCE; James A. Katowitz, MD
The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania

Introduction: The optimal surgical approach in Blepharophimosis-Ptosis-Epicanthus Inversus syndrome (BPES) is unclear. Some prefer combined ptosis and telecanthus surgical repair (trans-nasal wiring/TNW), others stage procedures. We evaluated the outcomes of our BPES approach of early ptosis surgery (PS) and compared combined versus staged approaches.

Methods: Retrospective cohort study of children with BPES over 5-years at The Children's Hospital of Philadelphia. PS was performed by 18 months of age when possible, to promote proper visual development. In one group, TNW was performed at a later age (STAGED), when craniofacial growth slowed, around 4-5 years of age. In another group, PS and TNW were performed initially during a single anesthesia episode (COMBINED). Two masked readers graded pre- and post-operative photographs. Outcomes included overall cosmesis/function (1-to-10-scale), eyelid height/contour, intercanthal distance reduction, increased horizontal-fissure length, increased nasal-scleral show.

Results: 35 patients were studied. Mean age at first surgery was 3.5 years, with 12 children having PS before age 18 months. Overall cosmesis rose from a mean of 3.6 (range 1-7.5) pre-op to 6.8 (3.5-9.5) post-op, for a mean improvement of +3.2 (0 to +6). The improvement was similar between 12 children undergoing COMBINED PS/TNW and 6 children undergoing STAGED PS/TNW (p=0.9).

Discussion: Early surgery facilitates early visual development, positive early emotional and social development, which are influenced by appearance, and improved head position, posture, and motor development.

Conclusion: Surgical management of BPES, including ptosis and telecanthus repair, results in positive functional and cosmetic outcomes. Both combined and staged approaches provide good results.

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Paper 28
Wednesday
9:34 - 9:41 am

Rate of Resolution in Congenital Nasolacrimal Duct Obstruction

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Introduction: The purpose of this study was to describe the rate of spontaneous resolution of congenital nasolacrimal duct obstruction (CNLDO) in a population-based cohort of children.

Methods: The medical records of all pediatric patients (<5 years) residing in a defined population who were diagnosed with CNLDO from January 1, 1995, through December 31, 2004, were retrospectively reviewed.

Results: In this 10-year study cohort of 17,720 newborns, 1998 (11.3%) were diagnosed with CNLDO at a mean age of 16.3 weeks; 1669 (83.5%) spontaneously resolved, 289 (14.5%) underwent treatment, and the remaining 40 (2.0%) were lost to follow-up. Among the 1958 observed infants, 47.3% spontaneously resolved by 3 months of age, 66.4% by 6, 75.7% by 9, and 78.4% by 12 months. Among the 1669 who spontaneously resolved, 47% resolved by 2 months of age, 70% by 4, 77.9% by 6, 86% by 8, and 89.4% by 10 months. Spontaneous resolution decreases with increasing age (p=0.01) and occurred in less than 15% of cases after 4 months of age, < 10% after 8 months, and < 5% after 15 months.

Discussion: While published reports suggest that most infants with CNLDO experience a spontaneous resolution, this study is the first population-based report to describe the rate of resolution in a large cohort of children with CNLDO.

Conclusion: Although 3 in 4 children with CNLDO resolve by 9 months of age, 86% of patients who spontaneously resolve will do so by 8 months. Intervention at this age is reasonable and may be preferable for some children.

Evaluation of High Definition Video Glasses for Telemedicine Strabismus Consultations

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Paper 29
Wednesday
11:25 - 11:32 am

Introduction: To evaluate the validity of using high-definition, wireless video recording Pivothead® glasses for assessing strabismus during live-streamed telemedicine consultations.

Methods: Wearing the Pivothead®, a pediatric ophthalmologist simultaneously performed and recorded strabismus examinations on 28 enrolled patients (4-16 years). Examinations were completed in primary gaze, with and without correction, at distance, and at near. Parameters included category of strabismus, accuracy of angle measurements within 5 prism diopters, and ocular motility within one grade. Masked to clinical findings, another pediatric ophthalmologist reviewed and graded live video feed transmitted at 4096 kbps. Agreement between remote and gold standard in-person findings was determined by unweighted kappa (κ) for categorical variables, intraclass coefficient (ICC) for continuous variables, and percent agreement.

Results: During 74 examinations, agreement was perfect for horizontal ($\kappa = 1.0$) and almost perfect for vertical deviations ($\kappa = 0.9$). The agreement for tropia, intermittent tropia, or phoria was almost perfect for all deviations ($\kappa = 0.85$). Angle measurements ($n=67$ due to inadequate view of prisms) had almost perfect agreement for horizontal (ICC=0.87) and vertical (ICC=0.83) deviations. For 52 individual eyes (4 excluded due to inadequate video quality), inferior and superior oblique agreement was 94% and 98%, respectively.

Discussion: Live video feed obtained with Pivothead® glasses may be read with high degree of reliability for detecting strabismus category, angle, and extraocular motility. Future analyses include re-evaluation of stored video clips by both graders 3 months after conclusion of enrollment to assess intra- and inter-physician reliability.

Conclusion: Audiovisual streaming technologies such as Pivothead® glasses may be an effective tool for real-time strabismus telemedicine consultations.

References: 1. Cheung JC, Dick PT, Kraft SP, Yamada J, Macarthur C. Strabismus examination by telemedicine. *Ophthalmology*. 2000;107(11):1999-2005. 2. Helveston EM, Orge FH, Naranjo R, Hernandez L. Telemedicine: Strabismus E-consultation. *J AAPOS*. 2001;5(5):291-6.

Are We Underestimating Superior Oblique Involvement in Restrictive Strabismus from Thyroid Eye Disease (TED)?

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Paper 30
Wednesday
11:32 - 11:39 am

Introduction: Strabismus surgery in TED is challenging. Severe restrictions from tight rectus muscles may mask superior oblique (SO) involvement. Troublesome A-patterns and intorsion may only be evident after rectus muscle surgery and later require SO surgery. Orbital CT scans can measure extraocular muscle size and infer the extent of their involvement in TED.

Methods: Institutional audit committee approved retrospective review of 66 TED patients treated for strabismus. The cross sectional area of superior oblique was compared to age matched controls using the Osirix Program.

Results: The female:male ratio was 2:1, 50% were smokers and 26% took statins. The SO cross sectional area in TED patients was 250% larger than normal controls (9.3 mm² [std 1.79] vs 23 mm² [std 6.52]). 96% of TED patients demonstrated significant SO enlargement (cross sectional area greater than three standard deviations from the mean). The first strabismus surgery in most cases was either vertical muscle surgery alone (41%) or combined vertical and horizontal surgery (42%) with none having SO surgery. At second operation, 15% had SO surgery and at third procedure 60% had SO surgery.

Discussion: Superior oblique enlargement in TED was ubiquitous but may not correlate with the severity of orthoptic finding such as A-patterns and intorsion. The frequency of SO surgery increased significantly with increasing surgical procedures.

Conclusion: Strabismus surgeons should be aware of the possible involvement of the SO in TED and be prepared to address this surgically. Intorsion and A-patterns should be measured in TED patients, although this may not be possible until after initial rectus muscle surgery.

References: 1. Prendiville P, Chopra M, Gauderman WJ, Feldon SE. The role of restricted motility in determining outcomes for vertical strabismus surgery in Graves' ophthalmopathy. *Ophthalmology* 2000;107:545-9 2. Holmes JM, Hatt SR, Bradley EA. Identifying masked superior oblique involvement in thyroid eye disease to avoid postoperative A-pattern exotropia and intorsion. *JAAPOS* 2012; 16; 280-5 3. Chen Y, Jin ZY, Zhang ZH et al. Quantitative evaluation of extraocular muscle with high field magnetic resonance in patients with Graves' ophthalmopathy with upper lid retraction. *Acta Academiae Medicinae Sinicae* 2012; 34: 461-7

Paper 31
Wednesday
11:43 - 11:50 am

Securing Extraocular Muscles in Strabismus Surgery: A Laboratory Analysis of Biomechanical Parameters

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Introduction: Little information is available regarding the mechanical forces involved in securing extraocular muscles to sclera in strabismus surgery. This study investigated the effect of scleral tunnel length on anchoring strength and hold, tensile properties of normal and damaged suture, and breakpoint of knots tied with different configurations.

Methods: A precision digital force gauge measured the tensile strength of intact 6-0 vicryl suture or suture damaged by an S-29 needle or ophthalmic needle holder, as well as breakpoints of knots tied in different configurations. Biomechanical strength and resistance to suture drag of partial thickness scleral tunnels was investigated using fresh human donor sclera. Mean values were compared using a student's t-test.

Results: Mean tensile strength of 6-0 vicryl suture was 623.5g (SD=149.4g). Tensile strength was markedly reduced by needle ($p<0.0001$) or ophthalmic needle holder ($p<0.0001$) damage. 2-1-1 knots broke at a mean force of 307.6g (SD=103.1g) compared with 292.8g (SD=93.3g) for 2-1-1-1 knots ($p=0.84$). 2mm scleral tunnels ruptured at a mean force of 916.9g (SD=75.9g) compared to 1201.8g (SD=570.7) for 4mm tunnels ($p=0.037$). Suture drag through a 2mm scleral tunnel was 4.6g (SD=2.2g) compared to 13.6g (SD=4.9g) for a 4mm tunnel ($p=0.011$).

Discussion: Given the known forces applied by normal human extraocular muscle, a 2mm scleral tunnel will provide sufficient holding force. Thread damage from a needle or needle holder may cause serious losses in tensile strength that could jeopardize muscle fixation. Knot strength is not significantly increased by adding a fourth throw and frictional forces are not sufficient to provide muscle stabilization.

Conclusion: Biomechanical analysis yields important quantitative insights that may inform proper surgical technique and analysis of failures in securing extraocular muscle to sclera.

References: Collins C, Carlson MR, Scott AB, Jampolsky A. Extraocular Muscle Forces in Normal Human Subjects. Invest Ophthalmol Vis Sci. 1981;20:652-64.

Paper 32
Wednesday
11:50 - 11:57 am

One- vs Two-Muscle Surgery for Unilateral Fourth Nerve Palsy

David L. Nash; David A. Leske; Erick D. Bothun; Brian G. Mohny;
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Introduction: Classic teaching regarding surgery for unilateral fourth nerve palsy is one muscle for 15pd or less in primary and two muscles for greater than 15pd, but surgeons still disagree on one versus two muscles for 14-25pd deviations. We compared outcomes of one- versus two-muscle surgery.

Methods: We reviewed medical records of 97 patients, age 5 to 86 years, who underwent either one- or two-muscle surgery for unilateral fourth nerve palsy with 14-25pd hypertropia in primary position. 6-week motor success was defined as orthophoria or 1-4pd undercorrection at both distance and near (by prism alternate cover test), overcorrection as any reversal of hypertropia, and undercorrection as >4 pd. Diplopia-free success was defined as none or rare diplopia in distance straight ahead and reading.

Results: 42 patients underwent one-muscle, and 55 two-muscle surgery. Motor success was similar (55% vs 62%), but there were more undercorrections with one-muscle surgery (43% vs 20%, $p=0.02$), and more overcorrections with two-muscle surgery (2% vs 18%, $p=0.02$). Regarding symptoms, there were similar rates of diplopia-free success between one- and two-muscle surgery (76% vs 60%, $p=0.1$). 73% of overcorrections were associated with diplopia, compared with only 38% of undercorrections ($p<0.01$).

Discussion: Although there were more undercorrections with one-muscle surgery than overcorrections with 2-muscle surgery, the undercorrections were less symptomatic, leading to similar overall motor and diplopia-free success rates.

Conclusion: For hypertropia of 14-25pd in primary position due to unilateral fourth nerve palsy, there appears to be no clear advantage of two-muscle surgery over one-muscle surgery.

Adjustable Bilateral Superior Oblique Advancements for Bilateral Fourth Nerve Palsy

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Paper 33
Wednesday
11:57 - 12:04 pm

Introduction: Bilateral fourth nerve palsy may be symmetric or asymmetric. We report a surgical technique that allows independent vertical and torsional adjustment.

Methods: 15 patients, age 17 to 73 years, underwent adjustable bilateral superior oblique advancements for bilateral fourth nerve palsy (11 symmetric (≤ 2 pd hypertropia in primary) and 4 asymmetric). In 4, advancement was accompanied by resection with hang-back, to facilitate adjustment. Motor alignment was assessed with double Maddox rods and prism and alternate cover tests.

Results: Preoperative torsion ranged from 7 to 30 degrees of excyclotropia (mean 16 excyclo \pm 7 deg) and hypertropia from 0 to 10 pd. Immediately following surgery, pre-adjustment torsion ranged from 5 excyclo to 40 incyclo, and hypertropia ranged from 0 to 8 pd. 12(80%) of the 15 were adjusted, so all patients had 0 hyperphoria and a target incyclo of 10 degrees (actual mean 9 incyclo, range 2 incyclo to 13 incyclo). At 6 weeks post-op, there was expected excyclodrift (to a mean 4 excyclo, range 2 incyclo to 15 excyclo), but 13 (87%) still had 5 degrees or less excyclo and 13 (87%) had within 2 pd of zero hyperphoria. Total torsional correction from pre-op to pre-adjustment was 31 ± 14 degrees ($P < 0.0001$), and from pre-op to 6-weeks was 13 ± 6 degrees ($P < 0.0001$).

Discussion: Adjustable bilateral superior oblique advancements allow independent control of the torsional and vertical components of the deviation.

Conclusion: Adjustable bilateral superior oblique advancement is a useful surgical technique for bilateral superior oblique palsy.

A Prediction Model for Retinopathy of Prematurity: Primary Results from the Postnatal Growth and ROP (G-ROP) Study

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On behalf of the G-ROP Study Group
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Paper 34
Wednesday
12:04 - 12:11 pm

Introduction: Current ROP guidelines, based upon studies of high-risk infants and expert opinion, have low specificity for treatment-requiring disease. Postnatal-weight-gain-based models improve specificity but have been limited by complexity, small development cohorts, and decreased sensitivity in validation studies. The G-ROP Study was undertaken to develop a clinically implementable, birth weight (BW), gestational age (GA), and weight-gain (WG) prediction model, using data from a large, broad-risk cohort of premature infants.

Methods: The G-ROP Study was a retrospective cohort study of infants undergoing ROP examinations at 30 North-American hospitals during 2006-2012. A hybrid modeling approach was used, combining BW/GA criteria; weight comparison to expected growth from infants without ROP; multiple growth-interval assessments; consideration of non-physiological WG; and user-friendly screening criteria. Numerous BW/GA levels, postnatal-age periods, numbers of time-intervals, time-interval lengths, and WG-percentile thresholds were evaluated to identify the most robust parameters. Primary outcomes were sensitivity for ETROP type 1 ROP and reduction in infants receiving examinations.

Results: 7,483 infants were studied, with median BW-1070g/(range 310-3000), GA-28wks/(22-35). Infants meeting any of 6 criteria undergo examinations: GA<28wks; BW<1051g; WG<120g, <180g, or <170g during days-of-life 11-20, 21-30, or 31-40, respectively; or hydrocephalus. This model predicted 459/459 Type 1 (sensitivity 100%, 95%CI 98.9-100%), 524/524 treated, and 466/472 Type 2 cases, while reducing infants requiring examinations by 30%.

Discussion: This large study cohort, broadly representative of infants undergoing ROP examinations, can provide more generalizable, evidence-based screening criteria.

Conclusion: With additional validation, the G-ROP model could be incorporated into modified ROP guidelines to reduce infants requiring examinations.

References: Binenbaum G, Tomlinson L, on behalf of the G-ROP Study Group: Postnatal Growth and Retinopathy of Prematurity Study: Rationale, Design, and Subject Characteristics. *Ophthalmol Epidemiol*, 2016 2016 Dec 20:1-12. [Epub ahead of print]

Paper 35

Wednesday

12:11 - 12:18 pm

Retinopathy of Prematurity Twin Concordance in The G-ROP Study

Lauren A. Tomlinson; Gui-shuang Ying; Gil Binenbaum

on Behalf of the G-ROP Study Group

The Children's Hospital of Philadelphia, Philadelphia PA

Introduction: We sought to determine concordance of retinopathy of prematurity (ROP) between premature twins and identify risk factors for inter-sibling discordance.

Methods: Retrospective cohort study of twin pairs receiving ROP examinations at 30 North-American hospitals between 2006-2012 (G-ROP Study). Higher-order multiples (triplets, etc.) were excluded. Outcomes were proportions of twin pairs who were concordant for any ROP and for severe ROP (ETROP Type 1 or 2). Birth weight (BW) and comorbidities of prematurity were evaluated as risk factors for discordance.

Results: Of 7,483 infants, 663 twin pairs (1326 infants) were studied; median GA 28 wks (range 23-35), mean BW 1172g (SD 349g), mean BW-difference between twins 179g (SD 180g, range 0-1140g). 110 (8.3%) infants developed severe ROP. Overall twin-pair concordance was 80.3% ($\kappa=0.59$) for ROP and 92.5% ($\kappa=0.50$) for severe ROP. Severe-ROP-concordance was similar regardless of percentage difference in BW (90-95%, $\kappa=0.47-0.58$). In 17/21 twin pairs discordant for both sepsis/NEC and severe ROP, the infant with sepsis/NEC had severe ROP (10 larger-twin, 7 smaller-twin). Nine of these 21 pairs had high discordance (one twin had severe ROP, the other twin had no ROP); in 8/9 of twin pairs with high discordance, the twin with severe ROP had sepsis and/or surgical NEC but the sibling did not.

Discussion: Twin siblings develop severe ROP with high concordance, generally irrespective of BW difference. Discordance is associated with systemic infection in the twin with severe ROP.

Conclusion: Ophthalmologists examining twins can expect similar ROP diagnoses but should suspect discordance when one infant develops sepsis or NEC.

References: Binenbaum G, Tomlinson L, on behalf of the G-ROP Study Group: Postnatal Growth and Retinopathy of Prematurity Study: Rationale, Design, and Subject Characteristics. *Ophthalmol Epidemiol* 2016 in press.

Paper 36

Wednesday

12:18 - 12:25 pm

Phase 1 Dose-Finding Study of Bevacizumab for Retinopathy of PrematurityDavid K. Wallace, MD, MPH; Raymond T. Kraker, MSPH; Sharon F. Freedman, MD;
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Deborah K. VanderVeen, MD; Trevano W. Dean, MPH; Roy W. Beck, MD, PhD;

Mike X. Repka, MD, MBA; Lois Smith, MD, PhD; William V. Good, MD;

Jonathan M. Holmes, BM, BCh; Lingkun Kong, MD; Mary Elizabeth Hartnett, MD

for the Pediatric Eye Disease Investigator Group

Jaeb Center for Health Research, Tampa, FL

Introduction: Intravitreal bevacizumab (0.25 to 0.625 mg) is increasingly used to treat type 1 retinopathy of prematurity (ROP), but there remain concerns about systemic toxicity. A much lower dose may be effective while reducing systemic risk.

Methods: Fifty-eight premature infants (mean BW = 721 g; mean GA = 24.9 weeks) with type 1 ROP in one or both eyes were enrolled in a masked, multi-center, dose de-escalation study. One eye per infant received 0.25, 0.125, 0.063, or 0.031 mg intravitreal bevacizumab, depending on success at each dose. Diluted bevacizumab was delivered using 300 microliter syringes with 5/16th inch, 30g fixed needles. Success was defined as improvement in pre-injection plus disease or zone I stage 3 ROP by 5 days post-injection, and no recurrence of type 1 ROP or severe neo-vascularization requiring additional treatment within 4 weeks.

Results: Thirty-two study eyes (55%) had zone II, stage 2 or 3 with plus disease, and 26 (45%) had type 1 ROP in zone I. A successful 4-week outcome was achieved for 11 of 11 eyes receiving 0.25 mg, 14 of 14 eyes receiving 0.125 mg, 21 of 24 eyes (88%) receiving 0.063 mg, and 9 of 9 eyes receiving 0.031 mg. Data on status at 6 months adjusted age are expected in early 2017, and will be available for presentation.

Discussion: Lower doses of bevacizumab may reduce the risk of systemic complications and possibly enhance normal retinal vascularization.

Conclusion: Bevacizumab doses as low as 0.031 mg were effective in this phase 1 study and warrant further investigation.

References: 1. Mintz-Hittner HA, Kennedy KA, Chuang AZ, Group B-RC. Efficacy of intravitreal bevacizumab for stage 3+ retinopathy of prematurity. *N Engl J Med*. 2011;364:603-15. 2. Quinn GE, Darlow BA. Concerns for Development After Bevacizumab Treatment of ROP. *Pediatrics*. 2016;137. 3. Good WV. Bevacizumab for Retinopathy of Prematurity: Treatment When Pathology Is Embedded in a Normally Developing Vascular System. *Ophthalmology*. 2016;123:1843-4.

Treatment of Retinopathy of Prematurity in Infants Weighing Less Than 500 Grams at Birth

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Louisiana Health and Sciences Center - Shreveport
Shreveport, Louisiana

Paper 37
Wednesday
12:25 - 12:32 pm

Introduction: Limited data exists evaluating Type 1 ROP in preterm infants weighing less than 500g at birth. This study assesses incidence, age of onset and response to treatment of Type 1 ROP in this unique population.

Methods: Retrospective study identified preterm infants weighing less than 500g at birth in one US city from 2004-2015. Infants with Type 1 ROP were treated with indirect laser ablation.

Results: Thirty infants with a birth weight less than 500g (mean 450g, range 370-499g) were identified; 77% (n=23) survived to the initial screening exam. 70% of survivors (n=16) developed Type 1 ROP between 32.1 to 48.0 weeks post gestational age (PGA) and underwent laser ablation (mean 36.7 weeks). Acute phase ROP regressed after treatment within 1.9 to 18.0 weeks (mean 4.6 weeks).

Discussion: In this study, a greater percentage of infants weighing under 500g at birth survived (77% versus 36%) and more infants developed Type 1 ROP requiring treatment (70%) compared to the ET-ROP study. Age of onset of Type 1 ROP was comparable with larger preterm infants (36.7 versus 35.2 weeks) but extended over a greater age range (up to 48 weeks). In this population, Type 1 ROP responded well to laser ablation therapy alone.

Conclusion: Preterm infants weighing under 500g at birth had a very high incidence of Type 1 ROP (70%) that responded well to retinal laser ablation. This study validates the current ROP screening guidelines in this population and suggests a prolonged screening period may be warranted.

References: 1. Wheeler, D.T., Dobson, V., Chiang, M.F. et al, Retinopathy of prematurity in infants weighing less than 500 grams at birth enrolled in the early treatment for retinopathy of prematurity study. *Ophthalmology*. 2011;118:1145-1151. 2. Early Treatment for Retinopathy of Prematurity Cooperative Group. Revised indications for the treatment of retinopathy of prematurity: Results of the Early Treatment for Retinopathy of Prematurity randomized trial. *Arch Ophthalmol*. 2003;121:1684-1696. 3. Palmer, E.A., Flynn, J.T., Hardy, R.J., Phelps, D.L., Philips, C.L., Schaffer, D.B. et al, The Cryotherapy for Retinopathy of Prematurity Cooperative Group: Incidence and early course of retinopathy of prematurity. *Ophthalmology*. 1991;98:1628-1640.

Plus Disease in ROP:

Why Do Experts Disagree, and How Can We Improve Diagnosis?

John P. Campbell; Jayashree Kalpathy-Cramer; Deniz Erdogmus; Susan Ostmo;
Ryan Swan; Kemal Sonmez; R.V. Paul Chan; Michael F. Chiang
Oregon Health & Science University, Portland, OR

Paper 38
Wednesday
12:32 - 12:39 pm

Introduction: This project was designed to explore causes of inter-expert discrepancy in plus disease diagnosis, and to examine future methods to improve diagnostic accuracy and consistency.

Methods: We recruited 8 expert ROP clinicians to classify ('plus, pre-plus, or normal') 100 ROP images of varying disease severity, and 6 physician and non-physician graders to classify and perform pairwise comparisons ('which image has more severe disease?') on the same images. Images were then ranked by averaging each expert's classification and pairwise comparison. We measured inter-expert agreement (weighted kappa) and correlation coefficients (CC) between ranking methodologies, and with a computer-based image analysis (CBIA) system we have developed (i-ROP).

Results: Agreement between experts in plus disease classification was variable (mean weighted kappa 0.30, range 0-0.75). However, correlation among both physician and non-physician graders in comparison ranking of disease severity was high (mean CC 0.84, range 0.74-0.93). The i-ROP computer-based image analysis system was able to model this spectrum of disease severity with good correlation (CC 0.86).

Discussion: The expert classifications suggested that diagnostic discrepancy is caused by individual systematic biases for cut points between plus vs. pre-plus, and pre-plus vs. normal. However, both physician and non-physician graders demonstrated high agreement on relative disease severity. Both methods provide similar rankings of disease severity, which correlate well with objective measurements obtained by computer-based image analysis.

Conclusion: The development of a quantitative ROP plus disease score, using either pairwise comparisons or computer-based image analysis, may more accurately reflect the spectrum of disease severity and improve diagnostic agreement in the future.

References: 1. Kalpathy-Cramer J, Campbell JP, Erdogmus D, Tian P, Kedarisetti D, Moleta C, Reynolds JD, Hutcheson K, Shapiro MJ, Repka MX, Ferrone P, Drenser K, Horowitz J, Sonmez K, Swan R, Ostmo S, Jonas KE, Chan RV, Chiang MF; Imaging and Informatics in Retinopathy of Prematurity Research Consortium. Plus Disease in Retinopathy of Prematurity: Improving Diagnosis by Ranking Disease Severity and Using Quantitative Image Analysis. *Ophthalmology*. Elsevier; 2016 Aug 24;0(0). 2. Campbell JP, Ataer-Cansizoglu E, Bolon-Canedo V, Bozkurt A, Erdogmus D, Kalpathy-Cramer J, Patel SN, Reynolds JD, Horowitz J, Hutcheson K, Shapiro M, Repka MX, Ferrone P, Drenser K, Martinez-Castellanos MA, Ostmo S, Jonas K, Chan RV, Chiang MF; Imaging and Informatics in ROP (i-ROP) Research Consortium. Expert Diagnosis of Plus Disease in Retinopathy of Prematurity From Computer-Based Image Analysis. *JAMA Ophthalmol*. 2016 Apr 14;134(6):651-7. 3. Campbell JP, Ryan MC, Lore E, Tian P, Ostmo S, Jonas K, Chan RV, Chiang MF; Imaging & Informatics in Retinopathy of Prematurity Research Consortium. Diagnostic Discrepancies in Retinopathy of Prematurity Classification. *Ophthalmology*. 2016 May 26.

Paper 39

Wednesday

12:39 - 12:46 pm

Treatment of Retinopathy of Prematurity after Hospital Discharge

Anne K. Jensen; Gui-shuang Ying; Lauren A. Tomlinson; Gil Binenbaum
on Behalf of the G-ROP Study Group
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Introduction: We sought to determine the incidence of and risk factors for retinopathy of prematurity (ROP) treatment following hospital discharge to home.

Methods: We conducted a retrospective cohort study of infants who were discharged to home before 40-weeks postmenstrual age (PMA), from 30 hospitals in North America during 2006-2012 (secondary analysis of the G-ROP Study). Infants with mature vasculature, treatment before discharge, transfer to another hospital, or no outpatient examinations were excluded. Outcome was proportion of infants requiring treatment after discharge. Birth weight(BW), gestational age(GA), and ROP diagnosis and PMA at last inpatient examination were evaluated as risk factors.

Results: Twenty-four of 3011 infants discharged to home prior to 40 weeks PMA subsequently required treatment (0.80%, 95%CI 0.54%-1.18%) at median PMA-39wks(range 36-45). BW and GA were lower in treated infants($p < 0.0001$). Treatment incidence when ROP was present before discharge was 3.6% (95%CI 2.3-5.8%). Incidences by diagnosis were immature: 2/1629, 0.12%(0.0-0.5%); stage-1: 7/436, 1.6%(0.8-3.3%); stage-2: 9/194, 4.6%(2.5-8.6%); stage-3: 2/31, 6.5%(1.8-21%); Z1: 1/2, 50%(0.45-90.6%); Z2: 19/1719, 1.1%(0.7-1.7%); Z3: 0/595, 0%(0-6.4%). Four treated infants were not examined as inpatients, so stage/zone before discharge were unknown. 0/1510 (0%,0-0.25%) infants with immature vasculature discharged PMA-35wks or later required treatment.

Discussion: Infants considered healthy enough for discharge before PMA-40wks have very low risk of needing ROP treatment, particularly if vessels have reached zone 3 or ROP has not developed by PMA-35wks.

Conclusion: Infants discharged before PMA-35wks or discharged with ROP before PMA-40wks are at higher risk of needing treatment and their outpatient follow-up should be ensured.

References: Binenbaum G, Tomlinson L, on behalf of the G-ROP Study Group: Postnatal Growth and Retinopathy of Prematurity Study: Rationale, Design, and Subject Characteristics. *Ophthalm Epidemiol* 2016 in press.

Paper 40

Thursday

8:11 - 8:19 am

*2017 AAPOS Young Investigator Award Presentation***Big Data on a Small Scale for Pediatric Ophthalmology Research**

Gil Binenbaum, MD, MSCE; The Children's Hospital Of Philadelphia

Introduction: Electronic medical records (EMR) present an opportunity to answer research questions faster, with much larger amounts of data. This study identified techniques for leveraging EMR to do pediatric ophthalmology research.

Methods: Methodological analysis of multiple retrospective, single-center studies that used EMR data as a primary data source.

Results: EMR enabled rapid identification of subjects when inclusion criteria were defined with consistently used billing codes and clinical variables readily accessible in the EMR. Large datasets were rapidly produced, but varying amounts of manual data collection, interpretation, and coding into analyzable, number-based variables were required. How much "augmentation" was necessary depended upon the study question, how clinicians recorded findings, and how data were stored in the EMR. Examples ranged from extensive (strabismus data), to minimal (uncommon retinal findings), to no (refractive data) extra, manual work. Overcoming variability in strabismus documentation was particularly laborious. Proactive steps were identified that could be taken by clinicians to facilitate EMR research, including entering findings consistently as numbers or codes, using discrete rather than free-text fields, and applying diagnostic codes in a disciplined and thorough manner.

Discussion: Tradeoffs were made between increasing both study efficiency and sample size and disregarding inaccuracies in the EMR. The significance of such limitations depended primarily upon the study question.

Conclusion: Development, adoption, and consistent use of standardized nomenclature and organization of clinical data in the EMR by clinicians in their daily practice facilitate rapid access to large amounts of data for quality improvement and research purposes.

References: 1. Binenbaum G, et al. Evaluation of Temporal Association between Vaccinations and Retinal Hemorrhage. *JAMA Ophthalmology*, 133(11): 1261-5, 2015. 2. Geloneck M, et al. Ocular complications in children with diabetes mellitus. *Ophthalmology*, 122(12): 2457-64, 2015. 3. Dawson L, et al. Pediatric Ophthalmologist Glasses Prescribing Patterns. 2014 Annual Meeting of the American Academy of Ophthalmology, Chicago, IL. October 2014.

Notes

Notes

Poster Schedule

1st Set of Hard Board Posters (1-24) displayed from Sunday, April 2, 4:00 PM - Tuesday, April 4, 11:30 AM, Broadway West Foyer

Interactive Poster Session - Author Presentation and Q/A - Monday, April 3, 10:00 - 11:00 AM

GENETICS

-
- Poster #1 A 17-Year Retrospective Review of the Incidence, Diagnosis and Outcomes of Retinal Pathology in Infants with Incontinentia Pigmenti
Robert H. Henderson, MD, FRCOphth
Neda Alband, FRCP; S. Chien Wong, FRCOphth; Anna Martinez, FRCP
-
- Poster #2 Genetic Mutations and Visual Acuity in Children with Leber Congenital Amaurosis
John H. Lillvis, MD, PhD
Meghan J. Marino, MS; Elias I. Traboulsi, MD
-

Poster #3 Poster Withdrawn

NEURO-OPHTHALMOLOGY

-
- Poster #4 Pediatric Myasthenia Gravis: Large Retrospective Assessment of Presentation, Risk Factors, Management, Longitudinal Systemic and Visual Outcomes
Michael A. Lopez, MD
Veeral Shah, MD, PhD; Douglas P. Marx, MD; Timothy E. Lotze, MD
-
- Poster #5 MR Imaging Findings in Children with Spasmus Nutans
Meredith Bowen
Jason H. Peragallo; Stephen F. Kralik; Andrea Poretti; Thierry A. Huisman; Bruno P. Soares
-
- Poster #6 Inter Hemispheric Asymmetries of Half Field Responses in Albinos Without Nystagmus
Sian E. Handley, B Med Sci, MSc
Ken Nischal; Alki Liasis
-
- Poster #7 Opening Pressure and Diagnostic Criteria in Pediatric Intracranial Hypertension
Hilliary Inger, MD
Rachel Reem, MD; David Rogers, MD; Shawn Aylward, MD
-
- Poster #8 Long-Term Visual Outcomes of Craniopharyngioma in Children
Michael Wan
-

VISION

-
- Poster #9 The Squint-Scope (Pat.Pend.) - A New Abductor Fixation Device Prototype - Provides Better Access for Inspection of the Temporal Fundus in Children with Large Angle Esotropia
Jon Peiter Saunte, MD
Max Bonne
-
- Poster #10 Long-Term Structural and Functional Visual Outcomes in Young Adults Born Extremely Preterm: The EPICure Study
Saurabh Jain
Joanne Beckmann; Neil Marlow
-
- Poster #11 The PlusoptiX Photoscreener and the Retinomax Autorefractor as Community-Based Screening Devices for Preschool Children
Michael Kinori
Iliana Molina; Erik O. Hernandez; Shira L. Robbins; David B. Granet; Anne Coleman; Stuart I. Brown
-
- Poster #12 Utilization of Geographic Information Systems Software to Analyze Vision Screening Results from a Socioeconomic Perspective
Ronela K. Tavoc
Leila Khazaeni; Jennifer A. Dunbar
-

STRABISMUS

-
- Poster #13 Diplopia After Orbital Trauma: Predicting Need for Surgical Treatment
Tyler B. Risma, MD
Tony Klauer, CO; Erin Shriver, MD; Scott A. Larson, MD
-
- Poster #14 High-Resolution Magnetic Resonance Imaging (MRI) in Diagnosis and Management of Inferior Rectus (IR) Palsy
Rui Zhang
Joseph L. Demer
-

Poster #15	Medial Rectus Muscle Violates Sherrington's Law During Fusional Divergence in Artificial Esophoria and Intermittent Esotropia Joseph L. Demer, MD, PhD Robert A. Clark, MD
Poster #16	Causes of Diplopia Associated with Epiretinal Membranes Jonathan M. Holmes Kevin K. Veverka; Sarah R. Hatt; David A. Leske; William L. Brown; Raymond Iezzi
Poster #17	Oculomotor Outcomes in Children Treated for Brain Tumors of the Posterior Fossa Maanasa Indaram, MD Jane Edmond, MD; Yan Guo, MD, PhD; Crandall Peeler, MD; Jeffrey Hollander; Gena Heidary, MD, PhD
RETINOPATHY OF PREMATURITY	
Poster #18	Incidence and Early Course of Retinopathy of Prematurity: Findings from the G-ROP Study Graham E. Quinn Gil Binenbaum; Edward F. Bell; Pamela Donohue; David Morrison; Lauren A. Tomlinson; Gui-shuang Ying
Poster #19	The Relationship Between the Antecedents of Preterm Birth with Retinopathy of Prematurity Anne M. Lynch, MD, MSPH Ashlee M. Cerda, MPH; Tamara S. Thevarajah, MS; Jennifer K. Hodges, MD, PhD; Brandie D. Wagner, PhD; Erica M. Wymore, MD, MPH; Alan G. Palestine, MD; Emily A. McCourt, MD
Poster #20	The Use of the Fenton Preterm Growth Chart and Z-Scores as Growth Parameters in Assessing the Risk of Retinopathy of Prematurity Ashlee M. Cerda, MPH Brandie D. Wagner, PhD; Anne M. Lynch, MD; Jennifer L. Jung, MD; Erica Wymore, MD; Jasleen K. Singh, MD; Robert W. Enzenauer, MD; Emily A. McCourt, MD
Poster #21	Validation Study of the Colorado Model for Predicting ROP Emily A. McCourt, MD Gui-shuang Ying, PhD; Anne Lynch, MD, MSPH; Ashlee M. Cerda, MPH; Brandie Wagner, PhD; Lauren Tomlinson; Gil Binenbaum, MD
Poster #22	A National Telemedicine Network for Retinopathy of Prematurity Screening Mario Zanolli Diego Ossandon; Ricardo Stevenson; Ricardo Agurto; Gad Dotan
Poster #23	Mortality Rate for Premature Infants Treated for ROP with Intravitreal anti-Vascular Endothelial Growth Factor (VEGF) Medication vs Retinal Ablative Surgery Iason S. Mantagos, MD Carolyn Wu, MD; Tamar Winter, BSN, RN, IBCLC; Deborah K. VanderVeen, MD
Poster #24	Evaluation of Computer-Based Image Analysis for Retinopathy of Prematurity Screening Sapna Tibrewal, MD Peng Tian, BS; Dharanish Kedariseti, MS; Jayashree Kalpathy-Cramer, PhD; Deniz Erdogmus, PhD; John P. Campbell, MD; Robison V. Chan, MD; Michael F. Chiang, MD

A 17-Year Retrospective Review of the Incidence, Diagnosis and Outcomes of Retinal Pathology in Infants with Incontinentia Pigmenti

Poster 1
Monday
10:00 - 11:00 am

Robert H. Henderson, MD, FRCOphth; Neda Alband, FRCP; S. Chien Wong, FRCOphth;
Anna Martinez, FRCP
Great Ormond Street Hospital for Children, London, United Kingdom

Introduction: Incontinentia Pigmenti (IP) is an X-linked genodermatosis caused by mutations in the *IKBKG* gene with cutaneous, neurological, ophthalmic, and dental manifestations. 16-66% (1,2) of patients have ocular pathology including retinal ischaemia which can have sight threatening implications. The peripheral retinal non-perfusion is difficult to identify through standard indirect ophthalmoscopy, but can lead to retinal detachment and blindness.

Methods: A hospital database search was performed of all patients with IP from 1998-2015. The diagnosis was made by a dermatologist in conjunction with a geneticist together with results of mutational analysis. The primary endpoint was the presence of ocular pathology. In 2014 a new vitreoretinal unit was established and all patients subsequently were screened with Retcam FFA.

Results: 26 infants (25 female, 1 male) were identified with IP during the study period. Ophthalmic information was obtained on 23 patients; 15 were prior to 2014. The mean age at first ophthalmology review was 124 days, the first dermatology appointment was 74 days. 8/46 (17%) eyes had abnormalities on clinical exam, 2 eyes presented with retinal detachment. Prior to 2014, 26% had FFA performed; after 2014 3/8 (19%) had clinical abnormalities, but 14/16 eyes (88%) had peripheral non-perfusion on FFA.

Discussion: Retinal detachment was identified in 6% of eyes at presentation suggesting earlier eye screening is necessary. FFA identified peripheral ischaemia in the majority of patients with significantly greater sensitivity.

Conclusion: FFA should be performed on all infants with IP to facilitate earlier intervention and to reduce the risk of retinal detachment.

References: 1) Swinney CC, Han DP, Karth PA, Incontinentia Pigmenti: a comprehensive review and update, *Ophthalmic Surg Lasers Retina*, 2015 Jun;46(6):650-7 2) O'Doherty M, McCreery K, Green AJ. Incontinentia Pigmenti- ophthalmological observation of a series of cases and review of the literature. *Br J Ophthalmol*. 2011;95:11-16.

Genetic Mutations and Visual Acuity in Children with Leber Congenital Amaurosis

John H. Lillvis, MD, PhD; Meghan J. Marino, MS; Elias I. Traboulsi, MD
Cole Eye Institute, Cleveland Clinic, Cleveland, OH

Poster 2
Monday
10:00 - 11:00 am

Introduction: Vision in children with Leber congenital amaurosis (LCA) varies considerably, from no light perception to $\geq 20/40$. Understanding the genetic determinants of this variability can help provide prognostic information and improve our understanding of LCA.

Methods: This is a retrospective cohort study of Cole Eye Institute patients with LCA and ≥ 1 confirmed mutation in *CEP290*, *CRB1*, *GUCY2D*, *AIPL1*, or *RDH12*. LCA genes with ≥ 2 patients were excluded. For each patient, visual acuity (VA), disease alleles, follow-up data, and clinical findings were analyzed.

Results: Thirty-seven patients met inclusion criteria. Patients with $VA > 20/200$ were identified as follows: *CRB1*=6/10, *GUCY2D*=0/8, *CEP290*=5/10, *AIPL1*=1/8, *RDH12*=2/3. Acuity was greatest in *CRB1* patients (mean $VA=20/160$; $n=2$ with $VA < 20/400$). *CEP290* patients had poor ($\leq CF$) or good acuity (20/20-20/80). No relationship was identified between vision and mutation for *CRB1*, *AIPL1* and *RDH12*. *CEP290* c.2991+1655A>G was twice as common in patients with poor vision ($n=4/5$) and second alleles differed between good and poor vision patients carrying c.2991+1655A>G.

Discussion: The range of VA was consistent with prior literature¹ for *CRB1*, *AIPL1*, *GUCY2D* and *RDH12*. A high proportion of *CEP290* patients had $VA > 20/200$. *CEP290* allele-specific effects may contribute to preserved VA; c.2991+1655A>G was more common in poor vision patients and those with good vision and c.2991+1655A>G had different second alleles. This mutation is associated with poor vision, although patients with $VA > 20/200$ have been reported.

Conclusion: $VA > 20/200$ was identified most commonly in *CRB1* and *CEP290* LCA patients. Severity of vision loss may correlate with specific *CEP290* alleles but additional work on genetic and environmental factors is necessary.

References: 1. Wallia S, Fishman GA, Jacobson SG, et al. Visual acuity in patients with Leber's congenital amaurosis and early childhood-onset retinitis pigmentosa. *Ophthalmology*. 2010 Jun;117(6):1190-8. 2. Perrault I, Delphin N Hanein S, et al. Spectrum of NPHP6/CEP290 mutations in Leber congenital amaurosis and delineation of the associated phenotype. *Hum Mutat*. 2007 Apr;28(4):416. 3. Cidecyan AV, Aleman TS, Jacobson SG, et al. Centrosomal-ciliary gene CEP290/NPHP6 mutations result in blindness with unexpected sparing of photoreceptors and visual brain: implications for therapy of Leber congenital amaurosis. *Hum Mutat*. 2007 Nov;28(11):1074-83.

Poster 3
Monday
10:00 - 11:00 am

Poster Withdrawn

Poster 4
Monday
10:00 - 11:00 am

Pediatric Myasthenia Gravis: Large Retrospective Assessment of Presentation, Risk Factors, Management, Longitudinal Systemic and Visual Outcomes.

Michael A. Lopez, MD; Veeral Shah, MD, PhD; Douglas P. Marx, MD;
Timothy E. Lotze, MD

Introduction: Myasthenia gravis is an autoimmune disease in which autoantibodies target the neuromuscular junction. In adults, well delineated symptoms of muscle weakness and fatigability are disease hallmarks. Clinical presentation and diagnosis in pediatric populations can be elusive. These patients have increased risk for other autoimmune diseases, as well as associations for other systemic and environmental risk factors. The management and outcomes have broad spectrum, especially with new immunosuppressive modalities. Our objective was to investigate these and other associations of myasthenia gravis in pediatric patients.

Methods: Retrospective chart review through electronic medical record search at Texas Children's Hospital.

Results: Forty children were found to have myasthenia. The average age at presentation was 7.9 years. Four (10%) had congenital myasthenia. Thirty-six (90%) had autoimmune myasthenia, and of those tested for acetylcholine receptor antibodies, sixteen (43%) were positive. Sixteen with autoimmune myasthenia (44%) are on an immunosuppressive agent. Four (10%) had a separate autoimmune disease, of which thyroid disease accounted for half. Only one out of twenty-six (4%) had documented tobacco exposure.

Discussion: Five (14%) of our patients had thymectomies with two more being planned (total of 19%), which may be explained by increasingly excellent control by immunosuppressive agents, which included IVIG, Cellcept, Rituximab, and Azathioprine.

Conclusion: The diagnostic myasthenia antibody panel shows correlation of positive testing with increased requirement for advanced treatment modalities, and correspondingly negative testing demonstrates a decreased risk of generalized symptoms.

References: 1. Andrews, P. (2004). "Autoimmune myasthenia gravis in childhood," *Semin in Neurology*, 24(1), 101-110. 2. Mullaney, P., Vajsar, J., Smith, R., and Buncic, J. (2000). "The natural history and ophthalmic involvement in childhood myasthenia gravis at The Hospital for Sick Children," *Ophthalmology*, 107, 504-510. 3. Pineles, S., Avery, A., et al. (2010). "Visual and systemic outcomes in pediatric ocular myasthenia gravis," *Am J Ophthalmol*, 150, 453-459.

MR Imaging Findings in Children with Spasmus Nutans

Meredith Bowen; Jason H. Peragallo; Stephen F. Kralik; Andrea Poretti;
Thierry A. Huisman; Bruno P. Soares
Emory University School of Medicine, Atlanta, GA

Poster 5
Monday
10:00 - 11:00 am

Introduction: Spasmus nutans (SN) involves the triad of nystagmus, head bobbing, and abnormal head positioning.[1] SN has been associated with underlying optic pathway gliomas based mainly on a small number of isolated case reports.[2] Previous retrospective analyses have found the rate of optic pathway gliomas in SN to be less than 2%, but these only intermittently used neuroimaging with computed tomography (CT), which has limited sensitivity for detection of small optic pathway lesions.[3]

Methods: We retrospectively queried neuroradiology databases at three institutions from 1/2010-5/2016 for examinations ordered for SN; MRI exams of the brain and/or orbits were included and evaluated for optic pathway gliomas and other structural abnormalities. Medical records were reviewed to confirm a diagnosis of SN, reveal previous diagnoses of underlying neurologic disease, or other pre-existing diagnoses.

Results: 40 patients were identified who underwent neuroimaging for SN. Median age at time of diagnosis as 16.3 months (IQR 17.4 months). No patient was discovered to have an optic pathway glioma (95% CI 0.00-0.09). Of 31/40(70%) patients who had medical records available to review 15/31(48%) had significant systemic, non-ocular, past medical histories. 2/40 (5%) of patient had optic nerve hypoplasia. 15/40(30%) of patients had other intracranial abnormalities identified.

Discussion: Patients with SN were not found to have underlying optic pathway gliomas in this analysis. Other structural intracranial abnormalities were found frequently.

Conclusion: Without other 'red flags' concerning for an intracranial mass lesion, neuroimaging may not always be necessary as part of an initial diagnostic workup for SN.

References: 1) Thomson J. Note on the peculiar nystagmus of spasmus nutans in infants. *British medical journal* 1901;1:763 2) Albright AL, Scabbassi RJ, Slamovits TL, Bergman I. Spasmus nutans associated with optic gliomas in infants. *J Pediatr* 1984;105:778-80 3) Arnoldi KA, Tychsen L. Prevalence of intracranial lesions in children initially diagnosed with disconjugate nystagmus (spasmus nutans). *J Pediatr Ophthalmol Strabismus* 1995;32:296-301.

Inter Hemispheric Asymmetries of Half Field Responses in Albinos Without Nystagmus

Sian E. Handley, B Med Sci, MSc; Ken Nischal; Alki Liasis
Great Ormond Street Hospital and Institute of Child Health UCL, London UK

Poster 6
Monday
10:00 - 11:00 am

Introduction: MRI studies have identified differences in occipital cortical thickness, grey matter volume and gyrification between albinos and controls [1]. Although electrophysiological techniques are well established in identifying chiasmal misrouting in albinism, hemifield stimulation is typically not employed due to the confounding effects of nystagmus. In an attempt to determine the functional consequences of the inter-hemispheric asymmetries observed in albinism compared to controls we recorded hemifield visual evoked potentials (VEPs) in clinically diagnosed albinos with no nystagmus.

Methods: Pattern reversal visual evoked potentials (VEP) to full and hemi-field stimulation and full field pattern appearance stimulation were recorded and analysed from 3 electrodes (O1, Oz and O2) in 16 albinoid subjects with no nystagmus.

Results: The amplitude of the pattern half field VEPs to stimulation of the crossing pathways were significantly larger than those to the non-crossing in each eye [(RE P=0.000004), (LE P=0.001)]. In addition responses evoked by the left hemisphere were larger than those from the right. This was most evident for the crossing pathways [P=0.004].

Discussion: This study has demonstrated electrophysiological differences in visual pathway function of the left and right hemisphere in subjects with albinism. These differences may be due to the anatomical asymmetries observed between control subjects and those with albinism or may also may be due to the inter-hemispheric differences observed in normal controls[2] yet to be documented in subjects with albinism.

Conclusion: This study has demonstrated electrophysiological inter-hemispheric differences in visual pathway function in patients with albinism. Future research will concentrate on determining what these findings have on functional vision.

References: 1. Bridge H, von dem Hagen EAH, Davies G, et al (2014) Changes in brain morphology in albinism reflect reduced visual acuity. *Cortex* 56:64-72. doi: 10.1016/j.cortex.2012.08.010 2. Kuroiwa Y, Celesia GG, Tohgi H (1987) Amplitude difference between pattern-evoked potentials after left and right hemifield stimulation in normal subjects. *Neurology* 37:795-799.

Poster 7
Monday
10:00 - 11:00 am

Opening Pressure and Diagnostic Criteria in Pediatric Intracranial Hypertension

Hilliary Inger, MD; Rachel Reem, MD; David Rogers, MD; Shawn Aylward, MD

Introduction: Revisions to the diagnostic criteria for pediatric intracranial hypertension (IH) have recently been suggested. The new criteria eliminate the use of clinical symptoms, focus more on radiographic features of the condition, and utilize a lumbar puncture opening pressure cutoff of 28 cm H₂O. There is concern that these criteria will underdiagnose IH.

Methods: The revised criteria were applied to 51 patients previously diagnosed with IH to assess for similarities in diagnosis.

Results: Ten patients (19.6%) with papilledema and lumbar puncture opening pressures below 28 cm H₂O had clinical courses suggestive of IH. None of these patients met definite IH diagnostic criteria under the revised guidelines as a result of their opening pressures alone. Nine patients (17.65%) did not meet any of the revised diagnostic criteria as they lacked sufficient radiologic evidence of the disease, but did have symptoms concerning for IH in the setting of lumbar puncture opening pressures greater than 28 cm H₂O.

Discussion: This study demonstrates the importance of including clinical symptoms in the diagnosis of IH and suggests that heavy reliance on radiologic evidence of IH may result in under-diagnosis of the condition.

Conclusion: Patients with findings highly suggestive of IH may not meet all diagnostic criteria, but may still benefit from treatment.

Poster 8
Monday
10:00 - 11:00 am

Long-Term Visual Outcomes of Craniopharyngioma in Children

Michael Wan

The Hospital for Sick Children and The University of Toronto
Toronto, Ontario, Canada

Introduction: Craniopharyngiomas in children commonly cause visual impairment. The purpose of this study is to report long-term visual outcomes in a cohort of pediatric craniopharyngioma patients.

Methods: The study design is a retrospective chart review of craniopharyngioma patients from a single tertiary care pediatric hospital.

Results: 50 patients were included in the study. Median age at presentation was 10.2 years old (range 0.7 - 18.0 years old). The most common presenting features were headache (74%), vision loss (32%), and nausea/vomiting (30%). At presentation, 42% had optic nerve pallor and 42% had optic nerve edema. Median follow-up was 4.5 years. During follow-up, 67% of patients had a recurrence requiring treatment and 32% of patients had at least one episode of sudden visual decline. At last follow-up, 60% of patients had moderate visual impairment in at least one eye (<20/40 or more than 50% visual field loss), 28% had moderate binocular visual impairment, and 12% of patients had severe binocular visual impairment (<20/200 or less than 20 degrees of visual field in the better eye).

Discussion: Vision loss is a common presenting symptom of craniopharyngiomas in children, and key diagnostic findings include optic nerve pallor and edema. After diagnosis, monitoring vision is important as sudden visual decline is a common indicator of recurrence. Vision loss occurs in the majority of patients, but severe binocular visual impairment is uncommon.

Conclusion: Craniopharyngioma is a potentially blinding disease in children. Visual symptoms and ophthalmological exam findings are important in the diagnosis, prognosis, and monitoring of affected children.

References: 1. Sorva R, Heiskanen O, Perheentupa J. Craniopharyngioma surgery in children: endocrine and visual outcome. *Childs Nerv Syst* 1988;4(2):97-9. 2. Abrams LS, Repka MX. Visual outcome of craniopharyngioma in children. *J Pediatr Ophthalmol Strabismus* 1997;34(4):223-8. 3. Poretti A, Grotzer MA, Ribi K, Schonle E, Boltshauser E. Outcome of craniopharyngioma in children: long-term complications and quality of life. *Dev Med Child Neurol* 2004;46(4):220-9.

The Squint-Scope (Pat. Pend.) - A New Abductor Fixation Device Prototype - Provides Better Access for Inspection of the Temporal Fundus in Children with Large Angle Esotropia

Jon Peiter Saunte, MD; Max Bonne
Rigshospitalet, Ophthalmology Dept., University of Copenhagen, Denmark

Poster 9
Monday
10:00 - 11:00 am

Introduction: Squint-Scope: A new fixation device prototype printed on a 3-D printer improves access for eye exam in small children or uncooperative adult patients.

Methods: Presentation of the 3-D printed prototype Squint-Scope a periscope with two mirrors and an integrated base-out prism with an attached iPod. The patient is allowed to watch a cartoon on the iPod through the handheld Squint-Scope, thus the other eye is abducted and available for examination. Squint-Scope can be used in front of both eyes alternatively, driving the non-fixation eye in abduction, and by holding the Squint-Scope in a vertical position, the non-fixating eye is driven in up- or down-gaze; the superior or inferior part of fundus then available for examination.

Results: The Squint-Scope prototype was tested during 6 months in a clinical setting. In children or mentally disabled patients with large angle Esotropia (ET) it was proven helpful in the examination of cornea and retina, especially by allowing examination of the temporal part of retina in esotropic eyes, thus avoiding need for eye-exam under general anesthesia in 3 children.

Discussion: Examination of the anterior segment and fundus in children with large angle ET can be challenging. To keep a good relation with an uncooperative child during an eye - examination can be difficult. When children focus in this device, the cartoon on show in the iPod can keep children busy for a long time. The prototype is not commercially available at present.

Conclusion: Examination of the anterior segment and fundus in children with large angle ET can be challenging. The prototype of the Squint-Scope: 1) Distracts the children and keeps them calm during examination by the ophthalmologist; 2) Provides better access for examination of the anterior segment and fundus in children; 3) Saves time in the clinic and in some cases further eye examinations under general anesthesia can be avoided.

Long-Term Structural and Functional Visual Outcomes in Young Adults Born Extremely Preterm: The EPICure Study

Saurabh Jain; Joanne Beckmann; Neil Marlow

Poster 10
Monday
10:00 - 11:00 am

Introduction: There is a high risk of visual impairment following birth at extremely low gestations [1], but long-term outcomes in adulthood have not been reported.

Methods: 126 young adults born extremely preterm (EP) ≤ 25 weeks of gestation and 64 term-born controls were evaluated at 19 years of age for visual acuity, refractive error, contrast sensitivity, colour vision, ocular motility and retinal morphology.

Results: In the EP group, 65/126 (52%) had neonatal retinopathy of prematurity (ROP); 16/65 (25%) received cryotherapy or laser therapy. At 19 years, 41% of controls and 49% of the EP group wore glasses or contact lenses. Within the EP group, 6 (9%) had low vision ($\log\text{MAR} > 0.5$) in at least 1 eye, and compared to controls, corrected visual acuity (VA) and contrast sensitivity were reduced ($P < 0.001$), but colour vision and refractive error were similar. Compared to controls, central retinal thickness and volumes were significantly increased and retinal nerve fibre layer (RNFL) thickness at the optic nerve head was reduced in the EP group. Within the EP group, VA was reduced in those with ROP and colour vision was better following treatment, but no morphological differences were found.

Discussion: VA, contrast sensitivity and colour vision are reduced at 19 years following EP birth, particularly in those treated for ROP. Structural retinal changes (increased central retinal thickness but reduced RNFL) may represent glial cell proliferation and neuronal apoptosis during the postnatal period.

Conclusion: Extreme prematurity is associated with significant retinal alterations resulting in long-term visual impairment. Intensive monitoring with appropriate intervention is essential in childhood.

References: Costeloe K, Hennessy E, Gibson AT, Marlow N, Wilkinson AR. The EPICure study: outcomes to discharge from hospital for infants born at the threshold of viability. *Pediatrics*. 2000; 106(4): 659-671.

Poster 11
Monday
10:00 - 11:00 am

The Plusoptix Photoscreener and the Retinomax Autorefractor as Community-Based Screening Devices for Preschool Children

Michael Kinori; Iliana Molina; Erik O. Hernandez; Shira L. Robbins; David B. Granet; Anne Coleman; Stuart I. Brown
Department of Ophthalmology, Shiley Eye Center, School of Medicine,
University of California-San Diego, La Jolla, California

Introduction: Purpose: To compare the performance of the Plusoptix S12 mobile photo-screener (PPS) and the Retinomax K+3 Autorefractor (RAR) as screening devices in preschool children.

Methods: Children ranging from 3 to 5 years of age from 11 San Diego county preschools underwent vision screening in their schools where ambient light could not always be controlled using both the RAR and the PPS. Cycloplegic refraction on the consented children were subsequently performed on the UCSD EyeMobile for children on site at the school locations.

Results: A total of 321 children were screened with the PPS and RAR. The PPS referred of 22% of children of whom 70% of the referrals were read as 'unable'. The RAR referred 13% and there were no 'unables'. Similar results occurred in the cycloplegic refracted 182 consented children who had 64% 'unables' by the PPS. Only one third of these 'unables' required glasses. Both devices referred the four children with amblyopia and one case of strabismus. However, PPS' 3 false negatives had amblyopia risk factors (ARF's) while the one RAR's false negative did not have ARF's.

The RAR screening had 95% sensitivity and 94% specificity. The PPS screening had 86% sensitivity and 84% specificity.

Discussion: In this preschool population and environment the PPS referred 63% more than the RAR in addition to a lower specificity and sensitivity.

Conclusion: Adjusting PPS referral criteria might not substantially improve the specificity of the PPS due to the high numbers of 'unables'.

References: 1. Crescioni M, Miller JM, Harvey EM (2015) Accuracy of the Spot and Plusoptix photoscreeners for detection of astigmatism. J AAPOS 19: 435-440 2. Donahue SP, Arnold RW, Ruben JB, Committee AVS (2003) 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 7: 314-316 3. Dahlmann-Noor AH, Vrotsou K, Kostakis V, Brown J, Heath J, Iron A, McGill S, Vivian AJ (2009) Vision screening in children by Plusoptix Vision Screener compared with gold-standard orthoptic assessment. Br J Ophthalmol 93: 342-345

Poster 12
Monday
10:00 - 11:00 am

Utilization of Geographic Information Systems Software to Analyze Vision Screening Results from a Socioeconomic Perspective

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Introduction: Photoscreening reaches children in large geographic areas. Geographic information system (GIS) software can describe different geographic units visually by superimposing socioeconomic data on maps. Using GIS software, we demonstrate the geographic relationships between vision screening referral rates, median income, ethnicity and pediatric population in our vision screening program.

Methods: Laypersons used the SPOT photo screener (Welch Allyn, Skaneateles Falls, NY) to screen children ages 0-8 from 9/2015 to 12/2016. Date of birth, ethnicity, gender, screening result and follow-up data were collected. ArcGISOnline (Esri, Redlands, CA) was used to geolocate screening sites and to display the median household income, ethnicities and pediatric population by census tract. The percentage of children referred for comprehensive examination by site was added to the map as an overlay.

Results: 9,912 children were screened and 1,711 (17.3%) were referred. The highest referral rate (47.1%) corresponded to 3 census tracts with median income \$32,142 (36% below national average) and a predominantly Hispanic population (65.7%). The lowest referral rate (0%) corresponded to 2 census tracts with median income \$88,934 (77% above national average) with a predominantly white population (46%).

Discussion: Our results support the possibility that children with low socioeconomic status are more likely to fail vision screening. Ethnicity also plays a role, as we found higher referral rates in areas with a predominantly Hispanic population.

Conclusion: GIS software provides a platform for exploring the relationship between vision screening results and socioeconomic data and can be used to tailor future vision screening programs.

References: 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. The British Journal of Ophthalmology. 2016;100(8):1109-1113. doi:10.1136/bjophthalmol-2015-307206.

Diplopia After Orbital Trauma: Predicting Need for Surgical Treatment

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Poster 13

Monday
10:00 - 11:00 am

Introduction: Diplopia after orbital trauma can result in persistent strabismus by multiple mechanisms. We analyzed a cohort of patients with orbital trauma to identify the factors associated with persistent strabismus requiring treatment.

Methods: We identified patients seen at the University of Iowa between 1995 and 2015 with orbital trauma and diplopia (N=404). Data from 257 patients were collected and included in this report.

Results: 45% had no surgery, 35% had orbital fracture repair alone, 6% had strabismus surgery alone, and 14% both orbital and strabismus surgery. Horizontal deviations at initial evaluation were most likely to resolve. Vertical deviations were less likely to spontaneously improve compared to those who had orbital surgery ($p = 0.007$), strabismus surgery ($p = 0.03$) or both ($p < 0.0001$). The initial amount of vertical deviation was correlated with the need for both orbital and/or strabismus surgery (ANOVA < 0.0001).

Discussion: To our knowledge this is the largest study correlating strabismus measurements and the need for different types of surgery in the setting of orbital trauma. These findings can help clinicians identify patients who may require orbital or strabismus surgery after orbital trauma.

Conclusion: Vertical deviations 8 PD were more likely to require orbital fracture repair and/or strabismus surgery whereas horizontal deviations were more likely to resolve spontaneously.

High-Resolution Magnetic Resonance Imaging (MRI) in Diagnosis and Management of Inferior Rectus (IR) Palsy

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Los Angeles, California

Poster 14

Monday
10:00 - 11:00 am

Introduction: IR palsy presents as incomitant hypertropia due to failure of IR force transmission or generation. Here we present cases of IR palsy evaluated etiologically by high resolution MRI.

Methods: We studied fifteen hypertropic patients who demonstrated non-restrictive deficit of infraduction in abduction, excluding myasthenia gravis or immediately after orbital trauma. High-resolution, fixation controlled, surface-coil MRI with 234-312 micron resolution was obtained in 2mm thick coronal and sagittal planes. IR morphology was evaluated in central gaze, supraduction, and infraduction.

Results: Two categories of IR palsy were identified: direct mechanical myopathy (transection, avulsion, or disinsertion), and denervational (atrophy, infraction, focal lesion). Seven mechanical cases exhibited discontinuity between the muscle belly and globe secondary to trauma or endoscopic surgical accident; the IR showed increased deep bulk due to posterior recoil, and the posterior belly contracted in infraduction. Eight cases of denervational palsy exhibited atrophy of the deep IR belly sparing the tendon, and lacked contractile thickening in attempted infraduction. Denervational cases were associated with nuclear or peripheral lesions (metastasis, congenital fibrosis syndrome or schwannoma) of the IR motor nerve; infarction, surgery or trauma to the oculomotor nerve; or idiopathic atrophy without lesion identifiable on imaging.

Discussion: High resolution MRI may distinguish mechanical from neurological causes of IR palsy. In cases of deep muscle transection or atrophy, imaging of the deep orbit provides information unavailable from surgical exploration.

Conclusion: High resolution MRI should be considered in appropriate cases where MRI can distinguish mechanical from neurological causes of IR palsy. MRI surface coils used in this study were investigational, not approved by the U.S. Food and Drug Administration for this purpose.

References: 1. Chou, T., and Demer, J. L. Isolated inferior rectus palsy caused by a metastasis to the oculomotor nucleus. *Am. J. Ophthalmol.*, 126:737-740, 1998. 2. Laursen, J. and Demer, J. L. Traumatic longitudinal splitting of the inferior rectus muscle. *J. AAPOS.* 15: 190-192, 2011. 3. Jiang, L. and Demer, J. L. Magnetic resonance imaging of the functional anatomy of the inferior rectus muscle in superior oblique palsy. *Ophthalmology* 115: 2079-2086, 2008.

Poster 15
Monday
10:00 - 11:00 am

Medial Rectus Muscle Violates Sherrington's Law During Fusional Divergence In Artificial Esophoria and Intermittent Esotropia

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Introduction: We employed functional magnetic resonance imaging (MRI) to identify extraocular muscle mechanisms implementing normal fusional divergence, and compared these with intermittent esotropia [E(T)].

Methods: We studied three patients aged 36 ± 7 (SEM) yrs old, each able to fuse 29 ± 4 PD E(T), and compared them with 6 orthotropic controls. Surface coil MRI was obtained during fusion of a centered, accommodative near target with and without 8PD base-in over either eye to optically induce esophoria (prism-E) in controls, or monocular occlusion in esophoria. Contractility was indicated by change in posterior partial volume (PPV).

Results: In controls, fusion in prism-E was associated with $2.6 \pm 0.8^\circ$ (SEM, $P < 0.01$) divergence ipsilateral to prism, without other changes in position of either eye. PPV in fusing controls increased $6.3 \pm 1.5\%$ ($P < 0.01$) in the entire lateral rectus (LR) of the diverging eye, without PPV change in the contralateral LR. During fusion the superior compartment of the medial rectus (MR) in prism-E relaxed, while inferior compartment PPV was unchanged ($P < 0.05$). Patients with E(T) diverged an average of $9.8 \pm 1.4^\circ$ during fusion, associated with $10.1 \pm 4.6\%$ increase in whole LR PPV, despite a co-contractive $7.9 \pm 2.6\%$ increase in the MR superior compartment ($P < 0.04$) and no relaxation in the inferior compartment.

Discussion: Normals compensate for prism-E primarily by ipsilateral contraction of the entire LR, with relaxation of only the superior compartment of the MR. Fusional divergence in E(T) is primarily accomplished by LR contraction overcoming paradoxical co-contraction of the superior MR compartment, and failure of inferior MR relaxation. The MR thus violates Sherrington's Law in both prism-E and E(T), employing contractile patterns different from inverse convergence.

Conclusion: The physiology of fusional divergence fundamentally differs from relaxation of convergence and violates Sherrington's Law because LR contraction is not reciprocated by MR relaxation. There may be a role for selective superior compartmental surgical weakening of the MR in E(T).

References: 1. Demer, J. L., Kono, R., Wright, W. Magnetic resonance imaging of human extraocular muscles in convergence. *J. Neurophysiol.* 9: 2072-2085, 2003. 2. Demer, J. L. and Clark R. A. Differential compartmental function of medial rectus muscle during conjugate and converged ocular adduction. *J. Neurophysiol.* 112:845-55, 2014.

Poster 16
Monday
10:00 - 11:00 am

Causes of Diplopia Associated with Epiretinal Membranes

Jonathan M. Holmes; Kevin K. Veverka; Sarah R. Hatt; David A. Leske; William L. Brown;
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Introduction: Epiretinal membrane (ERM) may cause abnormalities of the retinal mosaic leading to metamorphopsia, aniseikonia, and retinal mosaic misregistration associated with binocular diplopia (aka: central peripheral rivalry, dragged fovea diplopia, or macular diplopia.)

Methods: We reviewed 25 patients with ERM and presenting diplopia and 25 with ERM and no presenting diplopia. Sensory central peripheral rivalry (CPR), indicative of retinal mosaic misregistration, was assessed with a small isolated optotype and recorded positive if the patient reported a double optotype but single monitor frame. CPR was also assessed using custom synoptophore slides. Aniseikonia was measured using the Awaya test and reported with a +/- 2% threshold.

Results: Of 25 patients with ERM and presenting diplopia, 11 (44%) had diplopia associated with CPR alone, 8 (32%) strabismus or optical alone, 2 (8%) a combination (partially responding to ground prism or surgery), and 4 (16%) indeterminate. Unexpectedly, 6 (24%) of 25 patients with ERM and no presenting diplopia had CPR by isolated optotype/frame testing and 92% by synoptophore. Aniseikonia occurred with similar frequency in ERM patients with presenting diplopia associated with CPR and non-diplopic patients (81% vs 72%, $P > 0.7$).

Discussion: Retinal mosaic abnormalities are common with ERM and retinal mosaic misregistration appears necessary but not sufficient for symptomatic diplopia of CPR type.

Conclusion: Since diplopia associated with ERM may have multiple causes, and non-diplopic ERM patients may have positive CPR test findings, it is important to consider prism or surgery in patients who appear to have diplopia associated with CPR.

References: 1. De Pool ME, Campbell JP, Broome SO, Guyton DL. The dragged-fovea diplopia syndrome: clinical characteristics, diagnosis, and treatment. *Ophthalmol* 2005;112:1455-62. 2. Burgess D, Roper-Hall G, Burde RM. Binocular diplopia associated with subretinal neovascular membranes. *Archives of Ophthalmol* 1980;98:311-7.

Oculomotor Outcomes in Children Treated for Brain Tumors of the Posterior Fossa

Maanasa Indaram, MD; Jane Edmund, MD; Yan Guo, MD, PhD; Crandall Peeler, MD;
Jeffrey Hollander; Gena Heidary, MD, PhD
Boston Children's Hospital, Boston, Massachusetts

Poster 17
Monday
10:00 - 11:00 am

Introduction: Oculomotor dysfunction including cranial neuropathies and nystagmus may occur in the setting of posterior fossa brain tumors. Data regarding incidence and management of oculomotor sequelae for children treated for posterior fossa tumors are limited. We sought to evaluate these outcomes in a large cohort of pediatric patients seen at two tertiary care centers.

Methods: A retrospective chart review from 2005 to 2011 was performed. Data including tumor type, treatment, and ophthalmic findings relevant to oculomotor outcomes pre- and post- tumor treatment were recorded.

Results: We identified 127 patients with a mean age of 7 years (4.48 years) at tumor diagnosis who fulfilled inclusion criteria. The most common tumor type was medulloblastoma. Prior to tumor treatment, strabismus occurred in 19/127 (15%) patients of whom, 12 (63%) had an abducens palsy, 2 (11%) had a trochlear nerve palsy, and 4 (21%) had a variable exotropia. Following tumor treatment, 33/127 (26%) patients had nystagmus and 45/127 (35%) had strabismus, among whom an abducens palsy was the most common cranial neuropathy occurring in 31/45 (69%) patients. Spontaneous resolution of strabismus occurred in 28/56 (50%) of patients. Of the patients with persistent strabismus, 20/56 (36%) underwent surgery with modest outcomes. Good motor alignment <10PD was achieved in 9/20 patients (45%) with 7/20 (35%) patients demonstrating the presence of stereopsis.

Discussion: Oculomotor dysfunction is common in children treated for posterior fossa tumors. Spontaneous resolution of strabismus may occur in some patients.

Conclusion: Surgical management of strabismus is difficult with modest post-operative results.

References: 1. Weiss AH, Ojemann JG, Ellenbogen RG, et al. Eye movement deficits in children with posterior fossa tumors. JAAPOS 2007; 11:104-5. 2. Shalev B, Repka MX. Restoration of fusion in children with intracranial tumors and incomitant strabismus. Ophthalmology 2000; 107(10):1880-3. 3. Williams AS, Hoyt CS. Acute comitant esotropia in children with brain tumors. Arch Ophthalmol 1989;107(3):376-8.

Incidence and Early Course of Retinopathy of Prematurity: Findings from the G-ROP study

Graham E. Quinn; Gil Binenbaum; Edward F. Bell; Pamela Donohue; David Morrison;
Lauren A. Tomlinson; Gui-shuang Ying
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Poster 18
Monday
10:00 - 11:00 am

Introduction: We determined the incidence, onset, and early course of retinopathy of prematurity (ROP) for infants examined from 2006-2012 in the Postnatal Growth and Retinopathy of Prematurity (G-ROP) Study.

Methods: Retrospective cohort study of infants undergoing serial ROP examinations at 30 hospitals in the US and Canada. Outcomes included most severe ROP in either eye, classified as no ROP, mild ROP, Type 2 ROP, or Type 1 ROP (per Early Treatment for ROP criteria); onset in postmenstrual age (PMA) for zone I and stage of ROP, plus disease, and treatment

Results: Mean BW of the 7483 infants was 1099 g (SD 359), GA 28 weeks (SD 3). 3224 (43.1%) infants developed ROP, of whom 459(6.1%) developed Type 1 and 472(6.3%) Type 2 ROP. 514(6.9%) were treated in one or both eyes. Only 147(2%) infants had zone I disease. Mean (SD) of PMA at diagnosis of stage 1 was 34.8 weeks (2.9); stage 2, 35.4(2.7); stage 3, 36.7(2.8); and Type 1, 36.5(2.6)(range 30-45). The mean PMA at Type 1 was similar among infants with GA<=26, 26-30, or >=31 weeks (36.1, 38.7, 37.5, respectively). 98.1% of Type 1 or 2 ROP occurred in infants with BW<1251 g.

Discussion: This is the largest report to date of detailed ROP data on infants meeting current screening guidelines.

Conclusion: >40% develop some stage of ROP with most ROP regressing without treatment. However, <12.5% developed severe ROP, occurring largely in <1251g BW infants.

References: Binenbaum G, Tomlinson LA for the G-ROP Study Group. Postnatal Growth and Retinopathy of Prematurity (G-ROP) Study: Rationale, Design, and Baseline Characteristics. Ophthalmic Epidemiology, in press.

Poster 19
Monday
10:00 - 11:00 am

The Relationship Between the Antecedents of Preterm Birth with Retinopathy of Prematurity

Anne M. Lynch, MD, MSPH; Ashlee M. Cerda, MPH; Tamara S. Thevarajah, MS; Jennifer K. Hodges, MD, PhD; Brandie D. Wagner, PhD; Erica M. Wymore, MD, MPH; Alan G. Palestine, MD; Emily A. McCourt, MD
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Introduction: The relationship between the antecedents of preterm birth (PTB) with retinopathy of prematurity (ROP) is unclear.

Methods: We conducted a retrospective study of 827 infants screened for ROP. Two independent reviewers masked to ROP outcomes determined if PTB resulted from spontaneous preterm labor (SPTL), preterm premature rupture of the membranes (PPROM) or a medical indication (MIPTB). Discrepancies were resolved by a third reviewer. Data were analyzed using univariate and multivariable logistic regression.

Results: We found any ROP in 247 (30%) and high-grade ROP (Type 1 or 2) in 74 (11.3%) infants. The frequency of PTB resulting from SPTL, PPROM or MIPTB was: 281(34%), 215(26%), 331(40%) respectively. Rates of any ROP across antecedent categories were: SPTL =100/281(36%), PPROM =61/215(28%) MIPTB =86/331(26%), $p=0.03$. In an analysis restricted to infants with high-grade and no ROP, the incidence of high-grade ROP in births from SPTL, PPROM and MIPTB was: 37/218 (17%), 10/164 (6%), and 27/272(10%) respectively, $p < 0.001$. Adjusted for gestational age, birth weight and multiparity and compared to the PPROM group, the odds ratios of SPTL and MIPTB for high-grade ROP were: 6.1 (95% CI 1.8-20, $p = 0.003$) and 5.5 (95%CI = 1.4-21, $p = 0.01$), respectively. Interactions were not significant.

Discussion: Compared with infants born as a result of PPROM, infants born as a result of SPTL or a MIPTB were significantly more likely to develop high-grade ROP even after adjusting for differences in gestational age and birth weight.

Conclusion: The incidence of ROP differs between the antecedents of PTB.

References: Gagliardi L, Rusconi F, Da Fre M, Mello G, Carnielli V, Di Lallo D, Macagno F, Miniaci S, Corchia C, Cuttini M. Pregnancy disorders leading to very preterm birth influence neonatal outcomes: results of the population-based ACTION cohort study. *Pediatric research*. 2013 Jun;73(6):794-801.

Poster 20
Monday
10:00 - 11:00 am

The Use of the Fenton Preterm Growth Chart and Z-scores as Growth Parameters in Assessing the Risk of Retinopathy of Prematurity

Ashlee M. Cerda, MPH; Brandie D. Wagner, PhD; Anne M. Lynch, MD; Jennifer L. Jung, MD; Erica Wymore, MD; Jasleen K. Singh, MD; Robert W. Enzenauer, MD; Emily A. McCourt, MD
University of Colorado School of Medicine
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Introduction: Numerous studies have demonstrated the importance of weight gain in the preterm infant as a risk factor for ROP. The purpose of this study was to determine, using the z-score, if infants who negatively deviate from their growth curves have a higher risk of developing high-grade ROP (hg-ROP), Types 1 & 2. The z-score is a measure of deviation from the mean weight adjusted for gestational age.

Methods: We performed a retrospective review of 1025 infants who developed hg-ROP (2006 -August 2015). Z-scores for each infant's birth and 28 day weight were calculated using the Fenton Preterm Growth Chart. The difference in z-scores over the 4 week period was determined. Data were categorized to the following change in z-score deviation (dev) groups: 0-0.5 dev, 0.6-0.9 dev, 1-1.4 dev, 1.5-1.9 dev, and > 2 dev. The incidence of hg- ROP was assessed using trend analysis and logistic regression.

Results: In the 129 (12.6%) infants who developed hg-ROP, the median (range) deviation was -0.91(-2.81-(-0.01)). Incidence of hg-ROP among the deviation groups were: 20 (10.8%), 46 (10.3%), 45 (14.8%), 14 (18.9%), and 4 (26.7%), respectively ($p < 0.01$). Infants with > 2 deviations were 1.93 times more likely to develop hg-ROP than patients who deviated 0- 0.5 from their growth curve (OR: 1.93 95% CI: 0.91-4.05 $p=0.08$)

Discussion: There was a dose-response trend in the incidence of hg-ROP as deviation scores increased.

Conclusion: Infants who deviate from their growth curve have a higher risk of developing high-grade ROP and should be closely monitored.

References: Fenton TR, Kim JH. A systematic review and meta-analysis to revise the Fenton growth chart for preterm infants. *BMC Pediatr*. 2013; 13(1):59.

Validation Study of the Colorado Model for Predicting ROP

Emily A. McCourt, MD; Gui-shuang Ying, PhD; Anne Lynch, MD, MSPH;
Ashlee M. Cerda, MPH; Brandie Wagner, PhD; Lauren Tomlinson; Gil Binenbaum, MD;
On Behalf of the G-ROP Study Group
University of Colorado, Aurora, CO

Poster 21

Monday

10:00 - 11:00 am

Introduction: The Colorado ROP (CO-ROP) model uses birth weight (BW), gestational age (GA), and net weight gain at 28 days old (WG-28) to predict risk of retinopathy of prematurity (ROP). We sought to validate the CO-ROP model's performance in a large multicenter cohort of at-risk infants.

Methods: Retrospective cohort study of infants from 30 North American hospitals between 2006-2012 with a known ROP outcome. The CO-ROP model was applied (infants would have received exams if they met all 3 criteria: BW<1501g, GA<30wks, WG-28<650g). Missing WG-28 data was treated as <650g. The primary outcomes were sensitivity and specificity for severe (ETROP Type 1 or 2) ROP, and reduction in infants receiving exams.

Results: The study included 7,483 infants. 931 infants (12.4%) had Type 1 or 2 ROP; 3,224 (43.1%) had no ROP. The CO-ROP model had a sensitivity of 97.5% (95% CI 96.3-98.4%) and a specificity of 45.1% (43.6-46.6%) for detecting severe ROP. It did not detect 23 (2.4%) infants with severe ROP. CO-ROP would have reduced infants receiving exams by 29%.

Discussion: The CO-ROP model demonstrated high but not 100% sensitivity for severe ROP. The model requires all 3 criteria to be met in order to signal a need for examinations, but some infants with BW, GA, or WG-28 above the thresholds developed severe ROP.

Conclusion: The CO-ROP model is less sensitive and specific when applied to a larger and more diverse population of neonates and needs to be revised before considering implementation into clinical practice.

References: 1. Cao, JH, Wagner BD, McCourt EA, Cerda AM, Sillau S, Enzenauer RW, Mets-Halgrimson RB, Paciuc-Beja M, Gralla J, Braverman RS, Lynch AM. Colorado Retinopathy of Prematurity Model: Post Natal Weight Gain Screening Algorithm. J AAPOS 2016 Feb;20(1): 19-24.

A National Telemedicine Network for Retinopathy of Prematurity Screening

Mario Zanolli; Diego Ossandon; Ricardo Stevenson; Ricardo Agurto; Gad Dotan
Hospital de niños Roberto del Río, Santiago Chile

Poster 22

Monday

10:00 - 11:00 am

Introduction: To assess the results of retinopathy of prematurity (ROP) screening by a telemedicine system, evaluating its usefulness for referring patients who require treatment in a national network.

Methods: Premature infants at risk of developing ROP from 11 neonatal intensive care units were included. Inclusion criteria were gestational age of 32 weeks and/or less and birth weight of 1500 g or less. RetCam Shuttle imaging system was used to capture retinal images by a trained non-physician. ROP was graded by two masked ROP experts. Image quality was also recorded. Patients who met treatment criteria were referred for further evaluation.

Results: 2048 eyes of 1024 premature infants were included. Mean gestational age was 28.8 (± 2.2) weeks, and mean birth weight was 1128 (± 279) grams. The average number of examinations per patient was 2.8 \pm 2.5. In total, 5263 telemedicine examinations were performed and reported. In 93.1% (4903/5263) of cases the vasculature was at least at the end of Zone II at the time of imaging. 5172/5263 (98.2%) of images were defined as good enough to allow interpretation. 42/1024 (4.1%) preterm infants were referred for ROP treatment. Discharged patients with ROP type 2 did not present any complications or adverse effect in the six months follow-up.

Discussion: Telemedicine screening was able to detect ROP that required treatment and showed that is feasible enough to discharge patients.

Conclusion: Our study shows the utility of telemedicine screening for ROP in a developing country.

References: 1. Athikarissamy SE, Patole S, Lam GC, Dunstan C, Rao S. Screening for retinopathy of prematurity (ROP) using wide-angle digital retinal photography by non-ophthalmologists: a systematic review. Br J Ophthalmol. 2015;99(3):281-8. 2. Retinopathy of prematurity: guidelines for screening and treatment. The report of a Joint Working Party of The Royal College of Ophthalmologists and the British Association of Perinatal Medicine. Early Human Dev 1996. 21;46(3):239-58. 3. Screening examination of premature infants for retinopathy of prematurity. A joint statement of the American Academy of Pediatric, the American Association for Pediatric Ophthalmology and Strabismus, and the American Academy of Ophthalmology. Ophthalmology. 1997;104(5):888-9

Poster 23
Monday
10:00 - 11:00 am

Mortality Rate for Premature Infants Treated for ROP with Intravitreal Anti-Vascular Endothelial Growth Factor (VEGF) Medication vs Retinal Ablative Surgery

Iason S. Mantagos, MD; Carolyn Wu, MD; Tamar Winter, BSN, RN, IBCLC;
Deborah K. VanderVeen, MD
Boston Children's Hospital, Boston, MA

Introduction: Retinopathy of prematurity (ROP) remains a potentially blinding disease requiring timely treatment. Traditional treatment is with retinal ablation surgery (laser photocoagulation and/or cryotherapy), but the use of intravitreal anti-VEGF monoclonal antibodies has become popular for the treatment of ROP. Concerns remain about the systemic safety of anti-VEGF treatments, including possible increased mortality. The goal of this study is to compare mortality rates in infants based on modality of ROP treatment.

Methods: Retrospective chart review of premature infants treated by the ophthalmology service of Boston Children's Hospital from 2006 until 2016.

Results: 4012 premature infants were screened for ROP according to the AAP/AAPOS guidelines. Of the 129 children that were treated for ROP, 102 were treated with retinal ablation surgery (laser retinal photocoagulation, cryotherapy, or both), 19 with intravitreal bevacizumab (IVB) monotherapy, and 8 with a combination of retinal ablation and IVB. A total of 7 deaths occurred: 5 among infants treated with retinal ablation surgery and 2 among those treated with IVB. The mortality rate between the retinal ablation surgery group and the IVB monotherapy group was not statistically significant ($p=0.34$). Cause of death was multifactorial for most patients.

Discussion: The mortality rate for premature infants who survived to ROP screening and treatment was 5%, and was not greater in the group that received IVB.

Conclusion: Further studies are needed to evaluate the risk for morbidity and mortality from the use of anti-VEGF agents for ROP treatment, though it appears that the death rate is no greater after anti-VEGF therapy compared to retinal ablation surgery.

References: 1) 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. 2) Huddleston SM, Calderwood J, Hoehn ME. Comparing morbidity rates in retinopathy of prematurity treated with either intravitreal bevacizumab or conventional laser therapy. *Invest Ophthalmol Vis Sci* 2014;55:6357. 3) Micieli JA, Surkont M, Smith AF. A systematic Analysis of the Off-Label Use of Bevacizumab for Severe Retinopathy of Prematurity. *Am J Ophthalmol* 2009;148:536-43.

Poster 24
Monday
10:00 - 11:00 am

Evaluation of Computer-Based Image Analysis for Retinopathy of Prematurity Screening

Sapna Tibrewal, MD; Peng Tian, BS; Dharanish Kedariseti, MS;
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Introduction: This project was designed to explore whether the i-ROP computer-based image analysis (CBIA) system could identify infants with clinically-significant retinopathy of prematurity (ROP).

Methods: We developed a CBIA system (the "i-ROP" system) to calculate a ROP severity score using methods previously published.¹ We measured the receiver operating characteristic curve, calculated the area under the curve (AUC), and the sensitivity and specificity of the i-ROP system for detecting pre-plus or worse disease in a database of 195 images. We also compared the i-ROP regression score to zone, stage, and overall ETROP category to determine the sensitivity of detecting clinically-significant disease.

Results: The AUC for the i-ROP system was 0.94. The system could detect presence of pre-plus or plus disease with a sensitivity of 95% and a specificity of 72%, and could detect 93% of ETROP type 2 disease or worse ($n=47$). The sensitivity for detection of ETROP type 1 disease ($n=27$) was 100%.

Discussion: ROP diagnosis may be highly subjective and qualitative, even by experts.² This study shows that CBIA tools have potential to assist ophthalmologists in making more accurate and consistent diagnoses. These systems could also have a significant impact in ROP telemedicine programs worldwide by optimizing the screening capacity of limited human resources and improving access to care.

Conclusion: Computer-based image analysis is able to reliably detect clinically-significant ROP with high accuracy.

References: 1. Ataer-Cansizoglu E, Bolon-Canedo V, Campbell JP, Bozkurt A, Erdogmus D, Kalpathy-Cramer J, Patel S, Jonas K, Chan RV, Ostmo S, Chiang MF; i-ROP Research Consortium. Computer-Based Image Analysis for Plus Disease Diagnosis in Retinopathy of Prematurity: Performance of the "i-ROP" System and Image Features Associated With Expert Diagnosis. *Transl Vis Sci Technol*. 2015;4:5. eCollection 2015 Nov. 2. Chiang MF, Jiang L, Gelman R, Du YE, Flynn JT. Interexpert agreement of plus disease diagnosis in retinopathy of prematurity. *Arch Ophthalmol*. 2007;125:875-80.

Notes

Notes

Poster Schedule

2nd Set of Hard Board Posters (25-48) Displayed from Tuesday, April 4, 4:15 PM - Thursday, April 6 11:45 AM

Broadway West Foyer

Interactive Poster Session - Author Presentation and Q/A - Wednesday, April 5, 9:55 - 10:55 AM

PUBLIC HEALTH

Poster #25 Self-Esteem in Strabismic and Anisometropic Children Age 4-7 Years
Eileen E. Birch, PhD
Yolanda S. Castaneda, BSN; Christina Cheng-Patel, BS; Sarah E. Morale, BS; Cynthia Beauchamp, MD;
Lori Dao, MD; Krista R. Kelly, PhD

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Self-Esteem in Strabismic and Anisometropic Children Age 4-7 Years

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Poster 25
Wednesday
9:55 - 10:55 am

Introduction: Social acceptance and physical competence are key determinants of self-perception, including self-esteem. We previously reported fine motor skill deficits in amblyopic children.(1) Here, we examine key determinants of self-esteem in 4- to 7-year-old children with or without amblyopia.

Methods: Children (n=35; age 4-7y) with strabismus, anisometropia or both completed the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children.(2) For each of 24 items, the examiner presented two gender-appropriate pictures side-by-side, one of a child with high competence/ acceptance and one with less competence/acceptance. The child first decided which picture was most like him/her and then chose a large or small circle under the picture to indicate whether this was 'really true for me' or 'sort of true for me.' The instrument provides scores for two competence domains, Cognitive Competence and Physical Competence, and for two social acceptance domains, Peer Acceptance and Maternal Acceptance. Visual acuity was tested by ATS-HOTV protocol and stereoacuity by Randot Preschool Stereoacuity Test.

Results: Compared with nonamblyopic children, (n=18), amblyopic children (n=17) had significantly lower Physical Competence (2.83 ± 0.10 vs. 3.17 ± 0.11 ; $t_{33}=2.28$, $p=0.03$) and Peer Acceptance [2.33 ± 0.13 vs. 2.92 ± 0.10 ; $t_{33}=3.62$, $p=0.001$). No significant difference was found between groups for Cognitive Competence or Maternal Acceptance. Children with nil stereoacuity had significantly lower Physical Competence ($p=0.006$) and Peer Acceptance ($p=0.03$) than children with measureable stereoacuity. There was no significant association between patching or spectacle wear and lower scores.

Discussion: Amblyopia and associated conditions, including stereo deficits, may lower perceived physical competence and peer acceptance.

Conclusion: Rehabilitation of amblyopia and associated stereo deficits may benefit two key determinants of self-esteem, perceived physical competence and peer acceptance.

References: (1) Kelly KR et al (2016) Amblyopia disrupts the development of eye-hand coordination. AAPOS poster presentation. (2) Harter S, Pike R (1984) The pictorial scale of perceived competence and social acceptance for young children. *Child Dev* 55: 1969-82.

A Novel Prognostic Scoring System in Pediatric Nonpowder Gun Ocular Injuries

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Poster 26
Wednesday
9:55 - 10:55 am

Introduction: Ocular injuries from nonpowder guns result in significant visual morbidity in children. Visual outcomes are highly variable, and there are no prognostic formulas specific to these types of ocular injuries. The purpose of our study was to assess the associated complications of pediatric nonpowder gun ocular injuries in children and develop a prognostic scoring system to predict visual outcomes.

Methods: The medical records of all pediatric patients (<19 y/o) presenting at a single institution with nonpowder gun ocular injuries from 2011 to 2016 were retrospectively reviewed. Initial clinical presentation and subsequent examinations were studied and used to develop a prognostic scoring system.

Results: A total of 28 patients met inclusion criteria. Mean age at presentation was 11.36 y/o ± 2.99 (range 5 to 17 years) and 24 out of the 28 patients (86%) were male. Hyphema was the most common presenting complication (57%), followed by traumatic iritis (36%), vitreous hemorrhage (33%), and corneal abrasion (30%). Six or 21% of the patients had a final visual acuity of 20/40 or worse. Vitreous hemorrhage ($P<0.05$) was associated with a final visual acuity worse than 20/40.

Discussion: A novel prognostic scoring system was created with a sensitivity of 83% and a specificity of 100% for predicting final visual acuity in pediatric patients sustaining nonpowder gun ocular injuries.

Conclusion: Our novel trauma scoring system serves as a useful prognostic tool in assessing pediatric nonpowder gun ocular injuries and predicting visual outcomes.

References: 1. Kuhn F, Maisiak R, Mann L, Mester V, Morris R, Witherspoon CD. The Ocular Trauma Score (OTS). *Ophthalmol Clin North Am* 2002;15:163-165. 2. Lee R, Fredrick D. Pediatric eye injuries due to nonpowder guns in the United States, 2002-2012. *J AAPOS* 2015;19:163-168. 3. Shazly TA, Al-Hussaini AK. Pediatric ocular injuries from airsoft toy guns. *J Pediatr Ophthalmol Strabismus* 2012;49:54-57.

Poster 27
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Impact of Medical Trainees on Clinical Efficiency in a Pediatric Ophthalmology Practice

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Introduction: In an academic clinical practice, little information exists to describe how medical trainees affect the flow of an ophthalmology practice. Using data obtained through electronic health records (EHR) analysis, we can understand how training physicians influences the examination and wait times for patients.

Methods: Clinical work-flow was mapped through time-stamp data obtained through the EHR. EHR analysis identified the appointment, examination, and wait times via activity by staff, medical trainees, and the pediatric ophthalmologist within the patient chart.

Results: EHR time stamps were evaluated for one pediatric ophthalmologist (LR) during each half-day session. 8013 patient encounters were identified: 853 with a trainee and 7160 without. The mean exam time with a trainee was 27% longer (37 mins with and 25 mins without a trainee, $p < 0.001$). Mean wait time was 26% longer for clinic sessions with a trainee (40 mins with and 32 mins without trainees, $p < 0.001$). Mean clinic length increased by 5.0% for a half-day session (237 mins with and 226 mins without a trainee, p -value = 0.001)

Discussion: Future studies are needed to investigate why medical trainees worsen wait times and clinical session lengths for all patients. Residents increase exam and wait times the most followed by fellows and students. Further analysis can help create schedules that maximize clinical efficiency with trainee involvement.

Conclusion: Inclusion of medical trainees within a single pediatric ophthalmology practice lengthens appointment times and worsens wait times for both the patients seen by a trainee and those who do not see a trainee.

References: 1. Hribar MR, Read-Brown S, Reznick L, Lombardi L, Parikh M, Yackel TR, Chiang MF. Secondary Use of EHR Timestamp data: Validation and Application for Workflow Optimization. AMIA Proc Annu Symp. 2015. 2. Chiang, MF, Read-Brown S, Tu DC, Choi D, Sanders DS, Hwang TS, Bailey S, Karr DJ, Cottle E, Morrison JC, Wilson DJ, Yackel TR. Evaluation of electronic health record implementation in ophthalmology at an academic medical center (an American Ophthalmological Society thesis). Trans Am Ophthalmol Soc. 2013 Sep; 111:70-92. 3. Redd TK, Read-Brown S, Choi D, Yackel TR, Tu DC, Chiang MF. Electronic health record impact on productivity and efficiency in an academic pediatric ophthalmology practice. J AAPOS. 2014 Dec; 18(6): 584-9. doi: 10.1016/j.jaapos.2014.08.002. Epub 2014 Nov 14.

Poster 28
Wednesday
9:55 - 10:55 am

Making the Modified Nishida Transposition Surgery Adjustable

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Introduction: The modified Nishida procedure is an effective surgical procedure for the management of non-resolving abducens nerve palsy. We compared the predictability of postoperative results with this procedure when combined with an adjustable or a non-adjustable MR recession

Methods: 21 consecutive patients of non-resolving abducens nerve palsy which underwent modified Nishida's procedure were randomized into two groups: AMR, with adjustable MR recession and NMR, with non-adjustable MR recession. These patients were evaluated to compare the preoperative and postoperative deviation in primary gaze by PBCT, abduction amplitude, field of binocular single vision (FBSV) and any signs of anterior segment ischemia on slit-lamp biomicroscopy

Results: Mean preoperative deviation was 57.64 ± 24.36 prism diopter, PD in the NMR group and 56 ± 23.66 PD in AMR group while the postoperative deviation was -8.36 ± 23.46 PD and 4.6 ± 3.13 PD respectively. While there was no significant difference in correction between the two groups, 6 months postoperatively, the AMR group had a significantly higher number of orthophoric (+8PD to -8PD) patients (10/10) compared to the NMR group (6/11) ($p = 0.035$). In AMR group 6/10 patients were adjusted, 5 for overcorrection, 1 for undercorrection. Improvement in abduction and FBSV was not significantly different in the two groups

Discussion: 60% of the patients in the adjustable MR recession group required postoperative adjustment indicating the role of adjustable MR recession in the originally non-adjustable transposition procedure

Conclusion: Adjustable MR recession along with Modified Nishida procedure in abducens palsy provides a more acceptable and predictable surgical outcome

References: 1 Nishida Y, Hayashi O, Oda S, Kakinoki M, Myake T, Inoki Y, et al. A simple muscle transposition procedure for abducens palsy without tenotomy or splitting muscles. Jpn J Ophthalmol. 2005;49:179-80 2 Tanaka M, Nishina S, Ogonuki S, Akaike S, Azuma N Nishida's procedure combined with medial rectus recession for large-angle esotropia in Duane syndrome. Jpn J Ophthalmol. 2011 May;55(3):264-7.

Posterior Anchoring of the Inferior Oblique for Small Angle Hypertropia with Inferior Oblique Muscle Overaction

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4# GANSU ROAD, TIANJIN, CHINA

Poster 29
Wednesday
9:55 - 10:55 am

Introduction: To evaluate the efficacy of posterior anchoring of the inferior oblique muscle (IO) in treating inferior oblique muscle overaction (IOOA) with small angle hypertropia.

Methods: The medical records of 10 patients who underwent posterior anchoring of the inferior oblique muscle from March 2014 to July 2016 were reviewed. Posterior anchoring of the IO consisted of suturing the entire body of the muscle to the sclera 5 mm posterior to the temporal insertion of the inferior rectus muscle. All patients had small hypertropias (< 5PD) in the primary gaze position with associated IOOA. Pre- and postoperative deviations both in primary and lateral gaze were measured. Face turn or head tilt position was evaluated pre and post-operation. The degree of IOOA was also assessed pre and post-operation.

Results: 9 of 10 patients had a complete resolution of IOOA. In the remaining patient the IOOA improved from +3 to +1. None of the patients had any residual vertical deviation. 5 patients with head tilts and 4 patients with compensatory face turns improved to normal position. 1 patient with mild up drift of the involved eye also improved after the procedure. All patients expressed subjective satisfaction with the surgical outcome.

Discussion: Posterior anchoring of the IO effectively weakened mild to moderate inferior oblique overaction and corrected small primary position hypertropias.

Conclusion: This procedure may be a useful addition to surgical treatment options in patients with small hypertropias associated with IOOA.

References: Tomarchio S, Sabetti L, Tomarchio M, Berarducci A. New surgical intervention for the weakening of the inferior oblique muscle: equatorial scleral anchor. *J Pediatr Ophthalmol Strabismus*. 2015 Jan-Feb;52(1):58-60.

Another Benefit of Strabismus Repair: Reduced Fixation Scatter

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Poster 30
Wednesday
9:55 - 10:55 am

Introduction: Strabismus causes binocular noncorrespondence (BNC) and interocular suppression, which impacts fixation accuracy using either eye. Optimal strabismus repair restores binocular fusion, eliminating or reducing noncorrespondence and suppression. Here we describe how the duration of BNC affects fixation accuracy.

Methods: Strabismus was produced by exposing newborn macaque monkeys (8) to chronic BNC using prisms goggles. Control monkeys (2) wore plano goggles. The duration of the noncorrespondence ranged 3-24 wks. Psychophysical and binocular eye movement recordings were performed when viewing binocularly and monocularly.

Results: Each of the monkeys reared under conditions of BNC developed esotropic strabismus (range 4° to 15°). The angle of strabismus tended to increase with duration of BNC, along with other oculomotor signs (latent nystagmus, DVD). Each animal exhibited a fixation preference for one eye though visual acuity measured by SSVEP revealed no amblyopia. Fixation accuracy was within normal limits in the monkey exposed to BNC for only 3 wks – the equivalent of repairing strabismus of 3 mos duration in a human infant. Fixation scatter plots increased in size in monkeys exposed to BNC 6-24 months. Plots were distributed as horizontal ovals centered at the fovea. Scatter was most pronounced for the non-preferred eye, which exceeded normal values 3-10 fold.

Discussion: Strabismus repair reduces or eliminates BNC and interocular suppression, which are linked to causation of inaccurate fixation. The longer BNC is allowed to persist the worse the constellation of oculomotor deficits, one of which is fixation scatter.

Conclusion: Strabismus repair reduces or eliminates BNC and interocular suppression, which are linked to causation of inaccurate fixation. The longer BNC is allowed to persist the worse the constellation of oculomotor deficits, one of which is fixation scatter.

Poster 31

Wednesday
9:55 - 10:55 am

Prevalence and Onset of Pediatric Sickle Cell Retinopathy

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Introduction: Children with sickle cell disease (SCD) can develop proliferative retinopathy with vision loss, but lack of consensus exists regarding screening regimens. We sought to determine the prevalence, age at onset, and risk factors associated with sickle cell retinopathy (SCR) to inform development of screening guidelines for asymptomatic children.

Methods: Retrospective cohort study of children with SCD over a 4 year period. Outcomes were prevalence, age at onset, and type of SCR, based upon examination by an ophthalmologist. Markers of SCD severity (#ER/hospital admissions for crises, #blood transfusions, hydroxyurea therapy/dose, transcranial-Doppler-confirmed cerebral vasculopathy), genotype, gender, race were evaluated as SCR risk factors.

Results: Of 393 children (mean age 9.6 ± 4.6 years, range 0-18), 208(52%) had SS, 113(28%) SC, 77(19%) trait. 53(13.4%) children had SCR; 44/398 (11.1%, 95%CI 8.3%-14.5%) had non-proliferative-retinopathy (NP-SCR), 9/398 (2.3%, 1.2%-4.2%) had proliferative-retinopathy (P-SCR). Prevalence was higher for SC than SS for NP-SCR (21% vs. 9%) and P-SCR (5% vs. 1%); onset for SC was earlier than SS for NP-SCR (4.8 vs. 6.1 years) and P-SCR (12.2 vs. 15.4 years). No other risk factors were significantly associated with SCR.

Discussion: Clinical markers of SCD severity were not associated with SCR and are not necessary for screening guidelines.

Conclusion: Based upon our study and literature review, while screening could begin at age 5 years for NP-SCR, screening of children without ophthalmologic symptoms to identify treatment-requiring P-SCR could begin later, at age 9 years for SC and age 13 years for SS.

Poster 32

Wednesday
9:55 - 10:55 am

Comparison of the Characteristics of Retinal Hemorrhages in Abusive Head Trauma versus Normal Vaginal Delivery

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Introduction: Retinal hemorrhage (RH) is one of the hallmarks of abusive head trauma (AHT); however RH is also encountered with normal vaginal deliveries (NVD), and thus presents the clinician with a diagnostic dilemma. To further elucidate differing characteristics between the two groups, a comparison study was performed which evaluated RHs in an AHT group versus an NVD group.

Methods: Twenty patients with AHT and 200 NVD infants with retinal hemorrhages (RH) evaluated from 2013 to 2015 were included in this study. Pattern, size, extent, and severity were compared using Retcam images. Severities were calculated using the CHOP RH grading scale

Results: RH size was significantly larger in AHT patients compared to the NVD group (3.1 ± 0.512 vs 0.96 ± 0.046 disc diameters, respectively, $p < 0.001$). The AHT group also demonstrated a higher RH incidence involving all three retinal layers compared to the NVD group (60% vs 0.6%, respectively, $p < 0.001$). Vitreous hemorrhages were encountered more commonly in the AHT group (54.3%) in comparison to the NVD group (1.5%) ($p < 0.001$). Overall, grading demonstrated higher scores in the AHT group than the NVD group (7.15 ± 0.948 vs 3.59 ± 0.274 , respectively, $p < 0.01$). All patients in the AHT group demonstrated one or more other systemic findings, including epidural hemorrhage, loss of consciousness and seizure (100%) in contrast to the NVD group (0%) ($p < 0.0001$). The number of RHs and involved zones were not significantly different in either group ($p = 0.495$, $p = 0.034$ respectively).

Discussion: AHT presented with more severe retinal findings than NVD, including larger RH size, a higher percentage involving all three retinal layers, a higher percentage of vitreous hemorrhages, and higher CHOP RH grading scale scores.

Conclusion: In cases wherein NVD retinal findings are more extensive than anticipated, it is important to explore other factors suggestive of AHT, such as a history of loss of consciousness, history of seizures, and epidural hemorrhages observed on neuroimaging.

References: 1. Binenbaum G, Mirza-George N, Christian CW, et al. Odds of abuse associated with retinal hemorrhages in children suspected of child abuse. J AAPOS. 2009;13:268-72. 2. Watts P, Maquire S, Kwok T, et al. Newborn retinal hemorrhages: A systemic review. J AAPOS 2013;17:70-8. 3. Kivlin JD. Manifestations of the shaken baby syndrome. Curr Opin Ophthalmol 2001;12:158-63.

Risk of Retinal Detachment in Children with Ocular Coloboma

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Poster 33

Wednesday
9:55 - 10:55 am

Introduction: Optic nerve (ONC) and chorioretinal (CRC) coloboma are associated with retinal detachment (RD). The risk during early childhood is unclear. We determined the prevalence and age at onset of acquired RD in children with coloboma.

Methods: Retrospective cohort study of children with ONC and/or CRC, examined over 4-years at a children's-hospital-based clinic. Eyes with presumed congenital RD or retinal dysplasia were excluded. Primary outcomes were prevalence and age at diagnosis of acquired RD.

Results: 208 eyes (120 children) were studied. Median age at latest examination was 5.2yrs (Q1,2yrs; Q3,10yrs, range 0.1-19.9yrs). 35(29%) children had genetic/syndromic associations. 69(58%) children had bilateral involvement. 143(69%) eyes had ONC, 141(68%) CRC, 76(37%) both. ONC size was small-medium-large in 9%-57%-34% eyes; CRC was small-medium-large in 10%-57%-33% eyes. CRC involved macula and periphery, 59%; periphery only, 41%. Two eyes (2 children) had acquired RD (0.96%, 95%CI 0.3%-3.4%): one chronic-appearing RD, diagnosed 7yrs; one acute RD, diagnosed 13yrs.

Discussion: Reported prevalence of RD with ONC/CRC varies with age and referral bias: >40%, adults, high bias; 24%, children, high bias; 7% children, low bias; 0-4%, children, no bias (population-based). Our findings confirm a low incidence early in life, though onset has been reported during infancy.

Conclusion: RD associated with coloboma is uncommon in early childhood but does occur, so screening examinations are indicated. Prior referral-based and population-based reports have suggested a wide range of incidence, varying from 1-40%. A more complete understanding of secondary retinal detachment, including incidence, risk factors, and ocular associations, is needed before considering possible prophylactic treatments.

References: 1. Daufenbach et al. *Ophthalmology* 105:1455-8, 1998. 2. Morrison et al. *Ophthalmology* 106:645-6, 1999. 3. Uhumwangho et al. *Eye* 28:728-33, 2014.

Direct Measurement of Optic Nerve Size with Ultra Widefield Digital Camera

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Poster 34

Wednesday
9:55 - 10:55 am

Introduction: The size of the optic nerve has important implications in pediatric ophthalmology(1), however reliable measurements with direct or indirect ophthalmoscopy are complicated by lack of a direct reference and magnification-minification issues with refractive error.

Methods: We developed a method for efficient acquisition of fundus images with Optos California model (Optos, Dunfermline Scotland) in children as young as newborns. Refractive error and clinical diagnoses were recorded. Software allowed image zoom and direct linear measurement.

Results: 57 normal subjects had images for regression of horizontal optic nerve diameter regressed against refractive error: nerve size = $0.0002(\text{spherical equivalent}) + 1.66$, $r^2 = 0.0001$. Normal subjects had horizontal diameters with mean of 1.66 ± 0.14 units. Clinical cases of optic nerve hypoplasia had diameters of 1.23 ± 0.30 units.

Discussion: Widefield imaging is optically different from conventional fundus imaging with respect to refractive error; we found independence. 96% of normal optic nerve horizontal diameters fall between 1.38 and 1.94 units.

Conclusion: Quick Ultra widefield fundus images with simple image analysis affords a practical way to quantitate optic nerve size with implications for optic nerve hypoplasia (2), amblyopia (3) and coloboma.

References: (1) Hotchkiss ML, Green WR. Optic nerve aplasia and hypoplasia. *J Pediatr Ophthalmol Strabismus* 1979;16:225-40. (2) Zeki S, GN D: Optic nerve hypoplasia in children. *Br J Ophthalmol* 1990, 74:300-304. (3) Lempert P: Optic nerve hypoplasia and small eyes in presumed amblyopia. *J AAPOS* 2000, 4(5):258-266.

Poster 35
Wednesday
9:55 - 10:55 am

Ocular-Hypertensive Response to Topical Rimexolone versus Topical Dexamethasone versus Topical Fluorometholone in Children after Bilateral Strabismus Surgery

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Introduction: This study aims to compare the effects of topical Rimexolone versus Dexamethasone versus Fluorometholone on the intraocular pressure(IOP) in children less than 13 years of age.

Methods: 40 patients(80eyes) who underwent bilateral symmetric recession strabismus surgery were divided into two equal groups. GroupA included 20 children(40eyes), in which one eye was randomized to receive topical 1%Rimexolone, whereas the fellow eye received topical 0.1%Dexamethasone. GroupB included 20 children(40eyes) in which one eye was randomized to receive topical 1%Rimexolone, whereas the fellow eye received topical 0.1%Fluorometholone. Pre-operative and post-operative IOP values on weeks 1,2,3,4 and 6 were taken using the Tono-PenAVIA® under topical anesthesia. The ocular-hypertensive response of both groups was categorized into high, intermediate and low according to the Armary and Becker Classification.

Results: The peak IOP and the maximal IOP change were reached after 2 weeks of treatment in both groups. They were significantly higher in the Dexamethasone-treated eyes than in the Rimexolone- and Fluorometholone treated eyes, which had a comparable change.(Week 2 IOP in mmHg GroupA: 14.15+3.23 vs 17.95+4.27 GroupB: 15.1+2.27 vs 15.2+2.73). In both groups the increase was statistically significant compared to baseline IOP.(Preoperative IOP GroupA: 13.2+3.53 vs 13.1+3.43 GroupB: 12.55+2.98 vs 12.15+3.31). The IOP returned to near pre-operative values over the consecutive 4 weeks.(Week 6 IOP GroupA: 12.25+2.67 vs 12.55+2.95 GroupB12.15+2.8 vs 12.00+2.75).

Discussion: All patients were either intermediate or low responders.

Conclusion: Although Dexamethasone was found to cause a higher elevation in IOP than Rimexolone and Fluorometholone in children, the ocular hypertensive response was transient after the 2-week course.

References: 1. Ocular hypertensive response to topical dexamethasone in children: a dose-dependent phenomenon. Ng, JS, et al. 11, Nov 2000, Ophthalmology, Vol. 107, pp. 2097-2100. 2. A comparison of four methods of tonometry: method agreement and interobserver variability. Tonnu, PA, Ho, T and Sharma, K. 7, 2005, British Journal of Ophthalmology, Vol. 89, pp. 847-850. 3. Efficacy and safety of Rimexolone 1% ophthalmic suspension vs 1% Prednisolone Acetate in the treatment of uveitis. Foster, CS, et al. 122, Boston, USA : American Journal of Ophthalmology, 1996, American Journal of Ophthalmology, Vol. 2, pp. 171-182.

Poster 36
Wednesday
9:55 - 10:55 am

Abnormal Optic Nerve (ON) Traction on the Globe During Adduction in Normal Tension Glaucoma (NTG)

Robert A. Clark; Soh Y. Suh; Joseph Caprioli; JoAnn A. Giaconi; Kouros Nouri-Mahdavi;
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Introduction: ON straightening by medial rectus muscle counterforce during adduction may mechanically load the globe-ON junction, creating repetitive strain that could produce intraocular pressure (IOP) independent progressive ON degeneration in NTG.

Methods: Sixteen NTG patients and 30 normals underwent high-resolution, surface coil, quasi-coronal orbital magnetic resonance imaging in central gaze, abduction, and adduction to angles measured by displacement of globe-ON junctions. Globe size was estimated from images. ON area centroids were plotted in three-dimensions (3D) to determine ON lengths relative to minimum straight-line paths. Globe translation was determined 3D centroid displacement and globe elongation was calculated from differential translation of the posterior border of the globe.

Results: Average abduction ($20.8^{\circ} \pm 1.0^{\circ}$ versus $20.7^{\circ} \pm 0.8^{\circ}$) and adduction ($28.2^{\circ} \pm 0.9^{\circ}$ versus $26.6^{\circ} \pm 1.1^{\circ}$) angles were similar between groups. Coronal globe diameters were significantly larger in NTG (25.9 ± 0.2 versus 25.2 ± 0.2 mm, $p=0.01$). The ON significantly straightened only in adduction for both groups: $102.1\% \pm 0.2\%$ of minimum path length in adduction versus $104.4\% \pm 0.5\%$ in central gaze for NTG ($p=10^{-7}$), and $101.6\% \pm 0.1\%$ versus $102.7\% \pm 0.3\%$ for normals ($p=10^{-6}$). During adduction, the globe shifted medially in both groups, but in NTG the globe center retracted significantly farther posteriorly (0.7 ± 0.1 versus 0.1 ± 0.1 , $p=10^{-6}$) and elongated vertically (0.5 ± 0.1 versus 0.2 ± 0.1 , $p=10^{-5}$).

Discussion: In NTG, ON straightening during adduction abnormally pulls the globe posteriorly and elongates the globe inferiorly, reflecting globe tethering with mechanical loading of the globe-ON junction.

Conclusion: Although ON tethering in adduction is normal, in NTG there is greater globe displacement and deformation that may cause IOP-independent, neuropathic mechanical loading of the ON head and peripapillary sclera.

References: 1. Demer, J. L. Optic nerve sheath as a novel mechanical load on the globe in ocular duction. Invest. Ophthalmol. Vis. Sci. 57:1826-38, 2016.

Normal Ciliary Body Growth Using Anterior Segment Ultrasound Biomicroscopy

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Poster 37
Wednesday
9:55 - 10:55 am

Introduction: The ciliary body (CB) may be important in the pathogenesis of pediatric glaucoma and ultrasound biomicroscopy (UBM) is the best tool for visualizing this anatomy effectively, in vivo. Our understanding of specific UBM structural findings related to the normal pediatric CB is extremely limited. This study aims to use UBM technology to define a descriptive study of CB structural changes with eye growth in normal infants and young adults.

Methods: UBM of 14 normal eyes from 8 infants and 6 young adults were included in this study. UBM of the anterior segment focusing on the CB were performed. Image analysis and data collection were completed utilizing ImageJ software.

Results: The significant differences in CB measurements between infants and young adults were found in each of the parameters: CB thickness, CB area, CB internal density, trabecular ciliary process distance, angle from CB to corneal endothelium, and angle from CB to iris processes. These measured parameters confirm an established trend of exponential growth up until age 1, slowed growth from ages 1 to 5, and very minimal growth from ages 5 to 25 years.

Discussion: All angle structures showed an accelerated growth phase before age 1 and a slow phase up until age 5, mirroring the axial growth of the eye.

Conclusion: The study established a consistent ocular growth trend for normal pediatric CB measurements using UBM. A detailed and comprehensive description of normal pediatric anterior segment anatomy and growth is integral to our future studies to better understand CB changes in congenital and childhood glaucoma.

References: 1. Silverman, RH (2009). High-resolution ultrasound imaging of the eye - a review. *Clinical & Experimental Ophthalmology*, 37(1), 54-67. 2. Pavlin CJ, Harasiewicz K, Foster FS. Ultrasound biomicroscopy of anterior segment structures in normal and glaucomatous eyes. *Am J Ophthalmol*. 1992; 113: 381-9. 3. Hussein TR, Shalaby SM, Elbakary MA, Elseht RM, GAD RE. Ultrasound biomicroscopy as a diagnostic tool in infants with primary congenital glaucoma. *J AAPOS* 2007; 11: 546-550

Strabismus Following Glaucoma Drainage Device Implantation for Refractory Childhood Glaucoma: Incidence and Risk Factors

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Poster 38
Wednesday
9:55 - 10:55 am

Introduction: The reported incidence of strabismus following glaucoma drainage device (GDD) implantation in adults and children ranges from 1.4% to 77%¹⁻³ with most studies retrospective, and with few risk factors identified. Purpose: to determine incidence and risk factors for strabismus in children following GDD implantation.

Methods: Ongoing retrospective review of sequential GDDs implanted for refractory pediatric glaucoma (ages 0-21 years) under one attending surgeon from 1999-2015. Clinical features gathered included glaucoma type/details, pre-/post-GDD vision and sensorimotor findings (binocularity/motility/alignment[primary gaze]), and surgical details (#GDDs/eye, GDD type/location). Significant alignment change included: new-onset post-GDD strabismus and ≥ 10 PD increase (horizontal and/or vertical).

Results: Thirty-nine participants with appropriate data pre- and post-GDD have been enrolled to date. Mean age at GDD was 8.1 \pm 5.3yrs, with glaucoma diagnoses including primary congenital (7, 18%), post-cataract surgery (18, 46%), Sturge-Weber (4, 10%) and other (10, 26%). GDDs included Baerveldt (BVT) 250 (22, 56%), BVT 350 (6, 39%), and Ahmed FP7 (11, 28%). Pre-GDD strabismus occurred in 30 (77%) [horizontal 29, vertical 9, both 8], with motility limitation in 10 (26%). Post-GDD alignment change occurred in 12 (31%) at either early (2-6mos) or late (>6-18mos) post-operative visits; changes were horizontal (7, 58%), vertical (4, 33%), and both (1, 8%). 2/11 (18%) had post-GDD alignment changes noted late but not early. Post-GDD, 13 (33%) patients had new motility limitation; 6 (46%) of these had new/worsened primary gaze misalignment. Relative risk of post-GDD strabismus with age, glaucoma diagnosis, GDD (type/location), and pre-GDD strabismus was non-significant.

Discussion/Conclusion: Strabismus, common in refractory childhood glaucoma, frequently worsens post-GDD implantation. Post-GDD motility limitation is associated with worsening misalignment in a large number of patients. Risk factors for post-GDD misalignment and motility limitation may surface with larger participant numbers.

References: 1. O'Malley Schotthoefler E, Yanovitch TL, Freedman SF. Aqueous drainage device surgery in refractory pediatric glaucomas: I. Long-term outcomes. *J AAPOS*. 2008;12(1):33-9. 2. Rauscher FM, Gedde SJ, Schiffman JC, Feuer WJ, Barton K, Lee RK. Motility Disturbances in the Tube Versus Trabeculectomy Study During the First Year of Follow-up. *Am J Ophthalmol*. 2009;147(3):458-66. 3. Abdelaziz A, Capó H, Banitt MR, Schiffman J, Feuer WJ, McKeown CA, et al. Diplopia after glaucoma drainage device implantation. *J AAPOS*. 2013;17(2):192-6.

Poster 39Wednesday
9:55 - 10:55 am**Ahmed Valve Capsulectomy In Children: A Retrospective Chart Review**Lauren E. Fletcher, DO; Rosie Lee, MS4; John Roarty, MD
Children's Hospital of Michigan, Detroit, MI

Introduction: The use of glaucoma drainage implants is a common treatment for pediatric glaucoma when pressures cannot be controlled. Previous studies have reported failure of Ahmed Valves when the plate of the valve develops a fibrous capsule leading to elevated intraocular pressures (IOPs). The purpose of this study was to evaluate the success of Ahmed Valve Capsulectomies in children.

Methods: The medical records of patients aged 2 months to 15 years that had Ahmed Valves placed with subsequent capsulectomies between November 1999 and May 2016 were reviewed. Patients were evaluated prior to Ahmed valve placement, and followed monthly until Ahmed valve failure. Patients were then followed monthly after capsulectomy was performed. Surgical success was defined as post-capsulectomy IOP similar to IOP prior to valve failure without additional procedures.

Results: A total of 14 capsulectomies from 13 eyes of 10 patients were studied. The mean pre- and post- Ahmed Valve IOP was 33 (+/-4) and 17 (+/-4), respectively. The mean failed IOP was 29 (+/-4), and the mean post-capsulectomy was 19 (+/-3). There was an overall 37% drop in IOP after capsulectomy (p=.004). 7 out of 14 capsulectomies failed an average of 15 months post-capsulectomy.

Discussion: Removal of valve capsules results in lower IOPs in the pediatric population. This could prove to be a temporizing if not permanent solution in children that may otherwise require further surgery to lower IOP.

Conclusion: Ahmed Valve capsulectomy is a safe and effective option in children who have failed tube shunt surgery secondary to capsule growth over the valve plate.

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Poster 40Wednesday
9:55 - 10:55 am**Chromosomal Microarray Analysis in Congenital and Developmental Cataracts**Nutsuchar Wangtiraumnuay, MD; Jenina Capasso, MS; Michelle D. Lingao, MD;
Wadakarn Wuthisiri, MD; Zi-Xuan Wang, PhD; Erica Johnson, PhD; Vikas Khetan, MD;
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Introduction: The etiology of congenital and developmental cataract is diverse. Most are not syndromic and have no identifiable cause, thus creating a diagnostic dilemma. We investigated the utility of chromosomal microarray, in identifying the etiology of non-syndromic cataracts.

Methods: Patients with congenital or developmental cataract without associated other abnormalities were enrolled. Single-nucleotide polymorphism (SNP) microarray was performed. Segregation analysis was done on positive specimens. Copy number variants (CNV) were compared with previous literature reports and analyzed for candidate genes to assess pathogenicity.

Results: We enrolled 37 patients. Mean age was 10.98 years old. Nineteen patients (51.35%) had bilateral cataract. Positive family history was found in 11 patients (29.73%). Eighteen patients (48.65%) had abnormal microarray: 10 (27.03%) with CNV, 5 (13.51%) with regions of homozygosity and 3 patients with both CNV and homozygosity. In 3 patients (8%), we found a potentially causative cataract gene within a homozygous region.

Discussion: We detected a high rate of CNV and homozygosity. Three patients were homozygous in a region known to have a cataract gene suggesting an autosomal recessive disease. Some CNV were immediately near cataract genes and others may lead to identification of new genes.

Conclusion: SNP microarray had a surprisingly high rate of abnormal findings in patients with isolated cataract and may offer families the opportunity for genetic counselling, the potential of identifying other affected genes that could lead to other clinical abnormalities, and the discovery of new cataract genes.

References: 1. Hao D, Lamei Y. Molecular genetics of congenital nuclear cataract. *Epub Dec 30, 2013 Euro J Med Genet*. 2014; 57:113-22. 2. Alessandro S, Mauro W. The genetic and molecular basis of congenital cataract. *Arq Bras Oftalmol*. 2011; 74(2):136-42 3. Alexander U., Christopher H., Marina K., Shao-Chun C., Jun Z., Yucheng F., Edouard E. G., Monita W., Philip W.M. The identification and characterization of two phosphatidylinositol-4,5-bisphosphate 4-phosphatases. *Proc. Nat. Acad. Sci*. 2005; 102:18854-18859.

Developing a Model for Postoperative Axial Length in Children Undergoing Bilateral Cataract Surgery to Optimize Visual Outcomes

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Poster 41
Wednesday
9:55 - 10:55 am

Introduction: The purpose of this study was to develop a model for predicting postoperative globe axial length (AL) following ocular growth in children undergoing bilateral cataract surgery, with the goal of improving intraocular lens (IOL) power selection at the time of implantation.

Methods: This was a retrospective chart review of children who underwent bilateral cataract surgery. We analyzed variables that could influence globe axial growth following surgery and developed a multivariable GEE (generalized estimating equation) regression model of AL.

Results: The sample size was 100 children (200 eyes). Children underwent surgery between 1.8 and 17 years of age (mean=6.84) and were followed postoperatively for an average of 5.94 years with serial AL measurements. The final model of postoperative AL included AL at time of surgery (baseline AL), patient baseline age, age at follow-up, and the interaction between baseline age and age at follow-up.

Discussion: By knowing a patient's baseline AL and baseline age, we can use the multivariable model to predict AL at a chosen follow-up age with the following equation: Postoperative AL = $1.93 + 0.91*(\text{Baseline AL}) - 0.07*(\text{Baseline Age}) + 0.16*(\text{Age at follow-up}) - 0.0067*(\text{Baseline Age})*(\text{Age at follow-up})$. The predicted postoperative AL value could be used in IOL power calculations before surgery.

Conclusion: IOL power selection is a major challenge of pediatric cataract surgery due to unpredictable future eye growth. This model could theoretically be used to predict individual future adult sizes for each child undergoing cataract surgery, making IOL selection more accurate.

References: 1. Eibschitz-Tsimhoni M, Archer SM, Del Monte MA. Intraocular lens power calculation in children. *Surv Ophthalmol* 2007;52:474-82. 2. Lin AA, Buckley EG. Update on pediatric cataract surgery and intraocular lens implantation. *Curr Opin Ophthalmol* 2010;21:55-9. 3. Trivedi RH, Wilson ME. Biometry data from Caucasian and African-American cataractous pediatric eyes. *Invest Ophthalmol Vis Sci* 2007;48:4671-4678.

Accuracy of Preoperative IOL Master Lens Power Calculations for Artisan Aphakia Lenses in Children

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Poster 42
Wednesday
9:55 - 10:55 am

Introduction: The purpose of this study is to assess the accuracy of lens power calculations in the implantation of Artisan Aphakia lenses in pediatric eyes.

Methods: Retrospective comparative analysis was performed for 36 eyes of 19 pediatric patients undergoing Artisan lens implantation. Ocular biometry was performed with IOLMaster. Predicted refractive outcomes were compared to actual refractive outcomes. Mean absolute prediction errors (APE) and prediction errors (PE) were calculated.

Results: Mean patient age was 11.4 years old. 7/36 (19.4%) eyes were phakic and 29/36 (80.6%) eyes were aphakic at the time of surgery. Mean axial length was 24.17 ± 1.33 mm. The APE was lowest using Hoffer Q (0.41 ± 0.24 D), followed by Holladay 1 (0.45 ± 0.30 D), SRK/T (0.47 ± 0.33 D), SRK II (0.53 ± 0.35 D), and Haigis (1.72 ± 0.59 D). The PE was closest to plano using SRK/T (-0.12 ± 0.57 D), followed by Hoffer Q (0.23 ± 0.42 D), Holladay 1 (0.27 ± 0.47 D), SRK II (-0.33 ± 0.55 D), and Haigis (1.72 ± 0.62 D). In phakic eyes, APE was lowest for Holladay 1 (0.18 ± 0.30 D) and Hoffer Q (0.29 ± 0.27 D). In aphakic eyes, APE was similar (range $0.43 - 0.52$ D) for all formulae except Haigis.

Discussion: Good results were obtained using Hoffer Q, Holladay 1, SRK II, and SRK/T formulae. Haigis was the least accurate formula. Holladay 1 and Hoffer Q were the most accurate in phakic eyes.

Conclusion: This study helps establish the reliability of various formulae in lens power calculations for implantation of Artisan Aphakia lenses in pediatric patients.

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Wednesday
9:55 - 10:55 am

Primary Intraocular Lens Implantation in Infants Less than 6 Months: A Long Term Outcome

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Introduction: Intraocular lens (IOL) implantation in infants still remains challenging despite advances in pediatric cataract surgery. We aimed to study the long term safety profile and visual outcomes of primary IOL implantation in infants less than 6 months of age.

Methods: Retrospective, observational study of a selected few infants who underwent cataract surgery (lens aspiration, primary posterior capsulorhexis and anterior vitrectomy) with primary IOL implantation between January 2008 and December 2011, with a minimum 3 year follow-up.

Results: 71 eyes of 40 infants (31 bilateral, 9 unilateral; mean age 4.6 months) satisfying the inclusion criteria were reviewed. Mean follow-up was 51 months (range: 36 – 84). Median corrected visual acuity at final visit was 0.74 logMAR (interquartile range: 0.501-1.000 logMAR) with an average myopic shift of 6.7 dioptres over 4.2 years. Most common post-operative complication was visual axis opacification (VAO), seen in 13 eyes (18%), mandating membranectomy within 1 year of primary surgery. Other complications included pigmentary IOL deposits in 11 eyes (15%), IOL decentration and glaucoma in 4 eyes each (5.6%). Analysis using a mixed linear effect model found no significant association of laterality of cataract and post-operative complications with final visual acuity ($p \geq 0.12$ for all observations).

Discussion: Our study suggests that primary IOL implantation provides early and optimal visual rehabilitation even in younger infants. VAO was the commonest post-operative complication to develop, however the overall complication rate was significantly lower compared to other studies.

Conclusion: Primary implantation of IOL in appropriately selected infants, even under 6 months is safe with favourable visual outcome.

References: 1. Ram J, Brar GS, Kaushik S, Sukhija J, Bandyopadhyay S, Gupta A. Primary intraocular lens implantation in the first two years of life: Safety profile and visual results. *Indian J Ophthalmol.* 2007; 55: 185-9. 2. Lundvall A, Zetterström C. Primary intraocular lens implantation in infants: Complications and visual results. *Journal of Cataract & Refractive Surgery.* 2006; 32(10): 1672-7. 3. O'Keefe M, Fenton S, Lanigan B. Visual outcomes and complications of posterior chamber intraocular lens implantation in the first year of life. *Journal of Cataract & Refractive Surgery.* 2001; 27: 2006-11.

Poster 44
Wednesday
9:55 - 10:55 am

Pediatric Cataract Surgery: Unexpected Returns to the Operating Room within One Year

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Introduction: Previous studies have provided excellent data regarding the reoperation rates for infant eyes undergoing cataract surgery at less than 7-months of age. At present, generalizable data for incidence of unplanned return to the operating room following cataract surgery in the full spectrum of the pediatric age group are not readily available.

Methods: Retrospective chart review, with IRB approval, was carried out for eyes undergoing cataract surgery at a single institution 8/2012 through 8/2015, examining unexpected returns to the operating room. Age over 18 and ectopia lentis were excluded.

Results: One-hundred sixty-three (163) eyes met inclusion criteria. Fifteen (9.2%) eyes were unexpectedly re-operated within 1-year of cataract extraction, encompassing twenty additional surgeries. Eyes of children 7-months of age and older at the time of surgery demonstrated a reoperation rate of 2.6% (3 of 114 eyes), with those younger than 7 months of age exhibiting 24.5% (12 of 49 eyes) (Relative risk: 9.5, $P = 0.0003$). Total reoperations included 10 for after-cataract, 7 for glaucoma, 1 pupilloplasty, 1 retained lens cortex, and 1 for a vitreous strand.

Discussion: The results offered by this cohort demonstrate a reoperation rate indicative of the inherent risk of undergoing surgery at a younger age, with equally robust evidence of the decreased incidence of older patients within the same consecutive cohort. These data may assist with counseling parents and patients, as well as assessing for quality.

Conclusion: Rate of return for older infants and children decreases dramatically compared with eyes undergoing operation in early infancy.

Cataract Incidence and Severity After Therapeutic Radiation for Brain Tumors

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Poster 45

Wednesday
9:55 - 10:55 am

Introduction: To determine the incidence of cataract formation and requirement for cataract surgery in a pediatric population receiving therapeutic radiation for brain tumors (SJMB03). A lower risk group (LR), without known metastasis, received 23.4 Gy and a higher risk (HR), with known metastatic disease, received 36 -39.6 Gy.

Methods: Chart review of patients enrolled in SJMB03 study who received an ophthalmic exam.

Results: 162 patients met inclusion criteria (104 LR and 58 HR). Sixty-four patients developed cataracts (39.5%). Forty-four (42.3%) developed cataracts in LR versus 20 (34.5%) in HR. Median time to cataract formation was 92.75 months (range 22-146) in LR and 44.75 months (range 22-118) in HR. Twenty-seven patients required cataract surgery (16.7% of the total patients and 42.2% of those that developed cataracts). 35.5% of LR cataracts required extraction while 60% of HR cataracts required extraction (P=0.05). Median length of follow up for patients without cataracts was 18.5 months in LR and 6 months in HR. 11 patients in HR died during the follow up period, while 4 in LR expired (P<0.001).

Discussion: Cataract formation is common in patients receiving radiation therapy for brain tumors. There was no statistically significant difference in cataract formation between HR and LR. More patients in HR expired during follow up, which likely led to a lower detection rate. Patients in HR were more likely to need cataract surgery.

Conclusion: Long term ophthalmic follow up is needed for these patients as cataracts can appear years later and almost half of these patients will require cataract surgery.

References: 1. Zierhut D, Lohr F, Schraube P, Huber P, Wenz F, Haas R, Fehrentz D, Flentje M, Hunstein W, Wannenmacher M. Int J Radiat Oncol Biol Phys. Cataract incidence after total-body irradiation. 2000 Jan 1;46(1):131-5. 2. Dynlacht JR. The role of age, sex and steroid sex hormones in radiation cataractogenesis. Radiat Res. 2013 Dec;180(6):559-66. doi: 10.1667/RR13549.1. Epub 2013 Nov 21. 3. Packer RJ, Gurney JG, Punyko JA, Donaldson SS, Inskip PD, Stovall M, Yasui Y, Mertens AC, Sklar CA, Nicholson HS, Zeltzer LK, Neglia JP, Robison LL. Long-term neurologic and neurosensory sequelae in adult survivors of a childhood brain tumor: childhood cancer survivor study. J Clin Oncol. 2003 Sep 1;21(17):3255-61.

Evaluating the Pediatric Ocular Surface Microbiome

Kara M. Cavuoto; Anat Galor; Ta C. Chang; Julia D. Rossetto; Eduardo Alfonso;
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Poster 46

Wednesday
9:55 - 10:55 am

Introduction: Bacteria play an important role in maintaining health throughout the human body, including the ocular surface. Although other body surfaces have been extensively studied, relatively little is known about the ocular microbiome in children. Traditional culture fails to reveal the diversity of the ocular surface microbiome; however, newer technologies that utilize bacterial genetic material may be useful.

Methods: Prospective, cross-sectional study using culture and 16S sequencing.

Results: 50 patients with an average age of 37 months (range 1-168 months) were enrolled. 47 eyes of 30 patients had a positive culture. The average age differed between culture positive and negative patients (43 vs 29 months), however was not statistically significant (p=0.19). Prior surgery did not correlate with culture growth (p=0.71). Of the 52 total isolates, Coagulase negative Staphylococcus was the most common (18/52). With 16S sequencing, Staphylococcaceae and Streptococcaceae were dominant, followed by Corynebacteriaceae and Actinomycetaceae. Older children had significantly greater diversity of the ocular surface microbiome than younger children (p=0.03). No differences were found in the observed or Shannon Diversity Index between children without prior surgery compared to unilateral or bilateral surgery (p=0.58-1.00) or right and left eyes regardless of surgery status (p=0.67-1.00).

Discussion: 16S sequencing revealed a greater variety of microbes in the ocular surface microbiome than traditional culture. Older age correlated with a more diverse microbiome. Ocular surgery does not permanently alter the microbial composition.

Conclusion: 16S sequencing is a useful tool in evaluating the complexity of the ocular surface microbiome in children, identifying a wider diversity of microbes than culture-based techniques.

References: 1. Human Microbiome Project Consortium. Structure, Function and Diversity of the Healthy Human Microbiome. Nature 2012;486:207-14. 2. Ding T, Schloss PD. Dynamics and associations of microbial community types across the human body. Nature 2014;509:357-60.

Poster 47
Wednesday
9:55 - 10:55 am

Treatment of Pediatric Ocular Surface Pyogenic Granuloma with Topical Timolol

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Introduction: Pyogenic granulomas (PGs), acquired vascular lesions, form on the ocular or palpebral surface from inflammation related to chalazia, trauma, or surgery. They are unsightly, spontaneously bleed, and cause irritation. Traditional treatment with topical steroids and surgery has side effects. We queried whether beta-blockers might resolve these lesions given that the dermatologic literature suggests response.[1,2,3]

Methods: We reviewed the case records of children with acquired, ocular surface PGs treated at Boston Children's Hospital from 2014-2016. We identified treatment with timolol, and we abstracted the cause, duration, and symptoms of the PG in these cases as well as the treatment duration and response.

Results: Four cases of PG treated with timolol 0.5% were identified during this time frame. Each was treated twice daily for 30 days, and each showed complete resolution with no recurrence and with no adverse effects.

Discussion: This pilot case series suggests that ocular surface PGs respond to topical timolol treatment similar to dermatologic PGs.

Conclusion: Topical timolol has a lower side-effect profile than conventional topical steroid or surgical therapies for ocular surface PGs. If these results are confirmed in a larger series of patients, this may become the desired treatment modality.

References: 1. Lee LW, Ph D, Goff KL, et al. Treatment of pediatric pyogenic granulomas using β -adrenergic receptor antagonists. *Pediatr Dermatol.* 2014;31(2):203-207. 2. Malik M, Murphy R. A pyogenic granuloma treated with topical timolol. *Br J Dermatol.* Dec 2014;171(6):1537-1538. 3. Millsop JW, Trinh N, Winterfield L, Berrios R, Hutchens KA, Tung R. Resolution of recalcitrant pyogenic granuloma with laser, corticosteroid, and timolol therapy. *Dermatol Online J.* Mar 2014;20(3).

Poster 48
Wednesday
9:55 - 10:55 am

Intraoperative, Real-Time OCT-Guided Big Bubble-Deep Anterior Lamellar Keratoplasty in the Pediatric Patients

Ta C. Chang, MD; Carla J. Osigian, MD; Mohamed S. Sayed, MD; Kara M. Cavuoto, MD;
Mohamed F. Abou Shousha, MD
Bascom Palmer Eye Institute, Miami, Florida

Introduction: Deep anterior lamellar keratoplasty (DALK) allows preservation of the host endothelium in patients with endothelium-sparing corneal disease. Injection of an intrastromal air bubble allows for baring of the Descemet's membrane, which helps achieve optimum postoperative visual results.(1-3) We report our experience using real-time anterior segment optical coherence tomography (AS-OCT) to guide the depth of stromal dissection and 'big bubble' injection in pediatric patients undergoing big bubble DALK.

Methods: Intraoperative, microscope-integrated real-time AS-OCT was utilized to guide needle insertion into deep stroma, air bubble injection, and lamellar dissection.

Results: Three eyes of 3 children under 4yo with dense amblyopia secondary to corneal scarring underwent DALK. Real-time AS-OCT was successfully used intraoperatively to guide the procedure. A DM microperforation occurred in one case, in which AS-OCT demonstrated the presence of a double anterior chamber and allowed fluid drainage under direct visualization. Absence of fluid and air in the interface was demonstrated at conclusion of surgery in all patients.

Discussion: Adequate dissection can be expected if pneumatic dissection is performed at a sufficiently deep level. The technique is challenging, particularly in pediatric corneal grafting. To our knowledge, this is the first report of utilizing real-time AS-OCT guidance in pediatric DALK. It allows direct visualization of corneal layers and precise depth assessment, facilitating time-efficient intraoperative surgical decision-making, and enhancing reproducibility of the procedure.

Conclusion: Intraoperative, real-time AS-OCT guided pneumatic dissection may improve the success rate of DM baring, improving surgical outcomes in pediatric patients undergoing DALK, and facilitating visual development.

References: 1. De Benito-Llopis L, Mehta JS, Angunawela RI, Ang M, Tan DT: Intraoperative anterior segment optical coherence tomography: a novel assessment tool during deep anterior lamellar keratoplasty. *American journal of ophthalmology* 2014, 157(2):334-341 e333. 2. Harding SA, Nischal KK, Upponi-Patil A, Fowler DJ: Indications and outcomes of deep anterior lamellar keratoplasty in children. *Ophthalmology* 2010, 117(11):2191-2195. 3. Scorgia V, Busin M, Lucisano A, Beltz J, Carta A, Scorgia G: Anterior segment optical coherence tomography-guided big-bubble technique. *Ophthalmology* 2013, 120(3):471-476.

Notes

Notes

Electronic Posters

All Electronic Posters Displayed from Sunday, April 2, 4:00 PM - Thursday, April 6 11:45 AM

Broadway West Foyer

First Set of Electronic Posters (1-36)

Interactive Poster Session - Author Presentation and Q/A - Monday, April 3, 10:00 - 11:00 AM

Second Set of Electronic Posters (37-72)

Interactive Poster Session - Author Presentation and Q/A - Wednesday, April 5, 9:55 - 10:55 AM

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AMBLYOPIA

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Notes

Amblyopic Eye Accommodative Response Does Not Predict the Success of Amblyopia Treatment

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E-Poster 1
Monday
10:05 - 10:20 am
Station A

Introduction: While patching treatment is effective in improving visual acuity of most amblyopic children, some fail to respond and many are left with residual amblyopia. On the basis of a recent report that approximately half of amblyopic children experience significant accommodative error when the fellow eye is patched, it has been suggested that treatment that enhances retinal image quality (e.g., bifocals) may increase the magnitude of visual acuity improvement with patching.¹ Here, we assess the relationship of amblyopic eye accommodative response to visual acuity improvement with amblyopia treatment.

Methods: Accommodative response to a letter chart at 33cm (3.00 D) was evaluated in amblyopic children (n=37; age 4-11y) with anisometropia, esotropia, or both. Testing was performed for the amblyopic eye with their best correction and with the fellow eye occluded using the Grand Seiko Autorefractor WAM-5500. Best-corrected visual acuity (BCVA) was assessed at baseline and post amblyopia treatment. Amblyopia treatments include patching, atropine, contrast-balanced binocular games or movies, or a combination.

Results: Amblyopic children whose accommodative response was within the normal range (≥ 2.00 D; n=19) were no more likely than children with poor accommodative response (< 2.00 D, n=18) to respond to amblyopia treatment by improving ≥ 0.1 logMAR in BCVA ($X^2_{37}=0.35$, p=0.55). Risk ratio for poor accommodative response was not significant [RR=0.75 (95%CI: 0.29-1.95)]. Two of five children whose amblyopia resolved to 20/25 or better had poor accommodative response.

Discussion: Poor amblyopic eye accommodative response was not associated with failure of amblyopia treatment.

Conclusion: Amblyopia treatment designed to improve image quality for the poorly accommodating eye (e.g., bifocals) may not provide a clinical benefit to patients.

References: 1. Manh V; Chen AM; Tarczy-Hornoch K; Cotter SA; Candy TR. "Accommodative performance of children with unilateral amblyopia." Invest Ophthalmol Vis Sci. 2015;56:1193-1207.

Visual Exploration in Amblyopic Patients

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E-Poster 2
Monday
10:05 - 10:20 am
Station B

Introduction: Amblyopes have fixational abnormalities in fellow and amblyopic eye. Microsaccades are the largest and fastest fixational eye movement. Microsaccades shift the image on the fovea to counteract visual fading and serve as a sampling strategy while viewing visual scenes. The goal of our study was to assess visual search and micro-saccade production in amblyopes.

Methods: 13 amblyopes with no latent nystagmus(LN) (mild=5;moderate=6; severe=2), 11 amblyopes with LN(mild=6;moderate=3;severe=2) and 11 controls were recruited. Eye positions were recorded using infrared video-oculography during a)visual fixation b)while identifying picture differences (PDs).

Results: Amblyopes with and without LN had comparable dwell time during both fellow (normal: 49.8%;amblyopia only: 46.7%; amblyopia+LN: 41.5%;ANOVAp=0.3) and amblyopic eye viewing (normal:49.6%;amblyopia only:43.9%;amblyopia+LN:41.45%;ANOVAp=0.14). Amblyopes without LN were able to identify comparable PDs during fellow eye viewing (normal:5.7;mild:5.8;moderate:5.2;severe:4.3;ANOVAp=0.3) but had increased reaction times The ability to identify PDs was diminished during amblyopic eye viewing condition(normal: 5.8; mild:3.8; moderate:2.7;severe:0.8;ANOVAp<0.05). There was a decrease in microsaccade frequency with increasing severity of amblyopia. Amblyopes with LN had greater difficulty with identifying PDs with both fellow and amblyopic eye compared to those with amblyopia alone.

Discussion: The brain increases the rate of microsaccades to aid visual exploration. This relative increase in microsaccade production while viewing visual scene was diminished in severe amblyopes. The fellow and amblyopic eye of amblyopic patients with and without LN have difficulties with visual exploration.

Conclusion: Alteration in micro-saccades could explain the difficulty in perceiving details of a complex picture evident as crowding phenomenon in amblyopia. Amblyopia is not a simple monocular problem but has binocular consequences.

References: 1) Shaikh AG, Otero-millan J, Kumar P, Ghasia FF: Abnormal fixational eye movements in amblyopia. Plos One 21016 2) Otero-Millan J, Troncoso XG, Macknik SL, Serrano-Pedraza I, Martinez-Pedraza S: Saccades and microsaccades during visual fixation, exploration and search: foundations of a common saccadic generator. J Vision 2008

E-Poster 3

Monday
10:05 - 10:20 am
Station C

Time to Steroid Free Remission of Uveitis in Pediatric Population

Ujwala S. Saboo, MD; Ashley Abraham, MD; Cristiana Ronconi, MD;
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Introduction: Chronic uveitis in children can lead to vision threatening complications due to the disease itself and chronic corticosteroid treatment. The purpose of the study was to evaluate the outcomes and time to achieve steroid-free remission with immunomodulatory therapy (IMT) in pediatric patients with uveitis.

Methods: Retrospective review of 59 patients presented to uveitis clinic from September 2015 to May 2016 was performed. Patients diagnosed with recurrent uveitis, were steroid dependent, and treated with IMT were included.

Results: Thirty-seven patients, 19 males and 21 females were included. The mean age was 10±4 years. Uveitis presentation comprised of anterior uveitis (9 patients), pars planitis (7), posterior uveitis (4) and panuveitis (17). Systemic diagnosis included juvenile idiopathic arthritis (7 patients), sarcoidosis (2) and Vogt Koyanagi Harada syndrome (1). Steroid-free remission (no disease activity in the absence of corticosteroid treatment at all subsequent visits for a minimum of 90 days) was achieved in 24.3% of patients within a mean duration of 113 ± 63 days after starting IMT. The percentage of patients achieving steroid-free remission in recalcitrant uveitis (26%) was similar to those with new onset uveitis (23%). The side effects to IMT were nausea and vomiting (11%), hair loss (3%), rash (7%), anaphylaxis (5%), and drug induced lupus (3%).

Discussion: Prompt and aggressive treatment with immunomodulatory therapy to attain steroid-free remission is achievable and critical in avoiding long-term complications from chronic steroid use.

Conclusion: One fourth of the patients with chronic recurrent uveitis were able to achieve steroid-free remission on immunomodulatory therapy within a mean duration of 4 months after starting treatment.

References: 1. Foster CS, Kothari S, Anesi SD, Vitale AT, Chu D, Metzinger JL, Cerón O. The Ocular Immunology and Uveitis Foundation preferred practice patterns of uveitis management. *Surv Ophthalmol.* 2016 Jan-Feb;61(1):1-17 2. Foster CS, Kothari S, Anesi SD, Vitale AT, Chu D, Metzinger JL, Cerón O. The Ocular Immunology and Uveitis Foundation preferred practice patterns of uveitis management. *Surv Ophthalmol.* 2016 Jan-Feb;61(1):1-17

E-Poster 4

Monday
10:05 - 10:20 am
Station D

A 10-Year Review of Contact Lens Associated Corneal Ulcers in a Pediatric Population

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Introduction: We sought to characterize a single population of pediatric patients diagnosed with contact lens related ulcers (CLRUs).

Methods: A retrospective chart review was performed for all patients diagnosed with a corneal ulcer between January 2006 and December 2015 in a single resident pediatric ophthalmology clinic by searching for the CPT code "corneal ulcer." Data was gathered on contact lens (CL) habits, visual acuity, and ulcer location.

Results: 87 patients with corneal ulcers were identified. 62/88 (70%) ulcers were associated with CL use. 37/62 (60%) CLRUs were associated with sleeping in lenses. 56/62 (90%) CLRUs occurred in patients wearing soft prescription lenses and 5/62 (8%) occurred in emmetropic patients wearing non-prescribed cosmetic lenses. BCVA after treatment was 20/40 or better in 52/59 (88%) CLRUs. 9/62 (15%) CLRUs were located centrally and 53/62 (85%) paracentrally or peripherally. Of the non-central ulcers 36/53 (68%) were located superiorly.

Discussion: The majority of corneal ulcers seen in our clinic have been associated with contact lens wear and visual outcomes have been good. Most peripheral ulcers were located above the horizontal corneal midline. This may be due to mechanical lid compression or poor CL fit.

Conclusion: Contact lens wear remains an important risk factor for the development of corneal ulcers. This study suggests that peripheral ulcers associated with contact lens use are most commonly found above the horizontal corneal midline, a finding not previously described in the literature.

Clinical and Microbial Characteristics of Infectious Keratitis in Children

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E-Poster 5

Monday

10:05 - 10:20 am

Station E

Introduction: Infectious keratitis in children can result in poor visual outcomes and permanent vision loss, particularly if diagnosed and/or treated inadequately. The purpose of this study was to describe the characteristics of pediatric corneal ulcers in a tertiary referral center.

Methods: Retrospective chart review of patients < 18 years old diagnosed with microbial (non-viral) keratitis from 1992-2015.

Results: One hundred and seven charts were reviewed. Most patients presented with a unilateral ulcer (99%). The main predisposing factors were contact lens use (78%) and ocular trauma (8%). Cultures were positive in more than half of the scrapings performed (52/89). Seventeen microbial species were identified, with a predominance of *Pseudomonas aeruginosa* (46%), followed by *Stenotrophomonas maltophilia* (19%), *Fusarium* (14%), and *Acanthamoeba* sp (12%). A high antimicrobial susceptibility rate was seen for fluoroquinolones (95%), aminoglycosides (87-91%), and 3rd generation cephalosporins (93%). Combined fortified antibiotics were the most common treatment (51% of cases). Only two (2%) patients required a therapeutic penetrating keratoplasty. Mean visual acuity improved from 20/160 to 20/50 ($p < 0.0001$) after treatment. Mean follow-up time was 40.6 ± 91.6 weeks (range: 0.3-480 weeks).

Discussion: Pediatric microbial keratitis is most commonly associated with contact lens use. The predominant pathogen was *P. aeruginosa*. Corneal scrapings for smear and cultures are usually not mandatory as empirical treatment with combined fortified antibiotics is usually effective. With proper management, visual acuity can be significantly improved.

Conclusion: Children with corneal ulcers can have good visual outcomes with prompt evaluation and appropriate management. Therapeutic penetrating keratoplasty is rarely necessary.

References: 1. Young AL, Leung KS, Tsim N, Hui M, Jhanji V. Risk factors, microbiological profile, and treatment outcomes of pediatric microbial keratitis in a tertiary care hospital in Hong Kong. *American Journal of Ophthalmology* 2013;156:1040-4.e1042. 2. Cruz OA, Sabir SM, Capo H, Alfonso EC. Microbial keratitis in childhood. *Ophthalmology* 1993;100:192-6. 3. Wong VW, Lai TY, Chi SC, Lam DS. Pediatric ocular surface infections: a 5-year review of demographics, clinical features, risk factors, microbiological results, and treatment. *Cornea* 2011;30:995-1002.

Global Practice Patterns in the Management of Infantile Cataracts

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E-Poster 6

Monday

10:05 - 10:20 am

Station F

Introduction: The aim of this study was to survey current practice patterns in management of infantile cataracts globally.

Methods: Pediatric ophthalmologists were emailed a link to the survey via newsletters from AAPOS and WSPOS, and the Pediatric Listserv. The 17-question survey was anonymous and active during July-August 2016.

Results: 125 respondents (North America, 65%; Asia, 12%; Europe, 9%; other, 14%) reported operating on pediatric cataracts. Most practice in a university setting (55%). There was a strong consensus that both bilateral and unilateral cataract surgery should be performed between ages 4-6 weeks and aphakic contact lenses or spectacles should be used to optically correct these eyes, particularly in children ≤6 months of age. Surgeons who perform 20 pediatric cataract surgeries/year were more likely to utilize aphakic contact lenses in children undergoing cataract surgery >6 months of age (62% vs. 35%, $p = 0.04$). The preferred ages for secondary IOL implantation were 1-2 years (29%) and 3-4 years (17%), with no difference by region. Most respondents (73%) indicated that the Infant Aphakia Treatment Study (IATS) had changed how they manage unilateral congenital cataracts.

Discussion: The results of this study differ from a 2001 survey of AAPOS members, in which half of respondents were willing to implant an IOL in infants <7 months of age with unilateral cataract.

Conclusion: Current practice consensus in North America, Europe, and Asia is for congenital cataract surgery between ages 4-6 weeks, with initial correction using aphakic contact lenses or spectacles.

References: 1. Lambert SR, Lynn MJ, Hartmann EE, et al. Comparison of contact lens and intraocular lens correction of monocular aphakia during infancy: a randomized clinical trial of HOTV optotype acuity at age 4.5 years and clinical findings at age 5 years. *JAMA Ophthalmol.* 2014;132(6):676-682. 2. Lambert SR, Lynn M, Drews-Botsch C, et al. Intraocular lens implantation during infancy: perceptions of parents and the American Association for Pediatric Ophthalmology and Strabismus members. *J AAPOS.* 2003;7(6):400-405.

E-Poster 7
Monday
10:05 - 10:20 am
Station G

Cataract Surgery in Children: Visual Acuity and Refractive Error Outcomes One Year After Surgery

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Introduction: To describe visual acuity (VA) and refractive outcomes in children one year following lensectomy.

Methods: Prospective, registry study of children <13 years of age at time of lensectomy in at least one eye with follow-up between 6 and 18 months. Refractive error is reported for all eyes and optotype VA for eyes of children ≥ 3 years of age.

Results: 413 (89%) of 462 eyes ≥ 3 years of age with VA had an IOL implanted. Mean VA was better with increasing age ($p < 0.001$); 20/100 at 3 years, 20/80 at 4 years, 20/80 in 5 to <7 years, and 20/63 in children ≥ 7 years. After adjusting for age, pseudophakic eyes had better vision compared with aphakic eyes (mean difference=0.33 lines; $p < 0.001$) and poorer vision was seen after unilateral compared with bilateral surgery ($p < 0.001$). Median (range) refractive error was +16.75 (-10.50 to +35.00) in aphakic eyes and +1.25 (-10.25 to +23.50) in pseudophakic eyes. Mean change in refractive error from the postoperative visit was higher in aphakic (-2.65D) than in pseudophakic eyes (-0.73D), $P = 0.002$, adjusting for laterality and age.

Discussion: Pseudophakic eyes showed minimal loss of hyperopia during the postoperative year, while aphakic eyes (from much younger patients) had more loss of hyperopia. Useful, but subnormal VA was reported after unilateral and bilateral surgery.

Conclusion: Future long term data on refractive error progression of this large cohort will allow improved estimates of the expected change in refractive error allowing more precision in IOL selection.

References: 1. Pediatric Eye Disease Investigator Group. Cataract Surgery in Children from Birth to Less than 13 Years of Age: Baseline Characteristics of the Cohort. *Ophthalmology*. 2016 (in press).

E-Poster 8
Monday
10:05 - 10:20 am
Station H

Measurements, Reoperation Rates, and Outcomes in Persistent Fetal Vasculature with Elongated Ciliary Processes

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Introduction: Outcomes and reoperation rates in infants with persistent fetal vasculature (PFV) with elongated or stretched ciliary processes are typically unknown due to exclusion from infantile cataract surgery studies. The purpose of this study is to compare the pre-operative measurements, reoperation rates, and complications in PFV with stretched processes versus PFV without stretched processes.

Methods: In this non-randomized retrospective case series eighteen eyes operated for cataract surgery before 7 months of age were included, and were divided into those with stretched processes and those without. Preoperative measurements, complications, reoperations, and follow-up intervals were analyzed using the T-test, Chi-square, and Fisher's exact test.

Results: Patients without stretched processes had a mean age at surgery of 2.5 ± 2.2 months compared to 2.5 ± 1.4 mo in those with elongated processes. 75% (9 out of 12) aphakic eyes with stretched processes had visual axis opacification ($p > 0.05$, 0.523 Fisher's exact test) and of those six of those underwent pupilloplasty. Both non-stretched and stretched processes had similar corneal diameters 10.5 ± 0.9 mm and 10.6 ± 0.9 mm ($p > 0.05$), respectively. Of note, axial lengths were noted to be longer with stretched ciliary processes 18.91 ± 1.71 compared to non-stretched 18.13 ± 1.22 ($p > 0.05$). Of patients who underwent strabismus surgery 55% (10 out of 18) had stretched ciliary processes. 10 out of 18 (55%) of stretched ciliary processes developed glaucoma.

Discussion: It is suggested that children with elongated ciliary processes have longer axial lengths and are also predisposed to developing visual axis opacification. The need for strabismus surgery and development of glaucoma are homogenous in both groups. However due to the small sample size more power is needed to make these findings statistically significant.

Conclusion: Children with stretched ciliary processes have a higher incidence of visual axis opacification. Future studies will be done analyzing whether visual axis opacification develops faster in children with stretched ciliary processes.

References: 1. Dass AB, Trese MT. Surgical results of persistent hyperplastic primary vitreous. *Ophthalmology*. 1999; 106(2): 280-84 2. Alexandrakis G, Scott IU, Flynn HW, Murray TG, Feuer WJ. Visual acuity outcomes with and without surgery in patients with persistent fetal vasculature. *Ophthalmology*. 2000; 107 (6): 1068-72. 3. Mullner-Eidenbock A, Amon M, Moser E, Klebermass N. Persistent fetal vasculature and minimal fetal vascular remnants: A frequent cause of unilateral congenital cataracts. *Ophthalmology*. 2004; 111 (5) 906-13. 4. Plager D, Lynn M, Buckley E, Wilson E, Lambert S. Complications, adverse events, and additional intraocular surgery 1 year after cataract surgery in the Infant Aphakia Treatment Study. *Ophthalmology*. 2012; 119 (7) 1503-1504.

Pediatric Glued Secondary IOL Implantation: Yale Eye Center Experience

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E-Poster 9

Monday
10:05 - 10:20 am
Station I

Introduction: The purpose of this study is to analyze outcomes of intrascleral secondary intraocular lens (IOL) fixation with fibrin glue (Tisseel) in children with inadequate capsular support.

Methods: Three patients that underwent implantation with glued secondary IOL.

Results: 4 eyes in 3 children, age 6-7 years (average of 6.5 ± 0.5 years) were studied. Aphakia was due to traumatic cataract following ruptured globe ($n=1$) and due to lensectomy for congenital cataracts ($n=3$). One of the three children with congenital cataracts had bilateral disease. The mean follow-up after IOL surgery was 12.5 ± 5.7 months. Foldable 3-piece IOLs were used in all eyes. Preoperative mean best corrected visual acuity (BCVA) was 1.40 ± 0.47 LogMAR units. Corresponding postoperative mean BCVA was 1.59 ± 0.71 LogMAR units ($p=0.31$). One patient required a second surgery due to intraoperative IOL dislocation. There were no other complications.

Discussion: Glued IOL fixation, in the absence of capsular support, may be a good option for secondary IOL implantation in pediatric eyes. Benefits include placing a posterior chamber IOL in eyes without capsular support, absence of inducing astigmatism, and enhanced rate of adhesion with hemostasis with fibrin glue utilization. The glued IOL technique can be considered when an anterior chamber IOL is contraindicated, for instance, in eyes that have low endothelial cell count and peripheral anterior synechiae.

Conclusion: Pediatric glued IOL implantation is another option to consider in aphakic children with deficient capsular support requiring secondary IOL placement for visual rehabilitation. Longer follow-up and more patients are needed to determine the functional visual outcome.

References: 1. Kumar DA, Agarwal A, Prakash D, Prakash G, Jacob S, Agarwal A. Glued intrascleral fixation of posterior chamber intraocular lens in children. *Am J Ophthalmol.* 2012;153:594-601. 2. Wilson ME, Trivedi RH. Pediatric cataract surgery: techniques, complications and management. Lippincott Williams & Wilkins, 2014.

Congenital Anterior Polar Cataract: Surgical Outcomes and Associated Corneal Astigmatism

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Introduction: Congenital anterior polar cataracts are rare (3% of congenital cataracts) and often do not cause visual compromise. Some cases demonstrate spread of opacity into the subcapsular cortex during childhood, causing decreased visual acuity and amblyopia. A high incidence of corneal astigmatism and strabismus in this population has been reported as additional causes of visual morbidity.

Methods: A single-center, single-surgeon retrospective case review. We reviewed all cases undergone cataract extraction for visually significant anterior polar cataract 1/1995 to 9/2016.

Results: Sixteen eyes in 13 patients required cataract extraction. Median patient follow-up was 6.3 years, with a range of three months to 12.5 years. Median age at surgery was three years, with a range of four months to 8.5 years. Median final visual acuity was 20/25. Twelve patients (92%) required postoperative patching for amblyopia. Four eyes (25%) required reoperation for postoperative visual axis opacification (VAO) (fibrous and/or cortical). A total of five eyes were microphthalmic, three of which underwent reoperation for VAO. Two eyes of one patient were microphthalmic and developed open angle glaucoma two years after surgery. The patient maintains healthy nerves and intraocular pressure on topical therapy. Median corneal astigmatism in operated eyes was 1.7D by keratometry.

Discussion/Conclusion: Anterior polar cataracts are not often visually significant at birth but may require surgery secondary to a spreading opacity in the underlying anterior subcapsular cortex. This can occur any time in the first decade of life. Amblyopia and corneal astigmatism are also common in these eyes. Management guidelines will be shared.

References: 1. Bouzas AG. Anterior polar congenital cataract and corneal astigmatism. *J Pediatr Ophthalmol Strabismus.* 1992;29:210-212. 2. Wheeler DT, Mullaney PB, Abdulaziz A. Pyramidal anterior polar cataracts. *Ophthalmology.* 1999; 106(12):2362-7. 3. Sayed KM. Analysis of components of total astigmatism in infants and young children. *Int Ophthalmol.* 2016; Apr 30 [Epub ahead of print].

E-Poster 10

Monday
10:05 - 10:20 am
Station J

E-Poster 11

Monday
10:05 - 10:20 am
Station K

An Attempt at Natural Lens Regeneration in Congenital Cataract Surgery

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Introduction: Despite recent advances, successful rehabilitation of children with congenital cataracts is hampered by a range of unresolved issues [1]. The purpose of this study was to get personal assessment of the successful experience of Lin [2] on 24 eyes which underwent a modified aspiration procedure followed by natural lens regeneration.

Methods: A girl born 26/05/2015 with bilateral cataract has undergone a modified aspiration surgery on her right (11/04/2016) and left (16/05/2016) eyes. The surgical technique involved 23-gauge limbal paracenteses, 1.5 mm eccentric capsulorhexis, and biaxial irrigation/aspiration with maximal sparing of lens epithelial cells under the anterior capsule.

Results: Compared to congenital cataract surgery involving intraocular lens implantation surgical time with this modified approach was essentially halved. The postoperative inflammation was correspondingly lower. Within non-dilated pupil optical media are transparent. The anterior capsule is opacified around capsulorhexis. Visual function as judged subjectively by mother greatly improved. Teller Acuity Card testing failed to show acuity greater than 20/600. Spherical equivalent by autorefractometry: 06/05/2016 OD+15.6 OS non-measurable, 12/07/2016 OD+16.1 OS+16.4, 02/09/2016 OD+16.9 OS+14.6.

Discussion: Our preliminary findings are somewhat contradictory and need further follow-up. The child is scheduled for examination under anesthesia at 6 month postop to get an objective assessment of the anatomical lens regeneration.

Conclusion: The modified technique of congenital cataract aspiration is reproducible and accompanied by a decrease in surgical trauma and inflammatory reaction. It prevented visual axis opacification. Further follow-up will allow us to make an unambiguous conclusion as to the method's ability to provide for endogenous regeneration of the clear lens.

References: 1. Wilson ME, Trivedi RH. Pediatric Cataract Surgery: Techniques, Complications and Management. 2nd ed. Philadelphia: Lippincott Williams & Wilkins; 2014. 2. Lin H, Ouyang H, Zhu J, et al. Lens regeneration using endogenous stem cells with gain of visual function. *Nature*. 2016;531:323-328

E-Poster 12

Monday
10:05 - 10:20 am
Station L

Outcomes of Cataract Surgery in Children with Juvenile Idiopathic Arthritis-Associated Uveitis (JIA)

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Introduction: To evaluate the outcomes of cataract surgery in children with JIA associated uveitis.

Methods: Retrospective chart review of children with history of cataract surgery with JIA.

Results: 11 eyes of 7 children with JIA uveitis with visually significant cataract underwent cataract surgery. The mean age of surgery was 7.5 (SD 2.5) years old with a mean follow up of 5.8 (SD 4.0) years in 6 of the patients; 1 patient was lost to follow-up. Of the 7 patients, 3 were male and 4 were female. Nine eyes had a primary Acrysof posterior chamber intraocular lens (IOL) placed and 2 eyes of 1 patient were left aphakic. The posterior capsule was left intact in 4 eyes, and a pars plana vitrectomy with posterior capsulectomy was performed in 5 eyes. Seventeen surgeries were required for visual axis opacification in seven eyes with primary IOL implantation. Three out of the 9 eyes with primary IOL required subsequent glaucoma surgery. Treatment for Band keratopathy was required 14 times. The aphakic patient (2 eyes) did not require reoperation other than treatment for band keratopathy. Detailed analysis of pre and postoperative treatments and outcomes will be graphically presented.

Discussion: Multiple reoperations are often necessary when an IOL is implanted in JIA. Planned posterior capsulectomy should be performed at the time of initial cataract surgery.

Conclusion: Consideration should be made for leaving patients aphakic in the setting of bilateral visually significant cataracts associated with JIA.

References: 1. BenEzra D, Cohen E. Cataract surgery in children with chronic uveitis. *Ophthalmology* 2000;107:1255-60. 2. Phatak S, Lowder C, Pavesio. Controversies in intraocular lens implantation in pediatric uveitis. *Journal of Ophthalmic Inflammation and Infection* 2016;6:12. 3. Wilson M, Trivedi R. 2014. Pediatric Cataract Surgery: Techniques, Management and Complications. 2nd ed. Philadelphia (PA): Lippincott. Chapter 38, Pediatric Cataract Surgery in Eyes with Uveitis; 9. 257-265.

Postoperative Endophthalmitis in Children: An IPOSC Global Perspective

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IPOSC: International Pediatric Ophthalmology and Strabismus Council

E-Poster 13

Monday

10:25 - 10:40 am

Station A

Introduction: Endophthalmitis following cataract surgery in children is a rare but blinding complication. Prospective studies have not been undertaken. The purpose of this survey was to note worldwide features of this complications, and possibly reach a consensus for preferred clinical practice.

Methods: An email containing a link to a survey was sent to members of AAPOS listserv. The questionnaire examined the incidence and characteristics of the surgical procedure and results worldwide.

Results: 235 ophthalmologists replied. Endophthalmitis was most common in the 2-4 years old (38.1%). In most cases surgery was performed by only the consultant (72.7%). An intra-ocular lens was implanted in 59.1%. Vitrectomy and posterior capsulotomy were performed through the anterior chamber before IOL insertion in 47.6% of the cases. A surgical complication prolonged surgery in 94.5% of the cases. The most common clinical signs of endophthalmitis were conjunctival injection (36.4%). The visual acuity (VA) at presentation ranged from no light perception (NLP) to 6/160. The final VA ranged from NLP to 20/50. The most common organism that was cultured was *Staphylococcus aureus* (38%).

Discussion: Few reports are available on endophthalmitis following cataract surgery in children. Visual acuity of 20/80 and better was reported in only 29%. The most common presenting symptoms were redness and pain. In some studies eyes undergoing early vitrectomy attained better VA.

Conclusion: In adults, intracameral injection of cefuroxime at termination of cataract surgery reduced postoperative endophthalmitis. It may be useful to consider this prophylaxis in the pediatric age group, in addition to early vitrectomy when encountering endophthalmitis.

References: 1. Aqarkar S, Desai R, Jambulingam M, Sumeer SH, Raman R. Incidence, Management, and visual outcomes in pediatric endophthalmitis. JAAPOS.2016pii:S1091-8531. 2. Endophthalmitis Study Group, European Society of Cataract and REfractive Surgeons. Prophylaxis of postoperative endophthalmitis following cataract surgery: results of the ESCRS multicenter study and identification of risk factors. J Cataract refract Surg.2007, 33:978-88.

Incidence and Timing of Glaucoma Diagnosis in Pediatric Eyes with Secondary Intraocular Lens Implantation

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E-Poster 14

Monday

10:25 - 10:40 am

Station B

Introduction: To report the incidence, timing, and risk factors for developing glaucoma in pediatric eyes with secondary intraocular lens (IOL) implantation.

Methods: Retrospective chart review of all pediatric patients who underwent secondary IOL implantation at Boston Children's Hospital between 1999 and 2016. Eyes with traumatic and subluxated cataracts were excluded. Glaucoma was defined as intraocular pressure (IOP) > 25 mm Hg on more than one visit, anatomic ocular changes attributable to ocular hypertension, or glaucoma treatment.

Results: 99 eyes of 64 patients were analyzed. Mean age at primary surgery was 1.0 ± 2.2 years (median, 0.2 years), and at secondary IOL was 7.9 ± 6.0 years (median, 6.2 years). IOL implantation was within the capsular bag for 56 eyes and in the ciliary sulcus in 43 eyes. Mean follow-up was 4.7 years. Overall, 16/99 eyes (16.2%) developed glaucoma. One patient had bilateral aphakic glaucoma, 3 eyes had postoperative inflammation after surgery causing glaucoma, and other eyes developed late post-operative glaucoma (one at 7 months, 5 after 4 years, and 5 after 8 years). Eyes that developed glaucoma had primary surgery earlier (mean age, 0.3 ± 0.3 years; median, 0.2 years), and were more likely to have sulcus implantation (10/16, 62.5%). IOPs were controlled medically in all eyes except one, which also required 2 trabeculectomies.

Discussion: The incidence of glaucoma was 16.2% in our pediatric population with secondary IOL implantation. The risk factors for development of glaucoma appear to be early age at surgery, sulcus implantation, and severe postoperative inflammation.

Conclusion: Glaucoma is not uncommon and patients should be monitored before and after secondary IOL implantation.

References: Trivedi RH, Wilson ME, Golub RL. Incidence and Risk Factors for Glaucoma After Pediatric Cataract Surgery With and Without Intra-ocular Lens Implantation. J AAPOS 2006;10:117-123

E-Poster 15

Monday
10:25 - 10:40 am
Station C

What Does Electrophysiology Tell Us About Vision in Patients with Albinism?

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Introduction: Albinism patients have abnormal foveal anatomy, but correlation with function is incompletely understood. We correlated electroretinogram(ERG), optical coherence tomography(OCT) and visual acuity(VA) in albinism patients and compared with age-matched controls.

Methods: Prospective study of full field(ff) and multifocal(mf) ERG correlated with macula OCT and VA from chart review. Nonparametric permutation testing was utilized to determine significance.

Results: 13 albinism patients (7 males, 6 females, mean age 15 years, range 6-46) and 16 controls (5 males, 11 females, mean age 23 years, range 9-47). Multifocal(mf) ERG: 9 of 13 patients had Ring 1 amplitudes within 1 standard deviation of controls (75 ± 25 nV/deg²), even in the absence of a fovea on OCT. There was no significant correlation between VA and mfERG amplitudes (highest $r = -0.19$, $p = 0.27$, Ring 1). Fullfield(ff) ERG: Patients averaged higher amplitudes on 30 Hz flicker ($p = 0.05$), a-waves all conditions ($p = 0.02$), and b-waves light adapted 3.0 ($p = 0.022$) than controls, but there was overlap in amplitudes between the groups. FfERG amplitudes did not correlate with VA. OCT and VA: In patients, thicker central macula correlated with lower mfERG amplitudes ($r = -0.61$, $p < 0.05$) and lower a-wave amplitudes on ffERG ($r = -0.634$, $p = 0.024$). There was no correlation between macular thickness and VA ($r = -0.179$, $p = 0.28$).

Discussion: Neither ERG amplitudes nor foveal thickness correlate with VA in albinism, although they negatively correlate with each other. FfERG amplitudes averaged higher in patients than controls, however there was wide variation in both groups.

Conclusion: ERG is not helpful for diagnosis or prognosis in albinism; foveal thickness does not correlate with visual acuity.

References: 1. Russell-Eggitt, A Kriss, and D S Taylor. Albinism in childhood: a flash VEP and ERG study. *Br J Ophthalmol*. 1990 Mar; 74(3): 136-140. 2. Brandon K. McCafferty, MD, Melissa A. Wilk, BS, John T. McAllister, MD, Kimberly E. Stepien, MD, Adam M. Dubis, PhD, Murray H. Brilliant, PhD, Jennifer L Anderson, BS, Joseph Carroll, PhD, and C. Gail Summers, MD. Clinical Insights Into Foveal Morphology in Albinism. *J Pediatr Ophthalmol Strabismus*. 2015 May-Jun; 52(3): 167-172. 3. Melissa A. Wilk, John T. McAllister, Robert F. Cooper, Adam M. Dubis, Teresa N. Patitucci, Phyllis Summerfelt, Jennifer L. Anderson, Kimberly E. Stepien, Deborah M. Costakos, Thomas B. Connor, Jr, William J. Wirosko, Pei-Wen Chiang, Alfredo Dubra, Christine A. Curcio, Murray H. Brilliant, C. Gail Summers, and Joseph Carroll. Relationship Between Foveal Cone Specialization and Pit Morphology in Albinism. *Invest Ophthalmol Vis Sci*. 2014 Jul; 55(7): 4186-4198. Published online 2014 Jul 14. doi: 10.1167/iov.13-13217.

E-Poster 16

Monday
10:25 - 10:40 am
Station D

Home Tonometry in Pediatric Glaucoma: Parental and Physician Attitudes, and Clinical Indications

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Introduction: Home rebound tonometry has proved feasible in selected childhood glaucoma cases, demonstrating intraocular pressure(IOP) elevation/fluctuation not captured by clinic visits.¹⁻² Questions remain about the clinical utility/practicality/generalizability of this methodology, both in pediatric and adult glaucoma management.

Purpose: To evaluate clinical indications for home rebound tonometry in childhood glaucoma; and to assess provider and patient/parental attitudes towards this methodology.

Methods: Ongoing prospective study of long-term parent-measured Icare rebound tonometry(Icare,FinlandOy) in pediatric glaucoma(Icare Lending Library Project,ILLP). Ongoing prospective survey of physician and parental attitudes towards home tonometry using a secure, web-based application.

Results: Enrolled to date in ILLP: 21 patients(13 female), mean age 12.1 years(11 mos-31yrs), mean home tonometry duration 5.9mos. Glaucoma diagnoses(by patient) include: primary congenital(7,33%), post-cataract removal(8,38%), Sturge-Weber(2,9.5%), and other(4,19%). Clinical indications(≥ 1 /patient) for home tonometry in ILLP include capturing/monitoring: 1)suspected IOP peaks/fluctuations(81%), 2)post-operative IOP(38%), and 3)IOP post-medication changes(14%). ILLP monitoring prompted/validated glaucoma-related surgery in 8(38%). Survey of 100 ophthalmologists managing pediatric glaucoma revealed: 1) 40% response rate to date; 2) 92% use Icare; 3) 8.3% lend Icare for home tonometry; 4)biggest barrier to home tonometry is tonometer cost(85%); 5)biggest benefit is improved ability to monitor IOP fluctuations(44%); 6)most(81%) believe home monitoring will improve pediatric glaucoma management; and 7) 47% estimate 16-30% of pediatric glaucoma patients would benefit from home tonometry.

Discussion/Conclusion: Home tonometry (short- and longer-term) can aid management of selected cases of pediatric glaucoma, both pre- and post-operatively. Pediatric glaucoma specialists are gaining experience with both rebound tonometry and home tonometry, but instrument cost represents a barrier.

References: 1. Bitner, D, & Freedman, SF. (2016). Long-term home monitoring of intraocular pressure in pediatric glaucoma. See comment in *PubMed Commons below JAAPOS*. 2016 Oct 1. pii: S1091-8531(16)30501-8. doi: 10.1016/j.jaapos.2016.08.003. [Epub ahead of print] 2. Flemmons, M, Hsiao, Y, Dzau, J, Asrani, S, Jones, S, & Freedman, SF. (2011). Home Tonometry for Management of Pediatric Glaucoma. *American Journal of Ophthalmology*, 470-478.

Intermittent Angle Closure in Pediatrics: Identification and Treatment

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E-Poster 17

Monday
10:25 - 10:40 am
Station E

Introduction: Intermittent angle closure (IAC) in pediatric patients is difficult to diagnose and treat. Frontal headaches are a prime indicator of IAC, though they should be correlated with gonioscopy and visual field findings; both of which are challenging in the pediatric population. This study evaluates the symptom relief and change in FDT mean deviation (MD) in pediatric patients after laser peripheral iridotomy (LPI) for IAC.

Methods: Case control study of subjects <18 years diagnosed with presumed IAC undergoing LPI from 2010-2015 at a single clinical site with pre- and post-laser FDTs. Resolution of symptoms was primary outcome. Secondary outcomes were change in MD on FDT and IOP. Control group of pediatric glaucoma patients was used to adjust for the learning effect in FDT results. Student t-test analyzed the results.

Results: 27 eyes (14 patients; range 8-15 years) qualified. All treated subjects had resolution of frontal headache. Pre-laser MD was -8.4 ± 1.0 dB and post-laser -3.5 ± 0.5 ($p < 0.0001$). No change in IOP. Control group of 22 eyes (range 7-14 years) had MD on first field of -6.7 ± 0.9 dB and -5.5 ± 0.8 on second ($p < 0.05$). Mean change in the treatment group was $+4.8$ versus $+1.1$ dB in the control group ($p = 0.0009$).

Discussion: LPI treatment of pediatric patients with complaints of frontal headache as result of IAC provides both symptomatic relief and potential recovery of visual function. Using FDT perimetry and gonioscopy we believe there can be confident diagnosis and resolution of this condition. Notably, the gonioscopy findings are atypical yet convincingly result in periodic angle closure.

Conclusion: This study suggests that pediatric patients with headache should be evaluated for IAC and could benefit from LPI treatment, based on child cooperation.

References: 1. Blumenthal EZ, Haddad A, Horani A, Anteby I. The reliability of frequency-doubling perimetry in young children. *Ophthalmology* 2004;111:435-9. 2. Shindler KS, Sankar PS, Volpe NJ, Piltz-Seymour JR. Intermittent headaches as the presenting sign of subacute angle-closure glaucoma. *Neurology* 2005;65:757-758.

Prostaglandin Exposure in Pediatric Glaucoma - Prevalence of Prostaglandin Associated Periorbitopathy

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E-Poster 18

Monday
10:25 - 10:40 am
Station F

Introduction: Prostaglandin associated periorbitopathy is a well-known phenomenon in adult glaucoma patients¹⁻³ but is poorly described in the pediatric population⁴. Purpose: to determine the degree of orbital, eyelid and eyelash changes attributable to topical prostaglandin analogue (PGA) use in pediatric glaucoma patients.

Methods: This ongoing case series examined children/young adults with glaucoma treated with PGA monocularly for ≥ 6 months. Frontal and bilateral color photographs (with eyes open) were evaluated by 3 pediatric ophthalmologists and 2 oculoplastic surgeons who were blinded to PGA treatment laterality/drug, and graded for features of relative ptosis, enophthalmos, sulcus deformity and hypertrichosis. Graders chose right/left/indeterminate for each feature. Group consensus: if ≥ 2 graders chose the same eye (all other being indeterminate), that eye was considered chosen; if graders disagreed (right versus left), ≥ 3 votes for the same eye were needed; all other cases were indeterminate.

Results: Thus far 18 participants (11 female) with mean age 15.5 ± 6.2 yrs are included, with mean PGA treatment time 4.0 ± 2.8 yrs. Glaucoma type includes: post-cataract surgery ("aphakic", 7), primary congenital (5), and other (8). Prostaglandin analogs used include: latanoprost (14), travoprost (2), bimatoprost (1) and tafluprost (1). Group consensus (treated/untreated/indeterminate) for each feature showed: ptosis (7,7,4), enophthalmos (3,5,10), sulcus deformity (7,1,10) and hypertrichosis (13,1,4). Only hypertrichosis showed a statistically significant association with unilateral PGA-exposure ($p = 0.03$).

Discussion: Other than hypertrichosis, no PGA-induced periorbitopathy features were statistically verified in this small clinical series.

Conclusion: Nonetheless, PGA-induced periorbitopathy remains a concern in children who may face decades-long exposure to these glaucoma agents, and diligent long-term clinical monitoring is indicated.

References: 1. Peplinski LS, Albani Smith K. Deepening of lid sulcus from topical bimatoprost therapy. *Optom Vis Sci* 2004;81:574-7. 2. Filipopoulos T, Paula JS, Torun N, Hatton MP, Pasquale LR, Grosskreutz CL. Periorbital changes associated with topical bimatoprost. *Ophthalm Plast Reconstr Surg* 2008;24:302-307. 3. Berke SJ. P.A.P.: New concerns for prostaglandin use. *Review of Ophthalmology* 2012; Vol 19 Issue 10:70. 4. Al-Zobidi M, Khandekar R, Craven ER, Hanafi S, Edward DP. Periocular skin hyperpigmentation in children treated with prostaglandin analogues. *JAAPOS* 2015 Feb;19(1):49-53.

E-Poster 19

Monday
10:25 - 10:40 am
Station G

Gender and Response to Initial Angle Surgery Differ for *CYP1B1*-Related Primary Congenital Glaucoma

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Introduction: Primary congenital glaucoma (PCG) is considered to be more common in boys and to respond well to initial angle surgery (goniotomy or trabeculotomy). However, these characteristics are based on studies done in regions where bi-allelic mutations in *CYP1B1* are uncommon. We report our observations regarding a cohort of PCG with confirmed bi-allelic mutations in the gene.

Methods: Retrospective case series (103 probands with confirmed mutations).

Results: The vast majority of probands (69/103, 67%) were homozygous for the common Arabian mutation p.G61E. A total of 204 eyes underwent 449 surgeries over an 8 year period with an average of 4.35 glaucoma procedures per eye. First surgery was most commonly trabeculotomy (83/103, 81%) or combined trabeculotomy-trabeculectomy (17/103, 17%). Almost all patients (99/103, 96%) were judged to have failure of first surgery within 2 years of surgery (mean 21.25 months, range 14 days to 124 months).

Discussion: *CYP1B1*-related PCG seems more common in girls and to respond poorly to initial angle surgery, unlike what has been described for PCG in populations where *CYP1B1* mutations rarely underlie the disease.

Conclusion: Initial surgical approaches typically used for PCG in general may not be optimal for *CYP1B1*-related PCG.

References: Ho CL, Walton DS. Primary congenital glaucoma: 2004 update. J Pediatr Ophthalmol Strabismus. 2004 Sep-Oct;41(5):271-88.

E-Poster 20

Monday
10:25 - 10:40 am
Station H

Outcome of Goniotomy for Primary Congenital Glaucoma (PCG) in a North African Population

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Cairo University, Egypt

Introduction: To the best of our knowledge, there are no published reports on the success rate of Goniotomy from the Egyptian population to review.

Methods: In this study we retrospectively evaluated the 4-year success rate and survival time of adequate intraocular pressure control after goniotomy in Egyptian children younger than 3 years and analysed the timeline of relapse. The main outcome measures were intraocular pressure, and surgical success. Complete success was defined as IOP=21 mmHg at 48 months with no other signs of glaucoma progression. The use of glaucoma medications to achieve such a pressure was considered as qualified success. Kaplan–Meier survival analysis and mean survival time with 95% confidence intervals (CIs) were calculated.

Results: Eightyone eyes of 47 children fulfilled the inclusion criteria. Mean patient age at time of surgery was 6.1±6.7 months (range, 0–24 months). 34 children (72.3%) were bilateral. Mean follow-up interval was 37.3±15.6 months (range, 6–48 months). Cumulative probability of complete and qualified survival at 48 months was 43% (95% CI 25% to 61%) and 48% (95% CI 30% to 66%) respectively. Mean survival time was 16.7±16.4 months (range, 1–48 months).

Discussion: Compared to the western population a relatively higher frequency of relapse has been found. In Saudi Arabia, which we believe has a similar high rates of PCG as our country mainly due to the high consanguinity rates, there was a published study including 254 goniotomies reported a success rate of 52%.

Conclusion: A high frequency of relapse has been found even in those, who were primarily controlled. Monitoring of these patients is needed throughout life.

References: 1. Long-term outcome of primary congenital glaucoma. Don Julian de Silva, FRCS, FRCOphth, A Peng T. Khaw, PhD, FRCOphth, a,b,c and John L. Brookes, FRCOphth (J AAPOS 2011;15:148-152) 2. Walton DKG. Newborn primary congenital glaucoma. J Pediatr Ophthalmol Strabismus 2005; 42:333-41. 3. 7 Current Surgical Options for the Management of Pediatric Glaucoma Jose Morales,1 Sami Al Shahwan,1 Sami Al Odhayb,1 Ibrahim Al Jadaan,1 and Deepak P. Edward1,2. Journal of Ophthalmology Volume 2013 (2013), Article ID 763735, 16 pages

Phenotypic Variation in a Four-Generation Family with Aniridia Carrying a Novel PAX6 Mutation

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University of Michigan Kellogg Eye Center, Ann Arbor, MI

E-Poster 21

Monday

10:25 - 10:40 am

Station I

Introduction: In familial aniridia, PAX6 mutations often have variable expressivity as individuals who carry the same mutation may exhibit different eye findings. Here, we describe variable expressivity in a 4-generation family in which individuals affected with aniridia carry a novel PAX6 frameshift mutation.

Methods: Retrospective chart review of individuals affected with aniridia in a 4-generation family was performed. Outcomes included visual acuity, ocular co-morbidities and number/types of ophthalmic surgeries. PAX6 gene sequencing was performed using standard methods.

Results: Eleven of 13 family members with aniridia were included. Affected individuals had a novel Chr11:31716292 TG->T frameshift mutation in PAX6, which introduces an early stop codon. Despite the same genetic mutation, affected family members showed a wide range of visual acuities, ocular co-morbidities, and prior ophthalmic surgeries. Visual acuity ranged from 20/70 to no light perception. Factors that correlated with poorer vision were the presence of glaucoma, severity of corneal opacification, and history of ophthalmic surgery.

Discussion: In aniridia, family members with the same PAX6 mutation, can have variable expressivity, leading to different ocular co-morbidities and visual outcomes. The presence of glaucoma and severe corneal disease may necessitate surgical intervention and correlate with worse visual outcomes. The basis of variable expressivity in aniridia suggests that PAX6 regulation of eye development is affected by the broader genetic and epigenetic background.

Conclusion: We have identified a novel frameshift mutation in PAX6 that causes aniridia. Affected individuals within this 4-generation family have a wide range of ocular phenotypes, which resulted in vastly different visual outcomes.

References: 1. Kokotas, H., and M. B. Petersen. "Clinical and molecular aspects of aniridia." *Clinical genetics* 77.5 (2010): 409-420. 2. Lee, Hyunjoon J., and Kathryn A. Colby. "A review of the clinical and genetic aspects of aniridia." *Seminars in ophthalmology*. Vol. 28, No. 5-6. Taylor & Francis, 2013. 3. Jain, Amit, et al. "Aniridic glaucoma: Long-term visual outcomes and phenotypic associations." *Journal of glaucoma* 24.7 (2015): 539-542.

The Relationship of Vision and Quality of Life (QOL) in Patients with Pediatric Primary Brain Tumors (PBT)

Jason H. Peragallo; Caroline F. Vasseneix; Supharat Jariyakosol; Nancy J. Newman;
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Emory University School of Medicine, Atlanta, GA

E-Poster 22

Monday

10:25 - 10:40 am

Station J

Introduction: Brain tumors are the leading cause of death from childhood cancer. Although overall survival has improved due to earlier detection, better therapies, and improved surveillance, visual dysfunction and impaired vision-related QOL (VR-QOL) are often not recognized in children because of examination difficulty and lack of awareness.

Methods: We prospectively evaluated visual impairment and its effects on QOL in an ongoing quality improvement project. Patients ≤ 18 yo, ≥ 6 months from diagnosis of PBT, excluding primary intrinsic anterior visual pathway tumors, underwent neuro-ophthalmologic examination. Health-related QOL (HR-QOL) questionnaires, using PedsQL Brain Tumor Module, 1 were obtained from patients and parents. VR-QOL questionnaires, using CVFQ (Children's visual function questionnaire) 2 in children < 8 yo, and EYE-Q3 in children 8-18yo, were obtained. Demographic data, schooling, use of low-vision aids, and driving status were recorded.

Results: Among 43 patients, astrocytomas (9/43) and craniopharyngiomas (9/43) were the most common tumors. Among 12/43 (28%) visually impaired children, 3 (25%) were legally blind. Eye-Q median score was 4.275 (IQ range 3.925-4.750). Eye-Q score decreased 0.14 with every 0.1 increase in logMAR visual acuity [$p < 0.001$]. Patients who were legally blind had an Eye-Q score of 1.4 while those who were not had a score of 4.3 [$p = 0.003$]. Cognitive HR-QOL scores decreased 1.2 for every 0.1 increase in logMAR visual acuity [$p = 0.06$].

Discussion: Pediatric PBT patients' vision, HR-QOL, and VR-QOL are often severely affected (28% visually impaired), even when the PBT is considered "cured". Visual acuity and legal blindness is correlated with VR-QOL.

Conclusion: Systematic neuro-ophthalmologic examinations in pediatric PBT patients may improve long-term visual outcomes and QOL through earlier interventions.

References: 1. www.pedsql.org/ 2. <http://www.retinafoundation.org/questionnaire.htm> 3. Angeles-Han ST, Griffin KW, Harrison MJ, Lehman TJ, Leong T, et al. Development of a vision-related quality of life instrument for children ages 8-18 years for use in juvenile idiopathic arthritis-associated uveitis. *Arthritis Care Res (Hoboken)*. 2011 Sep;63(9):1254-61.

E-Poster 23

Monday

10:25 - 10:40 am

Station K

Stimulated Single-Fibre Electromyography (SFEMG) in Ocular and Generalized MyastheniaSiegfried K. Wagner; Victoria T. Barnett; Tom Tidswell; Saurabh Jain
Royal Free Hospital, London, United Kingdom

Introduction: Patients presenting to eye clinics with variable diplopia, ptosis and generalised muscular weakness are often suspected to have myasthenia gravis(MG). Single-fibre electromyography(SFEMG) which measures NMJ blockade is widely considered to be a more sensitive investigation compared to serology for antibody detection. Our study aimed to characterise clinical findings most predictive for MG, as confirmed by SFEMG and subsequent treatment response.

Methods: Retrospective cohort study(May 2011-January 2016) of patients at a tertiary teaching hospital undergoing investigation for MG, and demonstrating abnormal SFEMG. Data obtained included presenting features, ophthalmic examination and treatment response.

Results: 73 patients(29 male, 44 female, mean age 57, age range 2-92) had SFEMG supportive of ocular-MG. 25 had serology for acetylcholine-receptor antibodies; 7 were positive. Main clinical features were unilateral ptosis(n=16), bilateral ptosis(n=14) and diplopia(n=18). 18 patients had ophthalmoplegia. Only 31 patients(42%) had systemic or non-eye related neurological symptoms. Treatment follow-up was recorded in 40 patients: subjective improvements seen in 6/12 patients on pyridostigmine alone and in 8/8 on combined pyridostigmine and steroids. 7/7 patients improved with additional azathioprine, IVIG, mycophenolate or thymectomy. 3/9 patients improved with monitoring. 4 patients had patching, prisms or surgery.

Discussion: Preceding history of ptosis and/or diplopia was most frequently associated with NMJ dysfunction on SFEMG. Less than half of patients presenting with ocular symptoms had systemic features. Majority of patients commenced on pyridostigmine with steroids subjectively improved, compared to half of patients on pyridostigmine alone.

Conclusion: Ptosis and/or diplopia most commonly predict a MG diagnosis based on a positive SFEMG, and may be the only findings in over half of MG patients. Treatment to stabilise NMJ transmission is effective in 71% of patients with ptosis and/or diplopia. By comparison antibody testing has poor sensitivity; 46% of patients with negative antibodies responded to myasthenia treatment.

E-Poster 24

Monday

10:25 - 10:40 am

Station L

Clinical Characteristics and Outcome of Paediatric Idiopathic Intracranial HypertensionMiss Audrey Pang, FRCOphth; Dr Deepa Krishnakumar, MRCPCH, DCH;
Miss Brinda Muthusamy, FRCOphth
Cambridge University Hospitals NHS Foundation Trust
Cambridge, United Kingdom

Introduction: We reviewed the presenting features, demographics, treatment and visual outcome of paediatric patients with confirmed Idiopathic Intracranial Hypertension (IIH) in a British cohort.

Methods: A retrospective case review of paediatric IIH seen at Cambridge University Hospitals NHS trust between 2010 and 2016. Inclusion criteria were age between 4 and 16 years, features meeting the Modified Dandy Criteria: papilloedema, intracranial pressure of 25 cm H20 on lumbar puncture or CSF infusion study, normal MRI and CSF analysis.

Results: We identified 19 children with a mean age of 12.4 years (6-16) and 78.9% were female. 18 had primary IIH. All cases presented with headache, 42.1% with nausea or vomiting, 26.3% with transient visual obscurations, 21% with diplopia and 5.2% with facial palsy. The mean BMI was 28.4 (47.3% BMI > 30 and 31.6% BMI < 25). The mean intracranial pressure was 31cm H20 and papilloedema present in 84.2%. Presenting visual acuity was better than 6/9 in both eyes in 84.2% of children; 26.3% demonstrated enlargement of the blind spot. 84.2% received medical treatment and one child required surgical intervention. With treatment, vision improved in those with <6/9 acuity; all had improvement of papilloedema and diplopia within a mean follow-up of 8.5 months.

Discussion: The UK prevalence of paediatric obesity is rising and potentially the incidence of IIH. This cohort had good acuity at presentation and favourable visual outcome following treatment. The disease profile is similar to existing published data.

Conclusion: Our patients presented with typical features of IIH and all patients responded to treatment.

References: 1. Sheldon CA, Paley GL, Xiao R et al. Pediatric Idiopathic Intracranial Hypertension: Age, Gender, and Anthropometric Features at Diagnosis in a Large, Retrospective, Multisite Cohort. *Ophthalmology*.2016 Nov;123(11):2424-2431 2. Aylward SC, Waslo CS, Au JN et al. Manifestations of Pediatric Intracranial Hypertension From the Intracranial Hypertension Registry. *Pediatric Neurology*. 2016 Aug;61:76-82

The Clinical Evaluation of Infantile Nystagmus: What To Do First, and Why

Morgan Bertsch; Michael Floyd, MD; Taylor Kehoe, BS; Wanda Pfeifer, OC(C);
Arlene V. Drack, MD
University of Iowa, Iowa City, IA

E-Poster 25

Monday
10:45 - 11:00 am
Station A

Introduction: Infantile nystagmus has many causes, some life threatening. We determined the most common diagnoses in order to develop a testing algorithm.

Methods: Retrospective chart review. Exclusion criteria were no nystagmus, acquired after 6 months, or no examination. Data collected: eye examination findings, ancillary testing, order of testing, referring and final diagnoses. Final diagnosis was defined as meeting published clinical criteria and/or confirmed by diagnostic testing. Patients not meeting this definition were 'unknown.' Patients with incomplete testing were 'incomplete.' Patients with multiple plausible etiologies were 'multifactorial.' Patients with negative complete workup were 'motor.'

Results: 284 charts were identified; 202 met inclusion criteria. The 3 most common causes were Albinism(19%), Leber Congenital Amaurosis(LCA)(14%) and Non-LCA retinal dystrophy (13%). Anatomic retinal disorders comprised 10%, motor another 10%. The most common first test was MRI (74/202) with a diagnostic yield of 16%. For 28 MRI-first patients, nystagmus alone was the indication; for 46 MRI-first patients other neurologic signs were present. 0/28 nystagmus-only patients had a diagnostic MRI while 14/46 (30%) with neurologic signs did. Yield of ERG as first test was 56%, OCT 55%, and molecular genetic testing 47%. 85% of patients had etiologies identified.

Discussion: The most common causes of infantile nystagmus were retinal disorders, however the most common first test was brain MRI. A testing algorithm is needed.

Conclusion: For patients without other neurologic stigmata, complete pediatric eye examination, ERG, OCT and molecular genetic testing had a higher yield than MRI scan. If MRI is not diagnostic, a complete ophthalmologic workup should be pursued.

References: 1. Papageorgiou E, McLean RJ, Gottlob I. Nystagmus in childhood. *Pediatr Neonatol.* 2014 Oct;55(5):341-51. doi: 10.1016/j.pedneo.2014.02.007. Epub 2014 Jul 31. 2. Thomas MG, Thomas S, Kumar A, Proudlock FA, Gottlob I. FRMD7-Related Infantile Nystagmus. In: Pagon RA, Adam MP, Ardinger HH, Wallace SE, Amemiya A, Bean L, Bird TD, Fong CT, Mefford HC, Smith RJH, Stephens K, editors. *GeneReviews* [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2016. 2009 Feb 12 [updated 2011 Sep 29]. 3. Fu VL, Bilionick RA, Felius J, Hertle RW, Birch EE. Visual acuity development of children with infantile nystagmus syndrome. *Invest Ophthalmol Vis Sci.* 2011 Mar 14;52(3):1404-11. doi: 10.1167/iov.09-4686. Print 2011 Mar.

New Surgical Table For Horizontal Null Point Nystagmus

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E-Poster 26

Monday
10:45 - 11:00 am
Station B

Introduction: A variety of modifications and augmentations to the Anderson-Kestenbaum operation for null point nystagmus have been developed. We discuss the surgical results of a unique modification originally introduced in 1979 by Flynn and Dell'Osso using equal numbers of recession and resection (e.g. 5-5-5-5 mm), directly correlating with the gaze angle of the anomalous head positioning.

Methods: This study was conducted as a retrospective case series chart review of 40 patients seen in our clinic between January 2008 and June 2016. Patients who underwent surgical correction for nystagmus using equal numbers of recession and resection and augmentation of further increase only in the lateral rectus surgeries were included in the study, and pre and post-operative data from clinic visits were reviewed.

Results: Post-operative measurements showed improved residual to resolved anomalous head positioning in all subjects. In addition, decreased nystagmus intensity and improved visual acuity measurements in primary gaze were observed without any additional alignment deviations or ocular motility restrictions.

Discussion: The modified Anderson-Kestenbaum operation using equal numbers of recession and resection can provide a simple and efficient alternative for surgical planning, and has demonstrated favorable outcomes of resolved anomalous head positioning and in some cases increased visual acuity in our series of patients.

With this data we came up with a new modified surgery dosing table for a set measured horizontal head turn that has been fine tuned with the acquired data and outcomes.

Conclusion: The new table and numbers provides ease of pre-surgical planning. We are hoping that this new modified table that would have corrected the horizontal null point for all our patients will also be a guide for all eye surgeons alike.

References: 1. Flynn, JT and Dell'Osso, LF. The effects of congenital nystagmus surgery. Reprinted from *Ophthalmology* for Symposium on Strabismus. 1979. 2. Sternberg-Raab, A. Anderson-Kestenbaum operation for asymmetrical gaze nystagmus. *Brit J Ophthalmol.* 1963, 47, 339. 3. Taylor, JN. Surgery for horizontal nystagmus-Anderson-Kestenbaum operation. *Austral J Ophthalmol.* 1973, 1(3): 114-6. 4. Wang, ZI. and Dell'Osso, LF. Eye-movement-based assessment of visual function in patients with infantile nystagmus syndrome. *Optometry and vision science.* 2009, 86: 988-995. 5. Hertle, RW and Dell'Osso, LF. (2013). *Nystagmus in infancy and childhood: Current concepts in mechanisms, diagnoses, and management.* New York: Oxford University Press.

E-Poster 27
Monday
10:45 - 11:00 am
Station C

Pediatric Ophthalmoplegia and Ptosis Associated with Epidermolysis Bullosa Simplex-Muscular Dystrophy and PLEC Mutations

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Brenda Wong, MD
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Introduction: A previous case report described ptosis and ophthalmoplegia in a single patient with Epidermolysis Bullosa Simplex-Muscular Dystrophy (EBS-MD).¹ The aim of the present study was to evaluate ocular issues in a larger series of patients with this rare autosomal recessive systemic disease.

Methods: Medical records of patients with EBS-MD seen at one institution from 2000 to 2015 were retrospectively reviewed. Patients with genetic mutations in PLEC and documented eye exams were included.

Results: Six patients with EBS-MD and PLEC mutations were identified. Bilateral ptosis was observed in 3 patients and bilateral ophthalmoplegia was present in 2 patients. Exotropia and blepharitis were present in 1 patient each. No patients had ocular surface defects or other significant eye issues.

Discussion: This is the largest case series study to report eye issues of patients with EBS-MD. Bilateral ptosis and ophthalmoplegia appear to be common in this disease and were observed as early as age 6. These ocular issues do not appear to be associated with other subtypes of epidermolysis bullosa. Ptosis and ophthalmoplegia occurred after the onset of skin blistering but preceded systemic signs of muscular dystrophy.

Conclusion: Ptosis and ophthalmoplegia may be helpful signs in the early diagnosis of muscular dystrophy in patients with epidermolysis bullosa simplex and should prompt evaluation for PLEC mutations.

References: Auringer DE, Simon JW, Meyer DR, et al. Ptosis and ophthalmoplegia associated with epidermolysis bullosa simplex-muscular dystrophy. *Ophthal Plast Reconstr Surg.* 2010 Nov-Dec;26(6):488-9.

E-Poster 28
Monday
10:45 - 11:00 am
Station D

No More Scope, Scar, or Tears: Non-Endoscopic Endonasal Dacryocystorhinostomy in Children

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Cardiff, Wales, United Kingdom

Introduction: Congenital nasolacrimal duct obstruction that fails to resolve spontaneously by 12 months of age is treated with probing, intubation, or balloon dilation of the nasolacrimal duct. When probing fails, external approach, or in some cases endoscopic-endonasal, dacryocystorhinostomy may be offered. In this study we report a case series of children undergoing non-endoscopic-endonasal (without an endoscope) dacryocystorhinostomy (ENDCR).

Methods: Children undergoing an ENDCR for failed probing and intubation were identified from the surgical database and retrospectively reviewed. Data was collected on the gender, laterality, age at surgery, previous surgical procedure, and postoperative outcomes.

Results: There were 5 patients: 4 males and 1 female who had a total of 6 ENDCR procedures. The mean age at time of ENDCR: 5.2 years. All patients required previous interventions: syringe and probe and/or probe and intubation. Mean post-operative removal of silicon tubes was 4.7 months. Total average post-operative follow-up: 6.7 months. 4 out of 5 patients had symptom resolution. 1 patient was lost to follow up but reported minimal symptoms at last visit.

Discussion: The majority of patients who underwent ENDCR had good outcomes. Although one patient required a re-operation and had subsequent failure of treatment, there were no post-operative complications or need for additional treatments or hospitalizations.

Conclusion: ENDCR is a promising, safe, and minimally invasive approach to children with nasolacrimal duct obstruction that requires simple, inexpensive instrumentation.

References: Razavi ME, Eslampoor A, Noorollahian M, O'donnell A, Beigi B. Non-endoscopic endonasal dacryocystorhinostomy—technique, indications, and results. *Orbit.* 2009;28(1):1-6.

Kaneka Stents for the Treatment of Nasolacrimal Duct Obstruction

David I. Silbert, MD
Conestoga Eye, Lancaster, Pennsylvania, USA

E-Poster 29
Monday
10:45 - 11:00 am
Station E

Introduction: The Kaneka Lacriflow Stent is a newly introduced self-retaining bi-canalicular intubation set, which can be placed without retrieval from the nose. The simplified insertion process decreases intraoperative time and intranasal trauma. The stent is not tied in the nose and can be removed easily in the office. We review a cohort of children to evaluate the success rate of stent placement for NLDO.

Methods: Stents were placed in an outpatient surgery center under general anesthesia in pediatric patients. The stent is placed with a stylet through both punctum and self-retains due to a widened portion sitting distal to the common canaliculus in the lacrimal duct and sac. It does not require recovery from or removal from the nose.

Results: Children were between the ages of 1-12 years. Stents were left in place for 3 months. Stent's were placed successfully in 11 of 14 eyes. Two eye's of 2 different patients were not able to have the stent placed. There was an improvement in symptoms in all 8 eyes of 7 patients who we have follow up data on.

Discussion: Kaneka Lacriflow stents can be removed easily in the office without entering the nose making them ideal for use in children. A new insertion technique, bending the stylet should allow it to be used in even the youngest children.

Conclusion: Kaneka Lacriflow stents can be successfully placed in children to treat epiphora.

References: 1. Silbert DI: Use of a self-retaining bicanalicular nasolacrimal stent for partial nasolacrimal obstruction in adults without need for general anesthesia. ARVO Annual meeting abstract; June 2015 2. Celenk F1, Mumbuc S, Durucu C, Karatas ZA, Aytaç I, Baysal E, Kanlikama M: Pediatric endonasal endoscopic dacryocystorhinostomy. Int J Pediatr Otorhinolaryngol. 2013 Aug;77(8):1259-62. 3. Cunningham MJ1: Endoscopic management of pediatric nasolacrimal anomalies. Otolaryngol Clin North Am; 2006 Oct;39(5):1059-74

Punctal Occlusion for Treatment of Disabling Photophobia in Pediatric Patients

Richard M. Schroeder, MD; Gregg T. Lueder, MD
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St. Louis, Missouri

E-Poster 30
Monday
10:45 - 11:00 am
Station F

Introduction: Evaluation and treatment of photophobia is challenging in pediatric patients because their young age and discomfort may markedly limit their ability to cooperate with examination of the cornea and tear film. We describe the outcomes of patients with disabling photophobia managed with punctal occlusion.

Methods: Case series of children with photophobia that severely limited their activities. The presenting signs and symptoms, procedures and evaluations performed, physical examination after interventions, and subjective outcomes were reviewed. The patients were unable to tolerate slit-lamp examination in the office. They were initially treated with a collagen plug trial, with subsequent permanent punctal occlusion with silicone plugs or cautery.

Results: Three patients with disabling photophobia were treated. The first was a 3-year-old girl with no medical or other ocular problems. The second was a 10-month-old with IPEX syndrome. The third was a three-year-old with autistic behavior. All three patients had resolution of photophobia and resumption of normal activity shortly after punctal occlusion.

Discussion: Severe photophobia is an uncommon problem in children that can be difficult to evaluate and treat. Improvement following punctal occlusion indicates that corneal dryness is the likely cause of the photophobia. Permanent occlusion may provide long-lasting relief to some patients with this problem.

Conclusion: Punctal occlusion may be useful in the evaluation and management of pediatric patients with marked photophobia.

References: Mataftsi A, Subbu RG, Jones S, Nischal KK. The use of punctal plugs in children. British Journal of Ophthalmology 2012; 96:90-92

E-Poster 31

Monday
10:45 - 11:00 am
Station G

Amblyopia and Strabismus Decreased over the Last Decade Among Young Adults in Israel

Eedy Mezer, MD; Yinon Shapira, MD; Yossy Machluf, MD; Michael Mimouni, MD; Yoram Chaïter, MD

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Introduction: To estimate the prevalence of amblyopia, strabismus and amblyopia risk factors (ARFs) among young adults in Israel, and analyze secular trends.

Methods: We designed a cross-sectional study and after excluding 288 due to decreased vision secondary to ocular organic causes we included 107,608 subjects aged 17.4±0.6 years born between 1971-1994. We examined trends in the severity of amblyopia as well as anisometropia, strabismus in unilateral amblyopia, and isoametropia in bilateral amblyopia.

Results: The prevalence of amblyopia over a period of 23 years of birth declined by 33%. This decline can be attributable to a drop in unilateral amblyopia from 1% to 0.6%, while bilateral amblyopia prevalence remained the same (0.2%). The decline in unilateral amblyopia was noted in mild and moderate amblyopia, but not in severe amblyopia. Strabismic amblyopia was detected in 6.7-9.5% of the entire young adults population in the different birth years, without a significant secular trend. Strabismus or anisometropia were detected in 6-12% and 11-20% of subjects with unilateral amblyopia, respectively, without significant secular trends. Isoametropia occurred in 46-59% of bilateral amblyopia cases without a significant secular trend. Prevalence of strabismus in the study population decreased by 60% in the recent birth years. In subjects with strabismus, the prevalence of mild amblyopia increased, while moderate and severe amblyopia remained stable.

Discussion: The prevalence of unilateral mild and moderate amblyopia as well as of strabismus decreased significantly over close to a generation. The prevalence of strabismic, bilateral and unilateral severe amblyopia remained stable.

Conclusion: The continued improvements in the national screening program of children similar to other countries (1) and the improved utility of treatment for amblyopia due to an increase in the number of fellowship trained pediatric ophthalmologists may have contributed to these trends. This data may provide support for similar programs elsewhere.

References: 1. Rosman M, Wong TY, Koh CL, Tan DT. Prevalence and causes of amblyopia in a population-based study of young adult men in Singapore. *Am J Ophthalmol* 2005;140(3):551-2.

Rates of Loss to Follow Up in Pediatric vs Adult Ophthalmology Patients

Hussain Khimji; Deepak J. Karivelil, MB, BCh, BAO, LRCP&SI; Ayda Askari, BHSc; Fariba Nazemi

Introduction: An integral part of patient management has always been follow up.^{1,2} This is especially important in pediatric ophthalmology, as it facilitates monitoring of ophthalmic conditions during vital stages of eye development.³ Current research regarding loss to follow up in this area is limited. This retrospective chart review compares adult/pediatric follow up rates, and explores reasons why patients are lost to follow up. The study endeavours to develop strategies to address loss to follow up, thereby improving quality of clinical care.

Methods: Charts were chronologically examined within a 12 month window. New patients and patients requiring follow up within 6 ± 1 months were exclusively assessed to meet major cohort quotas (adult/pediatric/medical/surgical patient combinations). Follow up attendance was recorded; reasons for missing were categorically stratified.

Results: Adult medical follow up: 162/200 (81%); Pediatric medical follow up: 124/200 (62%); Adult surgery follow up: 48/50 (96%); Pediatric surgery follow up: 38/48 (79.2%).

Discussion: The pediatric population is identified as more inclined to be lost to follow up, compared to adults. Results yielded that surgical patients were more likely to attend follow ups, when compared to medical patients. Notwithstanding this, follow up rates were significantly lower in the pediatric population overall, compared to adults.

Conclusion: The implementation of improved support structures to aid with follow ups is, evidently, essential for pediatric populations. There is now a sound foundation for further research to explore these issues more in depth. With these results and continued investigation, guidelines and structures can be established to manage and prevent patient loss to follow up.

References: 1. DiMatteo M. Variations in Patients' Adherence to Medical Recommendations. *Medical Care*. 2004;42(3):200-209. doi:10.1097/01.mlr.0000114908.90348.f9. 2. Ung C, Murakami Y, Zhang E et al. The Association Between Compliance With Recommended Follow-up and Glaucomatous Disease Severity in a County Hospital Population. *American Journal of Ophthalmology*. 2013;156(2):362-369. doi:10.1016/j.ajo.2013.03.005. 3. Infant Vision: Birth to 24 Months of Age. *Aoaorg*. 2016. Available at: <http://www.aoa.org/patients-and-public/good-vision-throughout-life/childrens-vision/infant-vision-birth-to-24-months-of-age?ss=oy>. Accessed September 2, 2016.

E-Poster 32

Monday
10:45 - 11:00 am
Station H

Psychosocial and Asthenopic Improvements After Correction of Excyclotorsion with Harada-Ito

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E-Poster 33

Monday
10:45 - 11:00 am
Station I

Introduction: Patients with moderate to large excyclotorsion often complain of asthenopia, eye aches, headaches and eye discomfort when reading.

Methods: Excyclotorsion surgery was offered to forty-three patients (seventy eyes) who had asthenopic complaints. Objective and subjective torsion were measured.

Patients with over elevation in adduction receive an inferior oblique Z tenotomy or recession. If torsion remains, a nonabsorbable 6-0 mersilene suture is tied around only the bottom 1 1/2mm of the superior oblique, 4mm back from the insertion and tied. The superior oblique is not split. The superior oblique is then pulled anteriorly and temporally 2-3mm, and the needle is placed into the sclera, and final additional knots tied. (Modified Harada-Ito, "Stavis Cinch")

Results: Asthenopia, headaches, eye aches while reading and reading comfort all improved following this surgery. Infants with behavioral problems have a much higher percentage of large excyclotorsion. They often have severe behavioral problems that have been unexplained even after multiple visits to many physicians. Eliminating the excyclotorsion in most cases caused profound improvements in these children's behavior.

Discussion: Large excyclotorsion is often undercorrected. Inferior oblique recession only eliminates approximately one third of the torsion as seen by indirect ophthalmoscopy in the OR. Because we have underestimated the severity of asthenopic symptoms caused by excyclotorsion, and because we did not have an easy, safe, and reliable Harada-Ito operation, many patients were not offered more complete resolution of their excyclotorsion.

Conclusion: Asthenopic symptoms from excyclotorsion are often more severe than we recognize. Resolution leads to reduction in asthenopia. Children often have a profound improvement in their behavior and comfort when reading.

References: 1. Social and emotional impact of strabismus surgery on quality of life in children. Archer, SM, et al. JAAPOS 2005 2. Psychosocial implications of strabismus surgery in adults. J Pediatric Ophthalmology & Strabismus 1997 May 34:159-164 3. The psychosocial effects of strabismus before and after surgery. J Ped Ophthalmol Strabismus 2012 May-June 49(3) 170-175

Visual Impairment and Eye Disease Among Children of Migrant Farmworkers

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Emory University, Atlanta, GA

E-Poster 34

Monday
10:45 - 11:00 am
Station J

Introduction: There is a dearth of ophthalmic epidemiologic data for both rural and immigrant children in the United States. The purpose of the following study is to determine the prevalence of visual impairment and ocular disease among the children of migrant farmworkers in the Southeastern United States.

Methods: Visual acuity screening was performed on 156 Haitian and Hispanic children of migrant farmworkers attending a summer school in Bainbridge, GA. Presenting visual impairment (PVI) is analyzed and stratified by ethnicity and type, resolving with refractive correction or non-resolving, in the better and worse eye.

Results: Migrant farmworker children have a high prevalence of PVI, in the worse and better eye (20% and 14% respectively). Of those with PVI in the worse eye, 77% had uncorrected refractive error. The prevalence of uncorrected refractive error from astigmatism and high-astigmatism was significantly higher among Hispanics than Haitians. In our study, all PVI non-resolving with refraction was secondary to amblyopia. The prevalence of amblyopia amongst migrant farmworker children was 5%. Of those children with amblyopia, 57% of cases were anisometropic or secondary to uncorrected refractive error.

Discussion: Children of migrant farmworkers have a higher rate of PVI, largely from uncorrected refractive error, as compared to other Hispanic and African American children in the U.S. with a prevalence closer to that of children in Asian and Latin American countries than school children in the U.S. [1-3]

Conclusion: Our study illustrates the need for improved access to screening and care in this vulnerable population.

References: 1. Prevalence and causes of visual impairment in African-American and Hispanic preschool children: the multi-ethnic pediatric eye disease study. Ophthalmology. 2009;116:1990-2000.e1. 2. Maul E, Barroso S, Munoz SR, Sperduto RD, Ellwein LB. Refractive Error Study in Children: results from La Florida, Chile. Am J Ophthalmol. 2000;129:445-54. 3. Naidoo KS, Raghunandan A, Mashige KP, Govender P, Holden BA, Pokharel GP, et al. Refractive error and visual impairment in African children in South Africa. Invest Ophthalmol Vis Sci. 2003;44:3764-70.

E-Poster 35
Monday
10:45 - 11:00 am
Station K

Responding to Ocular Sentinel Events in a Children's Hospital: Root Cause Analysis, Multidisciplinary Interventions, and Compliance Assessment

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Introduction: Patient safety is a high priority. We demonstrate a systematic approach for improving safety by describing a multidisciplinary quality-improvement cycle response to pediatric intensive care unit (ICU) adverse ocular events.

Methods: Prospective development, implementation, and 6-year outcome assessment of an ocular prophylaxis program, following sentinel events with vision loss from exposure keratopathy. Outcomes were measured through passive surveillance for safety events and an end-period, cross-sectional assessment of exposure keratopathy risk factors and protocol compliance in cardiac and pediatric ICU patients at The Children's Hospital of Philadelphia.

Results: In 2009, two children had exposure-related corneal perforations, penetrating keratoplasties, and vision loss. Root cause analysis (RCA) revealed inadequacies in clinician knowledge, prophylactic lubricant use, nursing assessment, and timely ophthalmology consultation. Protocols were developed for risk factor assessment, simplified ocular examination, risk-stratification-guided prophylaxis, and consultation. Implementation included widespread physician and nursing education and changes to nursing flowsheets and pharmacy ordering pathways. In 2015-2016, two additional children had vision loss from exposure keratopathy. RCA identified recurrent gaps in care. Cross-sectional assessment of 104 ICU children was performed. Only 61% were in protocol compliance. 30% received no or underdosed lubricants. 12 had lagophthalmos, 5 with corneal exposure, of who 3 had no ophthalmology consultation, 2 no lubricants, 1 underdosed. Revision and implementation of annual mandatory education was undertaken.

Discussion: Despite broadly implemented protocols and reduction in adverse events, the effect was not sustained. Clinician knowledge waned, leaving patients at risk for vision-threatening complications.

Conclusion: Patient safety initiatives require multidisciplinary collaboration, ongoing surveillance, and continuing education to maintain provider awareness and compliance.

E-Poster 36
Monday
10:45 - 11:00 am
Station L

A Randomized Controlled Trial of Art Observation Training to Improve Medical Student Ophthalmology Skills

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Rebecca Mitchell; Barbara Bassett; Horace DeLisser; Gil Binenbaum
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Introduction: We sought to evaluate the effects of formal observation training in the visual arts on the general and ophthalmological observational skills of medical students.

Methods: We collaborated with The Philadelphia Museum of Art (PMA) to conduct a randomized, controlled, single-masked trial of 36 first-year medical students, randomized 1:1 into art-training and control groups. The art-training group received six custom-designed 1.5-hour art observation sessions at PMA. All subjects completed pre and post testing, in which they described works of art, retinal pathology images, and external photos of eye diseases. Written descriptions were graded for observational and descriptive abilities by reviewers masked to group assignment and pre/post-status, using an a priori rubric.

Results: Observational skills, as measured by description testing, improved significantly in the training group (mean change +19.1 points) compared to the control group (-13.5) ($p=0.001$), and there were significant improvements for each art and clinical sub-score. In a post-study questionnaire, students reported applying the skills they learned in the museum in clinically meaningful ways at school.

Discussion: Observation is a key component of ophthalmological examination and diagnosis. It is a difficult but pivotal skill to teach especially for beginner students and residents who must rely on their descriptive abilities to convey exam findings. It is encouraging to learn that principles from the field of visual arts, which is reputed to excel in teaching observation and descriptive abilities, can be successfully applied to medical training.

Conclusion: Art observation training for medical students can improve clinical ophthalmology observational skills. Further studies can examine the impact on clinical care.

References: Shapiro J, Rucker L, Beck J. Training the clinical eye and mind: Using the arts to develop medical students' observational and pattern recognition skills. *Med Educ.* 2006;40:263-8.

Private Practice Experience with Low-Dose Atropine for the Treatment of Progressive Myopia

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E-Poster 37
Wednesday
10:00 - 10:15 am
Station A

Introduction: Progressive myopia is associated with multiple sight-threatening conditions¹⁻². We retrospectively reviewed patients' charts on low-dose atropine from 2012 to present.

Methods: All patients' charts offered atropine were retrospectively reviewed from February 1, 2012 to November 30, 2016. Two cycloplegic refractions at least 12 months apart was the inclusion criteria. All statistical analysis was conducted via paired t-test.

Results: Of the 51 patients identified, 30 met criteria for inclusion. Nineteen of those were being treated with atropine 0.01% included 8 females, 11 Caucasians, 6 Asians and 2 Hispanics. The average amount of myopia at the start of treatment was 5.67 diopters with an average increase of 0.96 Diopters/year at first visit. The 11 controls had 5 females, 7 Caucasians, and 4 Asians. The average amount of myopia was 3.93 diopters with an increase of 1.5 diopters/year at first visit. The treatment group had an average increase in myopia of 0.48 diopters/year over 25 months of follow-up while the controls had an increase of 0.70 diopters/year over 19 months ($p=0.16$). When comparing the atropine group progression before and after treatment, the average increase/year was 0.96 versus 0.48 Diopter, respectively ($p=0.0008$). It is important to note, that two patients continued to have significant myopia progression on treatment with an increase of 1.74 diopters and 1.17 diopters per year. The atropine group reported blurred reading for two weeks. Two patients reported headaches and treatment was discontinued. The major negative outcome was a retinal detachment on treatment.

Discussion: This small retrospective case series does show statistically significant difference in the treatment group progression before and after treatment with atropine with minimal side-effects.

Conclusion: Before wide-spread use, it is imperative that a large randomized control trial be done to see if this treatment is efficacious.

References: 1. Rada JAS, Shelton S, Norton TT. The sclera and myopia. *Exp Eye Res.* 2006;82(2):185-200. doi:10.1016/j.exer.2005.08.009. 2. Saw S, Gazzard G, Shih-yen EC, Chua W. Myopia and associated pathological complications. 2005:381-391.

Pediatric Corneal Topography: Feasibility and Findings in Three Pediatric Risk Groups

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E-Poster 38
Wednesday
10:00 - 10:15 am
Station B

Introduction: While global consensus exists for the definition of progressive keratoconus in adults, the best ways of identifying children at risk have not been established. The present study investigated the utility of 3 corneal screening devices in 3 groups of children.

Methods: IRB approved, prospective cohort study of patients with Trisomy 21 (Group 1), first-degree relative with keratoconus/significant refractive error (Group 2), or control (Group 3) enrolled at Emory Eye Center. Informed consent was obtained before testing with Pentacam, Orbscan, and Ocular Response Analyzer (ORA). Ability to complete tests, quality of test results, and corneal parameters obtained for each eye were recorded. A 1-way Anova test compared results between the 3 groups.

Results: Fifty-four patients age 7-17 years (mean 11.74) were enrolled July 2014-July 2016. Number of patients in, and percentage of tests completed for groups 1, 2, and 3 respectively: 12, 55%; 21, 87%; 21, 88%. Pentacam values by group: central corneal thickness (CCT) 524, 543, 542 $p=0.36$; thinnest point (TP) 498, 536, 534 $p=0.03$; corneal front mean keratometry 44.94, 43.17, 43.22 $p=0.01$; quality score 1.42, 0.22, 0.04 $p<0.0001$. Orbscan: CCT 493, 551, 550 $p=0.01$; TP 451, 536, 538 $p<0.0001$. ORA: corneal hysteresis 10.6, 12.1, 11.6 $p=0.124$; corneal resistance factor 9.9, 11.8, 11.6 $p=0.03$; waveform score 5.6, 7.6, 7.3 $p=<0.0001$.

Discussion: Children with Trisomy 21 completed fewer tests reliably, had thinner corneas, and lower corneal resistance factors than children in Groups 2 and 3.

Conclusion: Corneal tests used to evaluate adults for keratoconus may not be reliable for the evaluation of certain high-risk pediatric patients.

References: 1. Aslan L, Aslankurt M, Yuksel E, et al. Corneal thickness measured by Scheimpflug imaging in children with Down syndrome. *J AAPOS* 2013;17:149-152. 2. Vincent AL, Weiser BA, Cupryn M, et al. Computerized corneal topography in a paediatric population with Down syndrome. *Clinical and Experimental Ophthalmology* 2005;33:47-52.

E-Poster 39

Wednesday
10:00 - 10:15 am
Station C

Corneal Topography Indications for the Diagnosis of Keratoconus in Children

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Introduction: Although corneal topography (CT) is the gold standard for diagnosing keratoconus (KC), its indications in children have not been defined. This study aims to define CT indications for cost effective KC screening.

Methods: We analyzed all CT's performed to patients 14 years and younger, between September 2014 and June 2016. We divided patients in 2 groups: KC and normal. Then analyzed: keratometry, refractive cylinder (RC) and age. Positive predictive (PPV) and negative predictive (NPV) values were calculated for keratometry (>47D) and refractive cylinder (> -3.00D).

Results: Of the 244 eyes included, 26 were positive for KC. In the KC group the mean age was 11.77 years (SD+ 1.03), keratometry 51.42D (SD+ 6.62) and RC -6.56D (SD+ 3.90). In the normal group the corresponding values were 10.11 (SD + 2.39), 46.88 (SD+ 1.50) and -4.40D (SD+2.09). Differences between groups were significantly different. 28.9% of KC patients and 26.92% of normal patients had refractive cylinder > -3.00 D. The PPV for keratometry > 47 D was 84.61% and NPV 40.82%. PPV was 26.92% and NPV 28.89% for RC > -3.00 D

Discussion: Using keratometry as an indication CT might be a cost-effective strategy for KC screening. RC >-3.00D does not appear to be useful in determining which children should undergo CT to rule out KC.

Conclusion: Keratometry is the most important variable for indicating CT to diagnose KC. The RC of > -3.00 D is not reliable for indicating a CT. Eye contact lens 40:326-330

References: 1. Belin MW, Villavicencio OF, Ambrosio RR Jr. 2014 Tomographic parameters for the detection of keratoconus: suggestions for screening and treatment parameters 2. Cavas-Martinez F, De La Cruz Sanchez E, Nieto Martinez J, Fernandez CaA±avate FJ, Fernandez-Pacheco DG 2016 Corneal topography in keratoconus:state of the art 22:3-5

E-Poster 40

Wednesday
10:00 - 10:15 am
Station D

Vitreoretinal Fibrosis in the Treatment of Coats Disease: A Meta-Analysis

S. Madison Duff, BS; Janelle F. Adeniran, MD, PhD; Nathan Lambert, MD;
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Introduction: With intravitreal anti-VEGF (anti-vascular endothelial growth factor) agents to treat Coats' disease, (1) concern for the development of vitreoretinal fibrosis lingers. (2) Due to the rarity of this condition, we undertook a meta-analysis to further review this complication.

Methods: A PubMed search for 'Coats disease' was completed. Patients were placed into groups: anti-VEGF injection alone (Group 1); injection plus laser (Group 2); injection plus cryotherapy (Group 3); standard treatment with cryotherapy and/or laser (Group 4); or injection plus both laser and cryotherapy (Group 5). The main outcome measure was occurrence of fibrosis at final follow-up.

Results: 183 articles described 1515 eyes. Groups 1 (n=22), 2 (n=188), 3 (n=20), 4 (n=862) and 5 (n=40) had 1, 8, 2, 41 and 3 cases of fibrosis upon presentation, respectively (total 55). Groups 1, 2, 3, 4 and 5 had 1, 14, 7, 130 and 13 at final follow-up, respectively (total 165). Including eyes that received no treatment (n=323) or enucleation (n=60), the overall reported incidence of fibrosis on presentation was 4.2/100. The average number of injections given was 2.9, most commonly, Bevacizumab. Multivariate analysis demonstrated a significant association between cryotherapy and any reported fibrosis. Anti-VEGF injection resulted in a slightly increased risk for fibrosis, while laser photocoagulation appears to be protective.

Discussion: Fibrosis in Coats' disease is more common than previously thought. (3) This may worsen with treatment, but is not necessarily due to anti-VEGF therapy.

Conclusion: Fibrosis should be recognized prior to therapeutic intervention. Coordinating the most appropriate treatment regimen should be further examined.

References: 1. Kaul S, Uparkar M, Mody K, Walinjar J, Kothari M, Natarajan S. Intravitreal anti-vascular endothelial growth factor agents as an adjunct in the management of Coats' disease in children. Indian J Ophthalmol 2010; 58(1): 76-78. 2. Ramasubramanian A, Shields CL. Bevacizumab for Coats' disease with exudative retinal detachment and risk of vitreoretinal traction. Br J Ophthalmol 2012; 96(3): 356-359. 3. Daruich A, Matet A, Tran HV, Gaillard MC, Munier FL. Extramacular fibrosis in Coats' disease. Retina. 2016 Mar 16. [Epub ahead of print] PubMed PMID: 26991649.

Optical Coherence Tomography in Pediatric Optic Nerve Hypoplasia

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E-Poster 41

Wednesday
10:00 - 10:15 am
Station E

Introduction: Unilateral optic nerve hypoplasia (ONH) can cause decreased vision, with a normal contralateral eye. Optical coherence tomography (OCT) assesses the structure of the optic nerve and macula and may reveal the relationship between affected and unaffected eyes. No previous studies have examined volumetric OCT data with an automatic segmentation method in optic nerve hypoplasia.

Methods: Retrospective review identified all pediatric patients (<18 years) with unilateral ONH and Cirrus OCT between 2000-2015. Volumetric OCT scans of optic nerve and macula were automatically segmented via Iowa Reference Algorithm1 to identify retinal layer thicknesses. Student's t-test compared retinal morphology between affected and unaffected eyes. Pearson correlation identified relationships between layer thicknesses and visual acuity.

Results: Ten patients met inclusion criteria with optic nerve OCT, of which seven also had macular OCT. Peripapillary retinal nerve fiber layer (RNFL), inner plexiform layer (IPL), inner nuclear layer (INL), and macular RNFL, ganglion cell layer, IPL and INL were all significantly thinner in affected than unaffected eyes ($p < 0.039$). Poorer visual acuity was associated with thinner peripapillary INL, peripapillary outer nuclear layer, and macular RNFL, IPL and INL ($r < -0.668$, $p < 0.05$).

Discussion: OCT analysis of retinal layers showed significant differences in pediatric eyes with optic nerve hypoplasia vs. unaffected eyes. Additionally, visual acuity correlated with thickness of several retinal layers.

Conclusion: OCT may help with diagnosis of unilateral ONH by patient-specific comparison of retinal layer thickness, which is especially important in the pediatric population in which normative OCT data are sparse.

References: Abramoff MD, Garvin M, Sonka M. Retinal Imaging and Image Analysis. IEEE Reviews in Biomedical Engineering, 3, 169-208, 2010. doi:10.1109/RBME.2010.2084567

Retinal Nerve Fiber Layer and Ganglion Cell-Inner Plexiform Layer Measurements Using Handheld Optical Coherence Tomography in Normal Children

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E-Poster 42

Wednesday
10:00 - 10:15 am
Station F

Introduction: Measurements of the ganglion cell complex (GCC), comprising the retinal nerve fiber, ganglion cell, and inner plexiform layers, can be correlated with vision loss caused by optic nerve disease. Handheld optical coherence tomography (HH-OCT) with sedation can be used in young children unamenable to traditional imaging. Purpose: to report GCC measurements in normal children using the HH-OCT.

Methods: Healthy, full-term children ≤ 5 years-old undergoing sedation or anesthesia were enrolled in this on-going, prospective observational study. Exclusion criteria: prematurity, pre-existing neurologic, genetic, metabolic or intraocular pathology. Demographic data, axial length (Master-Vu Sonomed Escalon, NY), and HH-OCT macular volume scans at 0 degrees (Biotigen, Inc., NC) were obtained. DOCTRAPv6.0 software was used to segment retinal layers and average volume thickness maps were created for 1-mm, 3-mm, and 6-mm rings centered on the fovea.

Results: Enrolled were 68 eyes (68 children, 32 male, age range 3.4-71 mos). Average axial length was 21.2 ± 1.0 mm with mean spherical equivalent 1.49 ± 1.34 diopters (range: -2.25 to +4.25). Reliable HH-OCT scans for 1-, 3- and 6-mm scan were available for 62, 59, and 53 eyes, respectively. Average GCC thickness at the fovea was 0.26 ± 0.20 μ m, and at 1-, 3-, and 6-mm was 35.1 ± 6.5 , 688.8 ± 93.1 , and 2627.0 ± 192.4 μ m, respectively. Multivariate correlation did not show significant difference in average GCC thickness with age ($p > 0.05$ for all parafoveal rings).

Discussion: Data collection and analysis is ongoing in this population of healthy children, and provide normative control data for children with glaucoma or other optic neuropathies.

Conclusion: Average GCC thickness was stable from 6-months to 5-years of age.

References: 1. Avery RA, Cnaan A, Schuman JS, et al. Intra- and inter-visit reproducibility of ganglion cell-inner plexiform layer measurements using handheld optical coherence tomography in children with optic pathway gliomas. Am J Ophthalmol. 2014;158:916-23. 2. Lee, Purohit, Patel, et al. In vivo foveal development using optical coherence tomography. Invest Ophthalmol Vis Sci. 2015;56:4537-45. 3. Rothman, Sevilla, Freedman, et al. Assessment of retinal nerve fiber layer thickness in healthy, full-term neonates. Am J Ophthalmol. 2015;159:803-11.

E-Poster 43

Wednesday
10:00 - 10:15 am
Station G

Intravitreal Bevacizumab for ROP in Guatemala

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Introduction: Laser therapy can be ineffective and challenging for stage 3 retinopathy of prematurity (ROP). Bevacizumab can be an alternative treatment. This study aims to compare outcomes and costs of laser and Bevacizumab for ROP treatment in Guatemala, a low-resource setting.

Methods: We reviewed the charts of all patients with stage 3 ROP between January 2009 to July 2015. Those treated with only Bevacizumab or laser were included. We used ROP recurrence as the outcome of interest. Costs were estimated based on the billing of the Unidad Nacional de Oftalmología in Guatemala.

Results: 146 eyes were treated, 64 (39%) with Bevacizumab and 82 (61%) with laser. Average weight and post menstrual age for each group were 1253.88 gr and 1321.8 gr ($p=0.43$) and 41.66 weeks and 38.15 weeks ($p=0.05$), respectively. ROP recurred in 3 (4%) eyes in the Bevacizumab group and 13 (15%) in the laser ($P=0.01$). Bevacizumab was \$526 less expensive per patient.

Discussion: ROP recurrence was significantly lower in eyes treated with Bevacizumab compared to laser. Bevacizumab appears to be less expensive compared to laser in this low-resource setting.

Conclusion: Bevacizumab appears to be more effective and less expensive for treating stage 3 ROP in Guatemala and therefore could be explored as the standard of care in low resource settings.

References: 1. Mintz-Hittner H, Kennedy K, Chuang A. Efficacy of intravitreal Bevacizumab for stage 3+ retinopathy of prematurity. *Perspective.* 2011;113-116. 2. Sharma R, Gupta VP, Dhaliwal U, Gupta P. Screening for retinopathy of prematurity in developing countries. *J Trop Pediatr.* 2007;53(1):52-54. doi:10.1093/tropej/fml071.

E-Poster 44

Wednesday
10:00 - 10:15 am
Station H

The Association Between the Serum Magnesium Level and the Development and Severity of Retinopathy of Prematurity

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Introduction: We evaluated the association between the serum magnesium level, as a surrogate of the autonomic nervous system activity, with the development and severity of retinopathy of prematurity (ROP).

Methods: The serum magnesium level was analyzed in 2 groups of high risk premature infants while in the NICU. The first group had severe ROP requiring treatment. The second group, the control, was comprised of preterm infants who did not develop significant ROP and who were matched for gestational age, birth weight, frequency of intraventricular hemorrhage ($p=1.000$), development of septicemia ($p=1.00$) and respiratory distress syndrome ($p=0.767$).

Results: We included 26 infants in the treatment group and 18 infants in the control. The mean gestational age for the treatment group was 24.85 weeks ± 1.71 and 25.28 weeks ± 1.31 for the control ($p=0.374$). The mean birth weight for the treatment group was 0.677 kg ± 0.20 and 0.71 kg ± 0.11 for the control ($p=0.575$). The mean magnesium level was 2.585 ± 0.540 in the treatment group and 2.171 ± 0.590 for the control group ($p=0.03$). The magnesium level tended to drop significantly over time in the treatment group when compared to the control group ($p=0.050$).

Discussion: The serum magnesium level was higher in the treatment group, but tended to drop significantly when compared to the control group.

Conclusion: The serum magnesium level may play an important role in the development and severity of retinopathy of prematurity.

References: 1. Hussein MA, Coats DK, Khan H, Paysse EA, Steinkuller PG, Kong L, O'Brian SE. 'Evaluating the association of autonomic drug use to the development and severity of retinopathy of prematurity.' *Journal of AAPOS*, 2014; 18(4): 332-337 2. Caddell JL. 'Hypothesis: the possible role of magnesium and copper deficiency in retinopathy of prematurity.' *Magnes Res*, 1995; 8(3): 261-70.

Outcomes of Stage 3 Retinopathy of Prematurity Persisting Beyond 40 Weeks of Post Menstrual Age

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E-Poster 45
Wednesday
10:00 - 10:15 am
Station I

Introduction: To evaluate structural outcomes of infants with stage 3 (S3) retinopathy of prematurity (ROP) persisting beyond 40 weeks of post menstrual age (PMA) and identify morphological risk factors in infants that were treated.

Methods: Retrospective chart review was performed of all premature infants screened between January 2004 -July 2015. All infants with S3 ROP persisting beyond 40 weeks of PMA were included. Infants treated before 40 weeks PMA were excluded. We collected data on patients' demographics and ROP parameters.

Results: Out of 2356 screened infants, 115 infants (172 eyes) met inclusion criteria. 33 eyes were treated and 139 eyes were observed. The average gestational age was 26.92 ± 2.4 weeks and 26.30 ± 2.02 weeks and birth weight was $916g \pm 280$ and $836g \pm 231$ for the treated and observed groups, respectively. Treatment was performed at mean PMA of 42.04 ± 2.01 weeks. 16 eyes were treated for type1 ROP and 17 were treated for persistent temporal band of S3. Two or more clock hours of S3 were present in 63 observed and 33 treated groups respectively, $p < 0.0001$. Temporal band of S3 crossed the horizontal midline in 73 observed and 28 treated groups respectively, $p < 0.0001$. No eye had unfavorable structural outcome.

Discussion: Persistence of a temporal band of S3 that extends more than 2 clock hours and crosses the horizontal midline are more likely to be associated with treatment.

Conclusion: In this cohort, S3 ROP persisting beyond 40 weeks of PMA was uncommon and associated with favorable structural outcome. Extent of S3 and crossing the horizontal midline were important factors for considering treatment.

References: 1. Early Treatment For Retinopathy Of Prematurity Cooperative G. 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.

Vitreomacular Bands in Premature Infants Screened for Retinopathy of Prematurity as Detected by Handheld Spectral Domain Optical Coherence Tomography

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E-Poster 46
Wednesday
10:00 - 10:15 am
Station J

Introduction: Vitreous findings by optical coherence tomography (OCT) have not been well characterized in premature infants. This study describes vitreomacular bands (VMB) and associated features in infants screened for retinopathy of prematurity (ROP).

Methods: Forty-one infants screened for ROP in two university Neonatal Intensive Care Units underwent imaging with the Envisu R2300 II handheld spectral domain OCT (Bioptigen, Inc, Morrisville, NC) in this prospective observational study. Images were analyzed for presence of VMB (linear opacities extending from the surface of the retina in multiple frames) and other retinal findings.

Results: Forty-one infants (24/41 or 59% male, median gestational age 27.6 weeks, range 23-31; median birth weight 995g, range 610-1659; median postmenstrual age at imaging 36 weeks, range 31-46) were imaged with OCT. Fifteen of 41(37%) had VMB, 23/41(56%) had ROP, 24/41(59%) had CME, and 3/41(7%) had Type 1 ROP requiring laser treatment. The presence of VMB was associated with punctate hyperreflective vitreous material ($p=0.04$). However, no significant associations were present between VMB and birth weight, sex, gestational age, ROP stage, or epiretinal membranes although there was a trend with ROP ($p=0.09$) and CME ($p=0.14$).

Discussion: VMB were associated with punctate hyperreflective vitreous material, but only trended toward an association with CME and ROP. The significance of VMB remains to be determined but they may represent vitreous liquefaction or detachment.

Conclusion: Some premature infants(37%) screened for ROP had VMB appreciated on handheld OCT. This finding deserves further study to better understand their significance and whether they contribute to CME development in some cases.

References: 1. Vinekar A, et al. Eye (Lond). 2010 Feb;24(2):379-82. 2. Dubis AM, Subramaniam CD, Godara P, Carroll J, Costakos DM. Sub-clinical macular findings in infants screened for retinopathy of prematurity with spectral-domain optical coherence tomography. Ophthalmology. Aug 2013;120(8):1665-1671. 3. Maldonado RS, Izatt JA, Sarin N, et al. Optimizing hand-held spectral domain optical coherence tomography imaging for neonates, infants, and children. Invest Ophthalmol Vis Sci. May 2010;51(5):2678-2685.

E-Poster 47

Wednesday
10:00 - 10:15 am
Station K

Portable Electroretinography in Term and Pre-Term Children

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Introduction: Retinal function can be disturbed by premature birth. The aim of the study was to compare electroretinographic(ERG) responses of preterm children, with and without a history of retinopathy of prematurity, to term children. RETeval is a portable device which was developed for ERG screening of adult diabetic patients, which we aimed to use in children.

Methods: 11 premature children, of mean gestational age 27weeks (range: 23-30w) and birth weight 1000g (range: 580-1700g), who were 7.1 ± 2.7 years old at the time of the study, participated in the study (premature group). Further subdivision according to a history of retinopathy of prematurity (ROP+) or its absence (ROP-), and according to gestational age (<27weeks) or (27-30weeks) was performed. 12 healthy term children, average age 8.0 ± 1.5 years participated in the study as the control group. 30Hz flicker ERG responses were obtained using the RETeval, and average latencies and amplitudes were compared between the groups.

Results: The average 30Hz latency was longer in the premature compared to the control group (27.0 ± 1.3 vs. 25.9 ± 0.9 ms, $p=0.004$). A trend toward longer latency was observed in the ROP+ compared to ROP- children (28.4 ± 1.0 vs. 26.1 ± 0.7 ms, $p=0.02$), and in the <27w compared to the 27-30w children (27.8 ± 1.4 vs. 26.1 ± 0.8 ms, $p=0.22$). The average 30Hz amplitude was lower in the premature compared to the control group (23.1 ± 6.1 vs. 26.8 ± 7.7 μ V, $p=0.11$).

Discussion: As the 30Hz ERG response is a measure of the retinal cone system function, the finding of its abnormality may suggest altered development of either cone photoreceptors or their post-photoreceptor retinal cells in preterm children.

Conclusion: Preterm children show longer latency and smaller amplitude of the 30Hz ERG response compared to controls.

E-Poster 48

Wednesday
10:00 - 10:15 am
Station L

Perinatal Risk Factors for Retinopathy of Prematurity

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Introduction: We sought to evaluate perinatal risk factors for retinopathy of prematurity (ROP) in a large, broad-risk cohort.

Methods: Retrospective cohort study of infants undergoing ROP examinations at 30 North-American hospitals in 2006-2012 (The G-ROP Study). Outcomes were any ROP and severe ROP (ETROP Type 1 or Type 2). Odds ratios (OR) from multivariate logistic regression were used to evaluate risk factors.

Results: Among 7483 infants, 3224(43.1%) had ROP, 931(12.4%) severe ROP. In multivariate analysis, significant risk factors for ROP were: lower birth weight (BW, e.g., OR=5.2, <501g vs. >1250g), younger gestational age (GA, e.g., OR=32, <25 vs. >29 weeks), 1-minute APGAR<4 (OR=1.2), race (e.g., OR=1.6, White vs. Black), outborn (OR=1.5), delivery-room intubation (OR=1.3); and for severe ROP were: lower BW (e.g., OR=20, <1250g vs. >1251g), younger GA (e.g., OR=30, <24 vs. >30 weeks), male (OR=1.5), Hispanic ethnicity (OR=1.8), race (e.g., OR=1.6, White vs. Black), outborn (OR=1.6), delivery-room intubation (OR=1.6). Together, these factors predicted ROP (AUC=0.87) and severe ROP (AUC=0.89) well, but BW and GA were the dominant factors for ROP (AUC=0.86) and severe ROP (AUC=0.88).

Discussion: Race, ethnicity, sex, and delivery-room intubation did not add much predictive information over BW and GA. Maternal age, gravidity, prenatal care, maternal diabetes, prenatal steroids, mode of delivery, multiparity, and other resuscitation measures were not significantly associated with ROP.

Conclusion: Based upon the largest report to date with detailed ROP data from infants meeting current screening guidelines, ROP risk is predominantly determined by the degree of prematurity at birth, with other perinatal factors contributing minimally.

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Retinopathy of Prematurity In Pakistan: PAK ROP STUDY

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E-Poster 49

Wednesday
10:20 - 10:35 am
Station A

Introduction: Retinopathy of Prematurity is becoming an epidemic in the developing world. This prospective study was carried out to assess the incidence of ROP in Lahore.

Methods: 172 (105 males) babies born under the birth weight of 3000 grams or gestational age of less than 36 weeks from January 2015 till May 2016 underwent a dilated fundus exam. They were followed up after one to two weeks intervals based on the stage of the disease and zone involved. Babies developing plus disease were treated with argon laser.

Results: 26 (15 Males) with gestational age of 27-34 weeks and birth weight of 800-2200 grams were diagnosed with ROP. 20 babies developed stage 1 ROP, 1 had Stage 2, 1 had stage 3 while 4 had bilateral Retinal detachments. 4 Babies had gestational age greater than 32 weeks.

Discussion: We screened babies with weight under 3000 grams and age below 36 weeks. We found 4 (14.8%) infants diagnosed with ROP over the age of 32 weeks. To the best of our knowledge, this is the first prospective study in Pakistan showing ROP in babies above 32 weeks of gestation. We risk a significant proportion of ROP infants being missed if western guidelines are used in developing countries.

Conclusion: Our study showed ROP to be present in infants between 32 to 36 weeks of gestation. We propose that premature babies of gestational age of < 36 weeks and weight of <2500 grams be screened in Pakistan.

References: 1) Stoll BJ, Hansen NI, Bell EF, et al. Trends in care practice, Morbidity and Mortality of Extremely Preterm Neonates, 1993-2012. JAMA 2015 Sep 8;314(10):1039-51. 2) Stoelhorst GM, Rijken M, Martens SE, et al. Changes in neonatology: comparison of two cohorts of very preterm infants (gestational age <32 weeks): the Project On Preterm and Small for Gestational Age Infants 1983 and the Leiden Follow-Up Project on Prematurity 1996-1997. Pediatrics. 2005 Feb;115(2):396-405. 3) Lorenz JM, The outcome of extreme prematurity. Semin Perinatol. 2001 Oct;25(5):348-59. 4) American Academy of Pediatrics. Section on ophthalmology, American Academy of Ophthalmology and Strabismus, American Association of Certified Orthoptists. Screening Examination of Premature Infants for Retinopathy of Prematurity. Pediatrics January 2013;131:189-95 5) Chaudhry TA, Hashmi FK, Salat MS et al. Retinopathy of Prematurity: an evaluation of screening criteria in Pakistan. Br J Ophthalmol. 2014 Mar;98(3):298-301 6) Shah VA, Yeo CL, Ling YL, et al. Incidence, Risk Factors of Retinopathy of prematurity among very low birth weight infants in Singapore. Ann Acad Med Singapore. 2005 Mar;34(2): 169-78 7) Mohammad Amer, Waseem Haider Jafri, Abid Mehmood Nizami et al. Retinopathy of Prematurity: are we missing any infant with retinopathy of Prematurity. Br J Ophthalmol 2012;96:1052-1055. 8) Palmmer EA, Flynn JT, Hardy RJ, et al. Incidence and Early Course of Retinopathy of Prematurity. Ophthalmology. 1991;98:1628-40. 9) Basmak H, Nayaz L, Sahin A, et al. Retinopathy of prematurity: screening guidelines need to be reevaluated for developing cauntries. Eur J Ophthalmol 2010;20:752-55

High Rate of Strabismus in a Cohort of Infants Screened for ROP

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E-Poster 50

Wednesday
10:20 - 10:35 am
Station B

Introduction: Type 1 retinopathy of prematurity (ROP) is associated with adverse ocular outcomes including strabismus. The frequency of strabismus in patients with ROP other than Type 1 is poorly delineated.^{1,2} Term preschool children have a prevalence of strabismus of 1-5%.³

Methods: We conducted a retrospective chart review of infants screened for ROP between January 2006 and August 2015 who received subsequent pediatric ophthalmology follow-up. Infants were categorized based on severity of ROP including Type 1, Type 2, low grade or no ROP.

Results: In the cohort of 1478 infants, 472 (32%) returned for follow-up eye exams. Among the children who returned, the mean \pm SD gestational age, birth weight and age at last examination was 28.2 ± 2.7 weeks, 1067 ± 369 g and 2.8 ± 1.2 years respectively. Fifty-four children (11.4%) had Type 1 ROP, 28 (5.9%) Type 2 ROP, 119 (25.2%) low grade ROP and 271 (57.4%) had no ROP. Strabismus developed in 28 (51.9%) Type 1, 10 (35.7%) Type 2, 31 (26.1%) low grade, and 38 (14%) children with no ROP. Among the children who developed strabismus, surgery was performed in 8 (28%) Type 1, 3 (30%) Type 2, 8 (25.8%) low grade, and 8 (21.1%) children with no ROP.

Discussion: All ROP subgroups had a higher rate of strabismus than term preschool children.

Conclusion: Our cohort of patients with ROP follow-up had a high rate of strabismus across all categories of ROP and warrant continued management by an ophthalmologist after ROP resolution.

References: 1. Küçükevçilloglu M, Mutlu FM, Sarici SÜ. Ocular morbidities of premature children with mild or no retinopathy of prematurity. Turk J Pediatr. 2015; 57(2): 129-35. 2. Ozdemir M, Koylu S. Ocular growth and morbidity in preterm children without retinopathy of prematurity. Jpn J Ophthalmol. 2009; 53(6): 623-8. 3. Ying GS, Maguire MG, Cyert LA, et al. Vision In Preschoolers (VIP) Study Group. Prevalence of vision disorders by racial and ethnic group among children participating in head start. Ophthalmology. 2014; 121(3): 630-6.

E-Poster 51

Wednesday
10:20 - 10:35 am
Station C

Callosal and Commissural Interhemispheric Connections Between Primary Visual Areas in Infantile Esotropia.

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Introduction: Images in the median plane of the head either fall on both nasal hemi-retinae or on both temporal hemi-retinae. Interhemispheric connections, in humans the corpus callosum, allow cortical cells to have receptive fields on opposite sides. These connections were shown to be abnormal in infantile esotropia while individuals with agenesis of the corpus callosum may show normal stereopsis and disparity vergence. We have investigated here whether interhemispheric connections through the anterior commissure, a phylogenetic earlier interhemispheric pathway, might explain this inconsistency.

Methods: Magnetic resonance imaging, diffusion tensor imaging and fiber tractography of the brain were performed in 4 individuals with infantile esotropia, in one individual with callosal agenesis and in 9 controls with normal binocularity.

Results: Anomalous tracts from both V1 and V2 running through the anterior commissure were found both in one of the subjects with infantile esotropia and in the individual with callosal agenesis. All other individuals showed interhemispheric visual connections through the corpus callosum only.

Discussion: Infantile esotropia may not only affect the number of callosal fibers but also the interhemispheric connections via the anterior commissure. This indicates that impeded binocular visual development determines the fate of interhemispheric fibers.

Conclusion: It suggests a developmental competition between the two commissures with the corpus callosum taking precedence under normal and most pathological conditions. In case of callosal agenesis binocularity may still develop using a pathway through the anterior commissure.

References: Mitchell DE, Blakemore C. Binocular depth perception and the corpus callosum. *Vision Res* 1970;10:49-54

E-Poster 52

Wednesday
10:20 - 10:35 am
Station D

Infantile Esotropia: Where Have They Gone? An International Survey of the Incidence, Presentation, and Treatment of Infantile Esotropia

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Introduction: The incidence of infantile esotropia from population studies in the USA suggests an incidence of 1 in 403 live births(1). This does not mirror the clinical experience in the UK. This study sought to analyse the possibility of this decreasing incidence as well as the choice of management.

Methods: We invited participants off paediatric ophthalmology discussion groups to complete an internet based survey.

Results: There were 52 respondents from the UK, 35 from the USA, and 14 from the rest of the world(ROTW). In the UK, 18% of clinicians saw more than 4 cases in the preceding year compared to 45% from the USA and the ROTW. On those that performed surgery, 17% of UK clinicians operated before the age of 1 compared to 55% of USA and ROTW clinicians. In the UK 32% of clinicians would treat with botulism vs 15% from the USA and ROTW. In the UK 59% of clinicians felt that the incidence was decreasing versus 39% from the USA and ROTW.

Discussion: The incidence appears to be decreasing in the UK whereas in the rest of the world, it seems stable. The timing of surgery is varied in the UK and not done as early as the USA and the ROTW. There is an increased preference for botulism in the UK.

Conclusion: The incidence of infantile esotropia seems to be decreasing in the UK. The timing of surgery is also varied and not done as early. This finding supports the need for larger prospective national studies.

References: 1. Louwagie C. Is the Incidence of Infantile Esotropia Declining?. *Archives of Ophthalmology*. 2009;127(2):200. 2. Wong A. Timing of surgery for infantile esotropia: sensory and motor outcomes. *Canadian Journal of Ophthalmology / Journal Canadien d'Ophthalmologie*. 2008;43(6):643-651. 3. Heng S, MacEwen C. Decrease in the rate of esotropia surgery in the United Kingdom from 2000 to 2010. *British Journal of Ophthalmology*. 2013;97(5):598-600.

Predicting Outcomes for Children Undergoing Botulinum Toxin Injection for Acute Onset Esotropia

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E-Poster 53
Wednesday
10:20 - 10:35 am
Station E

Introduction: Botulinum toxin can compare favourably to surgery[1] for pediatric manifest deviations including acute onset esotropia[1,2]. The aim of this study was to investigate predictors of outcome for children undergoing injections for acute esotropia.

Methods: Retrospective chart review (1994 - 2015) of all children undergoing toxin injections for acute onset esotropia at a single centre. Collected data included age, time from onset to injection, pre and postoperative angle of deviation, and stereopsis outcome. Success was defined as deviation <11 prism dioptres (PD), partial success as deviation <21PD.

Results: Thirty-three children underwent therapeutic injection. Median age of onset 5.3 years, median age at treatment 6.9 years (0.9 - 13.5 years). Median follow-up 20 months (6 - 43 months). The rate of success was 33%, and partial success 91%. On univariate regression analysis there was association between successful outcome and both younger age at treatment ($F(1,23)=7.21$, $R^2=0.23$, $p=0.01$) and shorter time from onset to treatment ($F(1,17)=3.40$, $R^2=0.18$, $p=0.06$). No association was found between baseline clinical characteristics and deviation size (mean 42.5PD, range 14-75PD). 2 children (6%) had post injection ptosis resulting in visual axis obscuration.

Discussion: Botulinum toxin injection appears to be associated with good outcome for early intervention in acute onset esotropia, with prolonged duration of effect. This retrospective series suggests that prompt intervention is associated with an improved chance of success for children with acute onset esotropia, as is younger age at treatment.

Conclusion: Acute onset esotropia is uncommon; our study suggests early therapy gives children the best chance of binocular function.

References: 1. Dawson EL, Marsham WE, Adams GGW. The Role of Botulinum Toxin A in Acute onset Esotropia. *Ophthalmology* 1999;106:1727-1730 2. Wan, Michael J. et al. Comparison of botulinum toxin versus surgery in the treatment of acute-onset, comitant esotropia in children *Journal of American Association for Pediatric Ophthalmology and Strabismus JAAPOS* 2015; 19 (4):e17 - e18

Paralytic Strabismus in Adults and the Risk for Mental Health Disorders

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E-Poster 54
Wednesday
10:20 - 10:35 am
Station F

Introduction: Children and adults with some forms of strabismus have recently been shown to be at an increased risk of developing mental illness. The purpose of this study was to determine if adults with paralytic strabismus are similarly at risk.

Methods: The medical records of all patients (n=302) diagnosed as adults with a new-onset, paralytic strabismus in a defined population from January 1, 1985, through December 31, 2004, were retrospectively reviewed. Each case was compared with a sex- and birthdate-matched non-strabismic control.

Results: Although the entire cohort of strabismic adults was no more likely than controls to also have a diagnosis of mental illness ($p=0.14$), depressive disorders ($p=0.003$), sleep-wake disorders ($p<0.001$), and neurocognitive disorders ($p=0.022$) were more common among strabismic adults compared to controls. Similarly, while each subset of paralytic strabismus was not associated with an increased risk of mental illness, oculomotor palsy, abducens palsy, and INO were found to have more sleep-wake disorders compared to controls ($p=0.002$, $p=0.002$, $p=0.021$, respectively) while trochlear nerve palsies were more likely to have depressive disorders ($p=0.043$).

Discussion: Mental illness is prevalent among adults with and without strabismus, with mental illness more often preceding the diagnosis of strabismus. However, adults with some forms of strabismus are significantly more likely to have sleep-wake disorders and depression, which generally occurred following the diagnosis of strabismus.

Conclusion: Mental health disorders are common among adults with and without strabismus. The specific disorders of neurocognition, depression, and sleep-wake cycles appear to be elevated among strabismic adults compared to controls.

References: 1. Mohney BG M, JA, Capo JA, et al. Mental illness in young adults who had strabismus as children. *Pediatrics* 2008. 122(5): 1033-38. 2. Olson JH LC, Diehl NN, et al. Congenital esotropia and the risk of mental illness by early adulthood. *Ophthalmol.* 2012; 119(1): 145-9. 3. Toyota T YK, Ebihara M, et al. Association between schizophrenia with ocular misalignment and polyalanine length variation in PMX2B. *Hum Mol Genet.* 2004; 13(5): 551-61.

E-Poster 55

Wednesday
10:20 - 10:35 am
Station G

Dexmetomidine (Precedex) Increases Oculocardiac Reflex

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Introduction: The only substances known to increase oculocardiac reflex (OCR) are fast-acting opioids(1). Last year, we reported that premedication with nasal dexmetomidine (Precedex) was associated with more OCR. Therefore, we performed an intra-subject, intravenous comparison to test our hypothesis that this alpha-adrenergic agonist potentiates the trigemino-vagal reflex.

Methods: In our ongoing, IRB study, OCR is prospectively monitored with 10-second, square wave 200 gram tension on inferior rectus- or other muscles during strabismus surgery. Between the first and second muscle, dexmetomidine 0.5µg/Kg I.V. was delivered.

Results: All patients had inferior rectus tension and no anticholinergic. 1399 control patients, media age 5.5 years had first OCR of $-24.2\pm 1.2\%$ and second OCR of $-22.7\pm 1.2\%$ with a delta (decrease) of $1.5\pm 1.0\%$. The 33 patients study patients, medial age 5.6 years, had first OCR $-16.0\pm 5.6\%$ and dexmetomidine second OCR of $-33.8\pm 8.8\%$ for a bradycardia augmentation of $17.8\pm 6.8\%$ (t-Test $p<0.01$).

Discussion: Similar to the impact of fentanyl, dexmetomidine will increase the bradycardia associated with extra-ocular muscle traction- almost doubling the amount.

Conclusion: Strabismus surgeons, neonatologists and anesthesiologists need to take precautions when using Precedex.

References: (1) Chung CJ, Lee JM, Choi SR, Lee SC, Lee JH: Effect of remifentanyl on oculocardiac reflex in paediatric strabismus surgery. *Acta Anaesthesiol Scand* 2008, 52(9):1273-1277.

E-Poster 56

Wednesday
10:20 - 10:35 am
Station H

Strabismus Surgery Curriculum for Residents: Yale and Harvard Experience

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Introduction: Facility with strabismus surgery is important to develop during ophthalmology residency. We developed a curricula specific to our institutions, including didactic lectures, non-cadaveric eye model, and assessment test. Our aim is to highlight the impact of these curricula on residency training.

Methods: Performance on the same assessment test was used for residents at two separate institutions. Test scores were tabulated pre- and post-wetlab curriculum. At Yale, there was a pre-wetlab test, 2.5-hour didactics, 0.5-hr wetlab, post-wetlab test 2 weeks later. At Harvard, there was a pre-wetlab test, 4 hour didactics, 1.5-hour wetlab, post-wetlab test the same day.

Results: Twelve residents rotating through Yale participated. Four residents without prior rotation in pediatrics had mean pre-wetlab score 57.1% (range: 42.8-71.4%) and mean post-wetlab score 71.4% (range: 61.9-80.9%). Eight residents who previously rotated in pediatrics had pre-wetlab mean score 77.4% (range: 66.7-90.5%) and post-wetlab mean score 83.3% (range: 76.2-90.5%). Twenty-three residents rotating through Harvard participated. All residents were starting second year with no prior exposure to strabismus surgery. Mean pre-wetlab score 65.9% (range: 52-84%) and mean post-wetlab score 84.5% (range: 76-100%).

Discussion: At both institutions, surgical knowledge in strabismus improved significantly after strabismus surgical curricula. Future aims to evaluate the impact of the wetlab on the surgical experience during the pediatric ophthalmology rotation would be valuable.

Conclusion: Wetlab curricula aimed at developing surgical skills in strabismus positively impact resident knowledge and should be considered as a tool to augment the residency experience.

References: 1. Gertsch KR, Kitzmann A, Larson SA et al. Description and Validation of a Structured Simulation Curriculum for Strabismus. *J AAPOS* 2015 Feb 19(1):3-5. 2. White CA, Wrzosek JA, Chesnutt DA et al. A Novel Method for Teaching Key Steps of Strabismus Surgery in a Wet Lab. *J AAPOS* 2015 Oct 19(5):468-70. 3. Motley WW 3rd, Golnik KC, Anteb J et al. Validity of Ophthalmology Surgery Competency Assessment Rubric for Strabismus Surgery in Resident Training. *J AAPOS* 2016 Apr 20(2): 184-5.

A Survey on the Peri-Operative Management of Strabismus

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E-Poster 57

Wednesday
10:20 - 10:35 am
Station I

Introduction: To identify strabismus surgical management protocols amongst pediatric ophthalmologists around the world.

Methods: A web based questionnaire regarding perioperative strabismus management was sent to all members of the Ped-Ophth-Listserv and the WSPOS mailing list.

Results: With 400 responses to date, most surgeons do not prescribe preoperative medications for children or

adults. Almost all close conjunctival incisions in all patients. A combination of antibiotic and steroids is the preferred topical medication post operatively. A majority prefer not to prescribe oral antibiotics or systemic steroids post operatively. Pain medications are prescribed to adults more often than children. Most surgeons do not patch or recommend ice compress over the eyes. Patients are allowed to return to a regular diet within the first 24 hours after surgery. First follow up exam typically is within the first week for all. Resumption of contact lenses wear is allowed by most surgeons 2-4 weeks after surgery. Activities with risk of contaminating the surgical site (exercise, swimming, showering, gardening, playing with pets, day care, returning to work) are resumed at 1-2 weeks post operatively. Half of the respondents use adjustable sutures and adjust within 24 hours, with a small subset adjusting within a week.

Conclusion: Consensus patterns emerge but with a wide range of approaches. The lack of conclusive evidence or scientific rationale surrounding perioperative strabismus management results in a wide and possibly confusing diversity of clinical practice.

References: 1. Birkmeyer, J. D., Reames, B. N., McCulloch, P., Carr, A. J., Campbell, W. B., & Wennberg, J. E. (2013). Understanding of regional variation in the use of surgery. *The Lancet*, 382(9898), 1121-1129. [http://doi.org/10.1016/S0140-6736\(13\)61215-5](http://doi.org/10.1016/S0140-6736(13)61215-5) 2. Olitsky Se, A. S., & Reynolds, J. D. (1997). Perioperative Care of the Strabismus Patient. *J Pediatric Ophthalmol Strabismus*, 34(2), 126-128. <http://doi.org/10.3928/0191-3913-19970301-17> 3. Salamon, S. M., Friberg, T. R., & Luxenberg, M. N. (1982). Endophthalmitis After Strabismus Surgery. *American Journal of Ophthalmology*, 93(1), 39-41. [http://doi.org/10.1016/0002-9394\(82\)90696-1](http://doi.org/10.1016/0002-9394(82)90696-1) 4. Wilson, M. E. (2008). Topical antibiotic/steroid medication for infection prophylaxis after strabismus surgery: Is it custom or science? *Journal of AAPOS*, 12(4), 321. <http://doi.org/10.1016/j.jaapos.2008.06.003> 5. Rodgers, A., & Cox, R. G. (2010). Anesthetic management for pediatric strabismus surgery: Continuing Professional Development. *Canadian Journal of Anesthesia/Journal Canadien D'anesthésie*, 57(6), 602-617. <http://doi.org/10.1007/s12630-010-9300-x>

Strabismus Surgery for Medicare-Aged Patients: More Than a Decade of Insights

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E-Poster 58

Wednesday
10:20 - 10:35 am
Station J

Introduction: As the population grows and life expectancy lengthens, the psychosocial and functional impact of strabismus among the elderly becomes increasingly important. In this study, we characterize the demographics, presenting complaints, health status, underlying etiology, and outcomes of strabismus surgery in three age cohorts of Medicare-aged patients.

Methods: A retrospective, non-randomized, IRB-approved chart review was conducted to analyze the records of all adult patients age 65 years and older who underwent strabismus surgery between 2004 and 2015 in a university-based strabismus practice using chi-square tests.

Results: One hundred ten patients were identified and divided into three age cohorts for analysis: young-old (age 65-74), middle-old (age 75-84), and old-old (age 85+). At least 75% of patients in all cohorts cited diplopia as their chief complaint ($p=0.87$). There was no difference in sex distribution, type of deviation, underlying etiology, or pre-operative ASA scores between the cohorts ($p=0.68$, $p=0.53$, $p=0.71$, $p=0.93$, respectively). By the 6-to-8-week post-operative visit, 63% of all patients reported complete resolution of their presenting chief complaint, while 23% reported some improvement and 11% reported no improvement with no difference between the cohorts ($p=0.12$).

Discussion: The majority of patients reported improvement of their symptoms after strabismus surgery. There was no difference in the type of deviation, underlying etiology, pre-operative ASA scores, and surgical success rates between the three age cohorts studied.

Conclusion: Given the functional and psychosocial impact of strabismus in the elderly, this study lends support in considering surgery as a viable option to successfully treat strabismus even among the oldest age cohorts.

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;133:60-5. 2. Merrill K, Satterfield D, O'Hara M. Strabismus surgery on the elderly and the effects on disability. *J AAPOS* 2010;14:196-8. 3. Repka MX, Yu F, Lum F, Coleman AL. Strabismus among aged Medicare beneficiaries: impact of health status and region. *J AAPOS* 2013;17:391-4.

E-Poster 59
Wednesday
10:20 - 10:35 am
Station K

Adjustable Rectus Muscle Plication for Management of Strabismus in Thyroid Eye Disease

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Introduction: Restrictive strabismus secondary to inflammatory and fibrotic change of extraocular muscle is common in thyroid eye disease (TED). Surgical management typically comprises recession rather than resection due to the concern of increased inflammation and restriction. However, residual undercorrection is not uncommon after maximal rectus muscle recession, especially in large angle deviation. We report our result of adjustable rectus muscle plication, instead of resection, for management of strabismus in TED.

Methods: The clinical results of patients with TED who underwent strabismus surgery with adjustable rectus muscle plication, using the short tag noose technique with pull-string modification, were reviewed (1).

Results: Five patients were included (mean age 51.8 years). Adjustable rectus muscle plications were performed for vertical deviation (mean 29.3 Δ) or horizontal deviation (mean 77.5 Δ). All five patients received post-operative adjustments aimed at slight undercorrection. At final follow-up examinations, 2 of 5 (40%) patients showed a drift toward overcorrection, both at the vertical deviation. None of the patients developed unusual inflammation.

Discussion: Despite the traditional concern of worsening restriction, Yoo and colleagues (2) successfully treated TED using rectus muscle resections. Volpe and colleagues (3) reported the uses of adjustable sutures in TED. However, no resections were performed in their patients. Our preliminary results showed the promising role of adjustable rectus muscle plication in management of large angle deviation in TED.

Conclusion: Adjustable rectus muscle plication might be a surgical option in TED. Careful selection of post-adjustment goal is important if this procedure is contemplated.

References: 1. Tsai CB. Pull-string technique for recovering subconjunctival short-tag noose adjustable sutures. J AAPOS Dec 2014;18(6):606-608. 2. Yoo SH, Pineles SL, Goldberg RA, Velez FG. Rectus muscle resection in Graves' ophthalmopathy. J AAPOS Feb 2013;17(1):9-15. 3. Volpe NJ, Mirza-George N, Binenbaum G. Surgical management of vertical ocular misalignment in thyroid eye disease using an adjustable suture technique. J AAPOS Dec 2012;16(6):518-522.

E-Poster 60
Wednesday
10:20 - 10:35 am
Station L

The Role of Superior Oblique Posterior Tenectomy for Treatment of Small Vertical Deviations in Brown Syndrome

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Introduction: Surgery to weaken the superior oblique (SO) muscle tendon in patients with Brown Syndrome is necessary when there is a significant vertical deviation in primary gaze with or without a compensatory head posture. Unlike other SO weakening procedures, a posterior 7/8 tenectomy may provide a more predictable outcome in Brown Syndrome patients with small vertical deviations (< 10 PD).

Methods: Medical records were reviewed from 2003 to 2016 for Brown Syndrome patients with vertical deviations < 10 prism diopters (PD) who underwent ipsilateral SO posterior 7/8 tenectomy. Intraoperative exaggerated traction testing confirmed SO restriction.

Results: 8 patients met inclusion criteria. Mean age at surgery was 36 months (range 8 to 79 months). 6 had simultaneous horizontal muscle surgery. Mean pre-operative vertical deviation in primary gaze was 5.4 PD +/- 2.4 (range 2-9 PD). At the most recent postoperative visit, 5 patients (62.5%) had complete resolution of their anomalous head posture (4 following initial surgery and 1 after reoperation). For 7 of the 8 patients, post-operative vertical deviation in primary gaze was 0 PD, while one had persistent AHP and vertical deviation after repeat surgery. Average follow-up was 37 months. Post operatively, all patients exhibited binocularity. No patient had restored elevation in adduction.

Discussion: In our study, there was improvement in vertical deviation and AHP without surgical complications.

Conclusion: Superior oblique posterior 7/8 tenectomy is a safe and effective procedure for small vertical deviations in Brown Syndrome patients.

References: 1. Ranka MP, et al. Bilateral posterior tenectomy of the superior oblique muscle for the treatment of A-pattern strabismus. J AAPOS 2014; 18:437-440. 2. Sato SE, Ellis FD, Pinchoff BS, Helveston EM, Rummel JH. Superior oblique overaction in patients with true Brown's syndrome. J Pediatr Ophthalmol Strabismus 1987;24:282-6. 3. Velez FG, Velez G, Thacker N. Superior oblique posterior tenectomy in patients with brown syndrome with small deviations in primary position. J AAPOS 2006;10:214-219.

Improved Surgical Treatment of V-Pattern Strabismus with Pseudo-Overaction of the Inferior Oblique Muscles in Craniofacial Syndromes

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E-Poster 61

Wednesday
10:40 - 10:55 am
Station A

Introduction: V-pattern strabismus with pseudo-overaction of the inferior oblique muscles is a common finding in craniofacial syndromes that is related to extorsion of the orbits. Over the years, numerous procedures have been employed to treat this motility disorder with limited success. We report on historical surgeries as well as a novel procedure that intorts the eyes in order to counter-balance the underlying extorsion of the orbits.

Methods: Retrospective review of seven patients with craniofacial syndromes and V-pattern strabismus with pseudo-overaction of the inferior obliques. All patients underwent surgical correction of their strabismus by one surgeon at a major academic medical center.

Results: All patients demonstrated extorsion of their extraocular muscles at the time of surgery. Several different procedures were performed, and most showed mild to modest benefit. A novel procedure for surgically intorting the eyes by combining bilateral inferior oblique anterior transpositions with bilateral Harada-Ito procedures resulted in the most improvement in comitance and best post-operative alignment.

Discussion: Our series shows the progression in thinking about treatment of V-pattern strabismus with pseudo-overaction of the inferior oblique muscles in craniofacial syndromes by one surgeon at a strabismus referral center. Success of surgery has improved by treating the underlying extorsion of the extraocular muscle cone by intorting the globes through bilateral inferior oblique anterior transpositions with bilateral Harada-Ito procedures.

Conclusion: The V-pattern strabismus with pseudo-inferior oblique overaction associated with craniofacial syndromes is difficult to manage. A novel procedure focusing on intorting the eyes has shown promise in treating this challenging type of strabismus.

References: 1. Tan K, Sargent M, Poskitt K, Lyons C. Ocular Overelevation in Adduction in Craniosynostosis: Is It the Result of Excyclotorsion of the Extraocular Muscles? J AAPOS 2005;9:550-557. 2. Coats D, Paysse E, Stager D. Surgical Management of V-Pattern Strabismus and Oblique Dysfunction in Craniofacial Dysostosis. J AAPOS 2000;4:338-342.

Is It Necessary to Pass the Arms of Lateral Rectus Under the Oblique Muscles During the "Medial Transposition of Y Split Lateral Rectus" Operation for Complete CN 3rd. Palsy?

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E-Poster 62

Wednesday
10:40 - 10:55 am
Station B

Introduction: Recent popular surgical approach for treatment in complete CN3rd paralysis is Gokyigit's medial transposition of Y split lateral rectus muscle. We performed the operation without passing the arms of muscle under the oblique muscles in order to prevent transient complications and simplify the technique. In this study we evaluate the results of the simplified Gokyigit technique's and compare with original Gokyigit's transposition technique.

Methods: In this retrospective study, there were 13 cases operated with original Gokyigit's transposition technique (Group 1), and 8 cases operated with simplified Gokyigit technique (Group 2). In simplified technique, after the dis-insertion split lateral rectus arms from sclera, the upper half was passed under the superior rectus muscle and the inferior half was passed under the inferior rectus muscle and moved to the medial rectus muscle insertion area. Patients' pre and postoperative deviations in primary position were noted, less than 14pd. deviation accepted as success. SPSS for windows program used for statistical evaluations. P<0.05 accepted as significant.

Results: In Group 1, preoperative mean deviation was 68.31±19.0 (45-90+) PD and postoperative was 10.62±9.13 (0-25) PD. In Group 2, preoperative mean deviation was 64.12±17.6 (40-90+) PD and postoperative was 11.87±7.05 (0-25) PD. In both groups there are significant difference between preoperative and postoperative deviations. (p<0.05) There was no statistical significant difference between 2 Groups (p>0.05).

Discussion: In complete CN3rd. paralysis, the function of four of the six extra-ocular muscles are compromised, leaving the lateral rectus and superior oblique muscles unopposed. Y split lateral rectus transposition of medial rectus area technique is very effective for treatment but simplified form as successful as original technique.

Conclusion: Passing the arms of lateral rectus under the oblique muscles is not necessary for every cases during the Medial transposition of Y split lateral rectus.

References: 1. Gokyigit B, et al. Medial transposition of a split lateral rectus muscle for complete oculomotor nerve palsy. J AAPOS. 2013 Aug;17(4):402-10. 2. Shah AS, et al. Adjustable nasal transposition of split lateral rectus muscle for third nerve palsy. JAMA Ophthalmol. 2014 Aug; 132(8):963-9. 3. Saxena R, et al. Medial transposition of split lateral rectus augmented with fixation sutures in cases of complete third nerve palsy. Br J Ophthalmol. 2016 May;100(5):

E-Poster 63

Wednesday
10:40 - 10:55 am
Station C

Outcomes Following Superior Rectus Transposition and Medial Rectus Recession vs. Inferior and Superior Recti Transposition for Acquired Sixth Nerve Palsy

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Introduction: To compare effectiveness of superior rectus transposition/medial rectus recession (SRT/MR) vs. inferior and superior rectus transposition (VRT) for acquired sixth nerve palsy.

Methods: The medical records of a case-control series of patients with acquired sixth nerve palsy who underwent VRT (1988-2005) or SRT/MR (2013-16) by a single surgeon were reviewed. The pre and postoperative findings were compared between the two groups.

Results: Eight patients underwent SRT/MR and VRT. Lateral fixation was performed on all but 4 patients in VRT group. Median follow-up was 6 months in SRT/MR group and 17 months in VRT group. Preoperative esotropia in primary position and abduction deficit were similar in both groups (SRT/MR, 42 PD, -4.6; VRT, 56 PD, -4.5; $p=0.195$, $p=1.0$). SRT/MR group underwent a mean MR recession of 6.0 mm (range, 5-7). Four patients in VRT group underwent MR recession (mean 5.3 mm). In addition, 5 patients in the VRT group had 9 injection of BOTOX in the MR. No additional procedures were performed in SRT/MR group. Fewer additional procedures were performed with SRT/MR (SRT/MR, 0; VRT, 1.8 ± 1.2 ; $p<0.010$). At last follow-up, residual esotropia (SRT/MR, 7 PD; VRT, 10 PD; $p=0.442$) was similar in both groups. But the abduction was better in the SRT/MRc group (SRT/MR, -3.0 ± 0.7 ; VRT, -3.8 ± 0.4 ; $p=0.038$). There were no new persistent vertical deviations or torsional diplopia.

Discussion: Both SRT/MR and VRT procedures improved ocular alignment in primary position and abduction without creating persistent vertical deviations.

Conclusion: Final outcomes were similar with SRT/MR vs. VRT. However, fewer additional surgical procedures were needed with SRT/MR.

References: 1. Mehendale RA, D L, Wu C. Superior rectus transposition and medial rectus recession for Duane syndrome and sixth nerve palsy. Arch Ophthalmol 2012;130:195-201. 2. Yang S, MacKinnon S, Dagi LR, Hunter DG. Superior rectus transposition vs medial rectus recession for treatment of esotropic Duane syndrome. JAMA 3. Ophthalmol 2014; 132:669-675. 4. Velez FG, Oltra E, Isenberg SJ, Pineles SL. Assessment of torsion after superior rectus transposition with or without medial rectus recession for Duane syndrome and abducens nerve palsy. J AAPOS 2014; 18:457-460.

E-Poster 64

Wednesday
10:40 - 10:55 am
Station D

Inferior Rectus Muscle Transposition for Abduction Deficiencies

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Introduction: Superior rectus transposition (SRT) has been popularized for the treatment of abduction deficiencies. Potential complications include induced vertical deviation and torsion. Therefore, SRT is not recommended in patients with preoperative hypertropia or incycloptropia. A new procedure, inferior rectus transposition (IRT) may be beneficial for patients for abduction deficiency especially those at risk of postoperative hypertropia and/or incycloptropia.

Methods: We prospectively evaluated 5 patients with a complete lateral rectus muscle palsy who underwent IRT alone or in combination with surgery on another rectus muscle. We compared changes in anomalous head posture, ocular rotations, ocular alignment, and torsion.

Results: The mean age at surgery was 66 ± 27 years (range 19-89 years). At the early 3-month postoperative follow up, there was a significant correction in the angle of esotropia (ET) from 40 ± 17 PD (14-55PD) to 9.4 ± 8.6 (0-22PD) postoperatively ($P=0.017$). Preoperative hypertropia of the affected eye (1.75 ± 2.3 PD, range 2-5PD) present in 2 of the 5 patients resolved postoperatively. Head turn was significantly improved from 31.6 ± 11.2 degrees to 5 ± 5.8 degrees postoperatively ($P=0.006$). All patients improved abduction with a mean of -4.4 ± 0.5 pre-operatively to -2.3 ± 1.6 post-operatively ($P=0.02$). No patient resulted in torsional diplopia

Discussion: Early postoperative follow up in patients with abduction deficiencies undergoing IRT demonstrates a significant improvement in ocular alignment and head turn. IRT resulted in a downward shifting effect on the operated eye.

Conclusion: IRT may be a beneficial procedure for patients with preoperative hypertropia and lateral rectus muscle palsy requiring transposition procedures.

References: 1. Mehendale RA, Dagi LR, Wu C, Ledoux D, Johnston S, Hunter DG. Superior rectus transposition and medial rectus recession for Duane syndrome and sixth nerve palsy. Arch Ophthalmol. 2012 Feb;130(2):195-201 2. Velez FG, Oltra E, Isenberg SJ, Pineles SL. Assessment of torsion after superior rectus transposition with or without medial rectus recession for Duane syndrome and abducens nerve palsy J AAPOS. 2014 Oct;18(5):457-60

Can Medial and Lateral Rectus Muscle Status Be Predicted by Severity of Preoperative Adduction Deficit in Consecutive Exotropia?

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E-Poster 65

Wednesday
10:40 - 10:55 am
Station E

Introduction: We investigated intraoperative medial rectus (MR) and lateral rectus (LR) muscle status across the spectrum of preoperative adduction deficits in patients with consecutive exotropia.

Methods: In 143 eyes of 129 patients undergoing surgery for consecutive exotropia, preoperative adduction deficits were graded on a -5 (severe limitation, not to midline) to 0 (normal) scale. Operative data were reviewed to classify: 1) MR attachment type (normal, abnormal [stretched scar or slipped], attached to pulley, behind pulley, or mixed); 2) LR tightness based on forced duction testing (normal, mild, moderate); 3) distal MR fiber location (millimeters from original insertion). We analyzed the relationship of grade of adduction deficit to each intraoperative factor.

Results: Eyes with abnormal (n=23), pulley (n=9), behind pulley (n=8), or mixed (n=7) attachments had worse adduction deficits than normal attachments (n=96, $P \leq 0.02$). Eyes with mild or moderate LR tightness (n=48) had worse adduction deficits than eyes without (n=95, $P < 0.001$). There was a significant association between distal MR muscle fiber location (0-19.5mm recessed) and grade of adduction deficit ($P < 0.0001$). Nevertheless there was considerable individual variability. Surprisingly, for -1 and -2 adduction deficits, MR attachment could be at the pulley, behind the pulley, or include the pulley (19 [22%] of 86), and the LR was tight in 36 (42%).

Discussion: In general, more severe preoperative adduction deficits are associated with MR insertion abnormalities and tight LRs, but there are frequent exceptions.

Conclusion: Severe MR insertion abnormalities, including lost muscles, may be found despite mild preoperative adduction deficits.

Immediate Post-Operative Alignment Measurements as a Predictor of Alignment Stability in Fixed Suture Strabismus Surgery

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Indiana University, Indianapolis, IN

E-Poster 66

Wednesday
10:40 - 10:55 am
Station F

Introduction: This study aims to evaluate the use of immediate post-operative alignment measurements as a predictor of future alignment stability in fixed suture strabismus surgery.

Methods: 54 subjects were prospectively evaluated after undergoing either horizontal or vertical rectus muscle surgery using fixed suture technique. Alignment measurements were taken within one hour of surgery completion, 1-3 weeks after surgery, and 2-3 months after surgery. A Spearman correlation coefficient (r) was used to compare measurements from the immediate to post-operative month 2-3 time period. Patients with dissociated strabismus, only oblique muscle surgery, and those patients with poor vision precluding precise alternate cover test were excluded.

Results: The mean age of all subjects was 47.7 years (range 12-86). 26 subjects underwent surgery for exotropia, 21 for esotropia, and 7 for hypertropia. The mean alignment measurement for all surgeries was 3^D undercorrection in the immediate post-operative period, which was similar to the mean of 4^D undercorrection at the 2-3 month exam. However, the Spearman correlation (r) between the immediate and 2-3 month measurements was found to be -0.12 for all surgeries, -0.09 for exotropia, 0.10 for esotropia, and 0.24 for hypertropia. The overall success rate, defined as $< 10^{\text{D}}$ of horizontal deviation and $< 5^{\text{D}}$ of vertical deviation, was 86% at 2-3 months.

Discussion: The relationship between immediate post-operative alignment and future alignment stability in fixed suture strabismus surgery has not been previously defined.

Conclusion: Our study demonstrated that although the surgical success rate was reasonably good, there was poor correlation between the immediate and 2-3 months post-operative alignment measurements.

References: 1. Vasconcelos GC and Guyton DL. Editorial: Adjustable sutures in strabismus surgery: why surgeons either love them or hate them after three decades. *Arq Bras Oftalmol.* 2014 Aug;77(4):5-6. 2. Haridas A, Sundaram V. Adjustable versus non-adjustable sutures for strabismus. *Cochrane Database of Systematic Reviews* 2013, Issue 7.

E-Poster 67
Wednesday
10:40 - 10:55 am
Station G

Outcomes of Strabismus Surgery Following Retinal Detachment Surgery

Lindsay D. Rothfield; Carla J. Osigian; Kara M. Cavuoto; Oriel Spierer; Hilda Capo
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Introduction: Strabismus and diplopia following retinal detachment (RD) surgery occur in 3.8 - 25% of cases. Anatomical success rates of strabismus surgery range from 47 - 80%.(1,2) Diplopia is alleviated in up to 60% of cases.(3) Our study reports factors associated with successful motor and sensory surgical outcomes of strabismus surgery after RD repair.

Methods: Retrospective review of medical records.

Results: 25 patients were included, of which 22 had scleral buckle procedures with or without vitrectomy and 3 had only vitrectomy. 88% had surgery in the eye with RD repair. There were no intraoperative or postoperative complications. No cases required scleral buckle removal. Motor surgical success rate (defined as horizontal <10 PD, vertical <4 PD) was 76% after 1.05 +/- 0.2 surgeries. Motor success rate was higher with preoperative horizontal deviations <25 PD (p=0.02). 60% patients had persistent diplopia postoperatively. Of these, 9 patients had diplopia despite successful motor outcome, but visual acuity, number of previous retina surgeries, macular involvement, and preoperative deviation were not significantly correlated with diplopia persistence.

Discussion: Motor surgical success can be achieved in the majority of patients undergoing strabismus surgery after RD surgery without need of scleral buckle removal. However, persistence of diplopia postoperatively is frequent, even after successful anatomical outcomes.

Conclusion: Smaller preoperative horizontal deviations are associated with better surgical outcomes. Postoperative binocular disturbances are common in spite of good motor alignment, and do not seem to be statistically associated with visual acuity, macular involvement, preoperative deviations or number of retina surgeries.

References: 1. Price RL, Pederzoli A. Strabismus following retinal detachment surgery. *Am Orthop J* 1982;32:9-17. 2. Farr AK, Guyton DL. Strabismus after retinal detachment surgery. *Curr Opin Ophthalmol* 2000;11:207-10. 3. Rabinowitz R, Velez FG, Pineles SL. Risk factors influencing the outcome of strabismus surgery following retinal detachment surgery with scleral buckle. *J AAPOS* 2013;17:594-7.

Strabismus Surgery After Scleral Buckle Implantation: Leaving the Buckle in Place

Orwa Nasser; Scott A. Larson
University of Iowa, Iowa City, Iowa

Introduction: Debate exists about the best approach to correct strabismus that occurs after scleral buckle implantation. This patient series reports on outcomes of strabismus surgery while leaving the scleral buckle in place.

Methods: Pre- and post-operative data of all patients operated on at one academic center between July 2013 and September 2016 for strabismus who also had a scleral buckle on the eye.

Results: All patients (n=10) had strabismus surgery on the eye with the buckle. Average follow-up time was 6 months. Half of the patients underwent a recess/resect procedure. Three had a single muscle operated. Average pre-op horizontal deviation was 28 prism diopters (PD). Average postop horizontal deviation was 7 PD with average improvement of 86%. Seventy percent had both horizontal deviation <10 PD and vertical deviation <4 PD. Only two had diplopia post op and required prism. 40% of the cases were found to have muscles inserted more posterior than expected. One developed a conjunctival cyst over the buckle one year post-op.

Discussion: Using alignment criteria (<10 PD Horizontal and <4 PD vertical) our series had a 70% success rate. Surgical technique may require the use of permanent suture and suspending muscles over buckle elements. Muscle insertions were frequently more posterior especially in cases where the buckle was not found immediately behind the muscle insertion.

Conclusion: Strabismus surgery after scleral buckle implantation can be successfully performed while leaving the buckle in place.

References: 1. Wong V, Kasbekar S, Young J, Stappeler T, Marsh IB, Durnian JM. The effect of exoplant removal on strabismus following retinal detachment repair. *J AAPOS*. 2011 Aug;15(4):331-3. 2. Rabinowitz R, Velez FG, Pineles SL. Risk factors influencing the outcome of strabismus surgery following retinal detachment surgery with scleral buckle. *J AAPOS*. 2013 Dec;17(6):594-7. 3. Chang JH, Hutchinson AK, Zhang M, Lambert SR. Strabismus surgery outcomes after scleral buckling procedures for retinal reattachment. *Strabismus*. 2013 Dec;21(4):235-41.

E-Poster 68
Wednesday
10:40 - 10:55 am
Station H

Partial Scleral Buckle Removal During Strabismus Surgery After Retinal Detachment Repair

Priyanka Kumar; Darren L. Hoover; Scott R. Lambert

E-Poster 69
Wednesday
10:40 - 10:55 am
Station I

Introduction: Strabismus is a common complication following scleral buckling for retinal detachment (1). There is no consensus on the surgical management of this entity (2,3). We describe outcomes after partial scleral buckle removal at the time of strabismus surgery.

Methods: The medical records of a consecutive series of patients with symptomatic diplopia who underwent strabismus surgery after scleral buckling were reviewed. All patients had a segment of the scleral buckle removed intra-operatively. Pre- and postoperative ocular motility was compared. Outcomes were considered successful if residual horizontal deviations were <10 PD and/or vertical deviations <4 PD.

Results: Twelve patients, mean age 51 years (range, 14-71 years), with a mean horizontal deviation of 16 PD (range, 2-40) and mean vertical deviation of 10 PD (range, 2 to 20) were studied (8 combined deviations, 3 horizontal only deviations, and 1 vertical only deviation). All patients underwent intra-operative removal of the segment of scleral buckle underlying a muscle being recessed at the time of strabismus surgery. Adjustable sutures were used in 86% of the surgeries. Surgical success and a subjective improvement in diplopia were achieved in all 12 patients after a mean of 1.25 surgeries and a mean follow-up of 12.4 months (range, 1-75 months). No patient had retinal re-detachment.

Discussion: Removal of the segment of the scleral buckle underneath a recessed muscle improves adherence of the muscle to the globe and facilitates postoperative adjustment.

Conclusion: Partial scleral buckle removal at the time of strabismus surgery is associated with good outcomes without retinal re-detachment.

References: 1) Ganekal S, Nagarajappa A. Strabismus following scleral buckling surgery. *Strabismus*. 2016. 24(1): 16-20. 2) Chang JH, Hutchinson AK, Zhang M, Lambert SR. Strabismus surgery outcomes after scleral buckling procedures for retinal reattachment. *Strabismus*. 2013. 21(4): 235-41. 3) Rabinowitz R, Velez FG, Pineles SL. Risk factors influencing the outcome of strabismus surgery following retinal detachment surgery with scleral buckle. *J AAPOS*. 2013. 17(6): 594-7.

Corneal Changes and Surgically Induced Refractive Change Following Strabismus Surgery

Mohamed S. Sayed, MD; Mehdi Tavakoli, MD; Carla J. Osigian, MD;
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E-Poster 70
Wednesday
10:40 - 10:55 am
Station J

Introduction: Strabismus surgery may induce changes in the refractive status.^{1,2} This is the first study looking into changes in higher order aberrations (HOAs) induced by strabismus surgery. This is particularly important in the era of wavefront-guided ablation in patients undergoing both strabismus and refractive surgery.

Methods: Prospective study on subjects (18-80 years of age) undergoing strabismus surgery. Corneal topography, refraction and aberrometry were performed preoperatively and at follow up.

Results: 27 patients were enrolled. At the first follow up visit, total HOAs root mean square (RMS) changed by an average of 80 μ m. Mean sphere and cylinder power increased +0.4 D and +0.75 D, respectively, while the average change in cylinder axis was 32 degrees. At 4-6 weeks postoperatively, HOAs changed from baseline by an average of 172 μ m in 4 eyes that completed follow up. The mean change in spherical and cylindrical power was -0.3 D and +0.6, respectively, and the average change in cylinder axis was 6 degrees.

Discussion: Our results demonstrate that significant changes in HOAs, sphere, and cylinder power and axis are common early postoperatively. While this can be attributed to early ocular surface changes, our long term follow up data (pending) may determine the long-term effect of strabismus surgery on these parameters.

Conclusion: Significant changes in refractive status appear to take place following strabismus surgery. Our results suggest that strabismus surgery should be considered prior to refractive surgery when both are to be performed. Longer follow up is needed to support such recommendation.

References: 1. Preslan MW, Cioffi G, Min YI. Refractive error changes following strabismus surgery. *J Pediatr Ophthalmol Strabismus* 1992;29:300-4. 2. Kwitko S, Feldon S, McDonnell PJ. Corneal topographic changes following strabismus surgery in Grave's disease. *Cornea*. 1992;11:36-40.

E-Poster 71
Wednesday
10:40 - 10:55 am
Station K

Student Adherence and Satisfaction with Eyeglass Usage in the Baltimore Reading and Eye Disease Study (BREDS)

Amy Huang, BA; Lucy Mudie, MBBS, MPH; Betsy Wolf, PhD; Josephine Owoeye, OD; Michael X. Repka, MD, MBA; David S. Friedman, MD, PhD, MPH; Robert E. Slavin, PhD; Megan E. Collins, MD
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Introduction: While school-based programs have become popular in identifying children with vision problems, few studies have examined the critical aspect of monitoring compliance after an initial intervention.¹ Poor adherence with glasses, a barrier to program efficacy, has been reported.² In our study, we examined student adherence and satisfaction with eyeglass usage in a school-based program.

Methods: Second and third graders attending twelve elementary schools received an in-school vision examination. Two pairs of eyeglasses were provided to children with refractive error (hyperopia $\geq 1D$, myopia $\leq -0.5D$, astigmatism $\geq 1D$). Replacements were provided for lost or broken glasses. Children prescribed glasses had a follow-up vision exam and interview regarding their use and attitudes about eyeglasses.

Results: Of 320 students examined, 66.4% were prescribed eyeglasses based on study criteria. In follow-up assessments during the same academic year, 87.4% were wearing glasses. 89.4% reported being happy with their glasses and 86.4% believed their glasses looked good on them. 68.2% felt their glasses helped them see 'a lot better' and 71.2% felt their glasses helped them read 'a lot better.' 20.2% reported being teased about wearing glasses.

Discussion: In our school-based program, the majority of children were wearing glasses at follow-up. Most students were happy with glasses and the majority reported significant improvement in their ability to see and read.

Conclusion: In our study, adherence with eyeglass use was higher than reported in previous studies.³ This may be related to close monitoring and a robust replacement program. Social issues remain a barrier to compliance, as teasing was reported by one-fifth of students.

References: 1. Ethan D, Basch CE. Promoting healthy vision in students: Progress and challenges in policy, programs, and research. *J Sch Health* 2008; 78:411-416. 2. Messer DH, et al. Spectacle wear in children given spectacles through a school-based program. *Optom Vis Sci Off Publ Am Acad Optom* 2012; 89: 19. 3. Alvi RA et al. The Eagles Eye Mobile: Assessing its ability to deliver eye care in a high-risk community. *J Pediatr Ophthalmol Strabismus* 2015; 52:98-105.

E-Poster 72
Wednesday
10:40 - 10:55 am
Station L

The Accuracy of the PlusoptiX S12 and the Spot Photoscreening Measurements When Screening for Astigmatism in an Ethnically Diverse Population

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Introduction: The Oregon Elks Preschool Vision Screening program screens a diverse population of Head Start children ages 36 months to 60 months to identify those at risk for amblyopia. The goal of this study is to determine the accuracy of the plusoptiX S12 and Spot photoscreening measurements when screening for astigmatism in an ethnically diverse population (91% non-Caucasian).

Methods: In January 2016, 155 plusoptiX S12 and Spot vision screenings were performed by the Elks vision screening program using identical referral criteria. IRB consent was obtained to provide dilated eye exams of passes and refers from both devices. Photoscreening measurements were compared to cycloplegic auto refraction.

Results: Cycloplegic cylinder measurements were compared to 143 photoscreening cylinder measurements from the plusoptiX S12 and the Spot. When compared to the autorefractor, the photoscreening cylinder measurements were 0.157 D higher for the plusoptiX S12 and 0.166 D for the Spot.

Discussion: When referring for astigmatism, both devices performed similarly with sensitivity and specificity for the plusoptiX S12 (91% and 88%) and Spot (82% and 94%) respectively. The success rate for both devices were 100% for the Spot and 94% for the plusoptiX S12. These findings contradict a previous study that reports a low specificity and a low measurement rate for plusoptiX S12 in an ethnically diverse population.

Conclusion: Our findings show both devices performed similarly in an ethnically diverse group.

References: Mabel Crescioni, JD, DrPH, Joseph M. Miller, MD, MPH, Erin M. Harvey, PhD. Accuracy of the Spot and Plusoptix photoscreeners for detection of astigmatism. *J AAPOS* 2015;19:435-440.

Notes

Notes

Workshop Schedule

Monday, April 3, 2017

2:45 PM - 4:00 PM Workshop #1	OMIC Risk Management Workshop: Consent, Documentation and Reporting Denise R. Chamblee, MD; John T. Reese, Esq; Michelle A. Pineda, MBA	Broadway Ballroom West
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Tuesday, April 4, 2017

8:00 AM - 4:00 PM Workshop #2 NO CME	Practice Management Workshop - Administrators Program Heather H. Dunn, COA	Cumberland #1 and #2
7:00 AM - 8:15 AM	Workshop Session A	
Workshop #3	How Recent Technology Should Change Your Practice Patterns Yasmin Bradford; Burt Kushner; Michael Struck; Melanie Schmitt	Broadway Ballroom East A-D
Workshop #4	Interdisciplinary Management of Children with Craniofacial Malformations (Craniosynostosis) Meghan Flemmons, MD; Christopher Bonfield, MD; Linda Dagi, MD; Jane Edmond, MD; Kevin Kelly, MD, DDS	Broadway Ballroom West F
Workshop #5	Tips for Understanding Pediatric Ocular Tumors Carol L. Shields, MD; Jerry A. Shields, MD	Broadway Ballroom East E
Workshop #6	Management Pearls in Pediatric Uveitis Erin D. Stahl; Virginia Utz; Stefanie L. Davidson; Sheila Angeles-Han	Broadway Ballroom West G-K
8:30 AM - 9:45 AM	Workshop Session B	
Workshop #7	Guidelines for Developing an Exit Strategy for Withdrawal from Practice and Entering Retirement Albert W. Biglan, MD; John D. Baker, MD	Broadway Ballroom West G-K
Workshop #8	AAPOS Genetic Task Force Workshop: Genetic Testing in Pediatric Ophthalmology, A Must or a Bust? Arlene V. Drack, MD; Elias Traboulsi, MD; Virginia Utz; Debra Costakos; Arif O. Khan, MD	Broadway Ballroom West F
Workshop #9	Strabismus Surgery in Complex Neurologic Disease: Surgical Strategy and Outcomes Gena Heidary, MD, PhD; Stacy Pineles, MD; Jason Peragallo, MD; Mitchell Strominger, MD; Jane Edmond, MD; Linda Dagi, MD	Broadway Ballroom East E
Workshop #10	Teratogens, Neonatal Infections and the Visual System Alan O. Mulvihill, FRCSEd, FRCSt; Alan B. Richards, MD; Ruth Hamilton, PhD; Andrew Blaikie, FRCOphth	Broadway Ballroom East A-D

10:30 AM - 11:45 AM	Workshop Session C	
Workshop #11	Oculoplastics: Imaging and Surgical Pearls Alexandra T. Elliott, MD; Linda Dagi, MD; Suzanne Freitag, MD; Lora Glass, MD	Broadway Ballroom East A-D
Workshop #12	The Apt Lecturer Workshop: The Zika Virus Epidemic from an Ophthalmologic Perspective Marilyn T. Miller, MD; Liana Ventura, MD; Camila Ventura, MD; Linda Lawrence, MD	Broadway Ballroom West F
Workshop #13	Case-Based Overview of the Management of Adult Strabismus Secondary to Ocular Surgery Stacy Pineles; Hilda Capo; Alejandra de Alba Campomanes; Jonathan M. Holmes; Burton Kushner; Federico Velez	Broadway Ballroom East E
Workshop #14	How to Afford to Practice Pediatric Ophthalmology Gonzalo (Vike) C. Vicente; David Epley; Kenneth Wright; Marc Greenberg	Broadway Ballroom West G-K
12:15 PM - 1:00 PM Workshop #15	Pediatric Anesthetic Neurotoxicity and Complex Coordination of Care Jill E. Kilkelly; Stephen R. Hays	Broadway Ballroom East E
1:15 PM - 2:30 PM	Workshop Session D	
Workshop #16	AOC/AAPOS Workshop: Controversies in Pediatric Ophthalmology and Orthoptics Stephen P. Christiansen, MD; Erick D. Bothun, MD; Casey Mickler, MD; David Hunter, MD, PhD; Kyle Arnoldi, CO, COMT; Cindy Pritchard, CO; Ron Biernacki, CO; Amy Hutchinson, MD	Broadway Ballroom East E
Workshop #17	AAP Workshop: Gene Therapy for Inherited Retinal Diseases - Answers for Common Questions? Daniel J. Karr; Arlene Drack; Arif O. Khan; Alex V. Levin; Hannah Scanga; Elias Traboulsi	Broadway Ballroom East A-D
Workshop #18	What Pediatric Ophthalmologists Need to Know about OCTs: Pearls and Pitfalls for Clinical Care Leah G. Reznick; Allison R. Loh; John P. Campbell; David Y. Huang; Bibiana J. Reiser; Beth Edmunds	Broadway Ballroom West G-K
Workshop #19	Telemedicine for Retinopathy of Prematurity: Why and How Deborah K. VanderVeen; RV Paul Chan; Michael F. Chiang; Michael T. Trese	Broadway Ballroom West F
2:45 PM - 4:00 PM	Workshop Session E	
Workshop #20	What's New and Important in Pediatric Ophthalmology and Strabismus in 2017 Darron A. Bacal, MD; Tina Rutar, MD; Chryssa Adamopoulou, MD; Leah Reznick, MD; Erin Herlihy, MD; Walker Motley, III, MD; Hilda Capo, MD; Emily McCourt, MD; Wadih Zein, MD; Leemor Rotberg, MD; Elena Gianfermi, MD	Broadway Ballroom East E
Workshop #21	Abusive Head Trauma: Primer and Mock Trial Gil Binenbaum; Alex V. Levin; Steve E. Rubin; Brian J. Forbes; P. Leigh Bishop, JD	Broadway Ballroom East A-D
Workshop #22	Lessons Learned About Cataract Surgery from the Infant Aphakia Treatment Study Scott R. Lambert; Elias I. Traboulsi; David A. Plager; David Morrison; Sharon Freedman; Erick Bothun; Carolyn Drews-Botsch	Broadway Ballroom West F
Workshop #23	Corneal Collagen Crosslinking in Kids Phoebe D. Lenhart; Erin D. Stahl; Asim Ali	Broadway Ballroom West G-K
4:30 PM - 6:00 PM Workshop #24	Symposium: A Wandering Eye: Peripatetic Adventures of an Ophthalmic Epidemiologist Alfred Sommer, MD, MHS	Broadway Ballroom East E

Wednesday, April 5, 2017

2:00 PM - 3:15 PM Workshop #25	SEC Contracting and Benchmarking Workshop: Developing Contracts and Safety Nets for Retinopathy of Prematurity Care Lisa Bohra, MD; Shira L. Robbins, MD; Robert Gold, MD; Rebecca Sands-Braverman, MD; Denise Chamblee, MD; Michael Bartiss, OD, MD; Robert Wiggins, MD	Broadway Ballroom West
3:30 PM - 5:30 PM Workshop #26	Coding: A Day in the Life of the Pediatric Ophthalmologist 2017 Sue Vicchilli, COT, OSC; Michael J. Bartiss, OD, MD; Heather Dunn, COA; Robert S. Gold, MD, FAAP	Broadway Ballroom West

Thursday, April 6, 2017

7:00 AM - 8:00 AM Workshop #27	Heads Up! Concussion: Current Trends in Diagnosis and Management Nancy M. Benegas, MD; Gary S. Solomon, PhD, FACP; Allan K. Sills, MD, ABPP-CN; Jennifer V. Wethe, PhD; Jeffrey D. Schall, PhD	Broadway Ballroom West
8:25 AM - 9:25 AM Workshop #28	Video Demonstrations of Signs, Diseases, and Complex Surgical Procedures in Pediatric Ophthalmology and Strabismus Sharon F. Freedman, MD; Erick D. Bothun, MD; Mays El-Dairi, MD; Sonal Farzavandi, MD; Maria Rosario Gomez de Liano, MD; David G. Morrison, MD	Broadway Ballroom West
9:35 AM - 10:35 AM Workshop #29	Difficult Non-Strabismus Problems In Pediatric Ophthalmology Elias I. Traboulsi, MD, MEd; Sharon Freedman, MD; Fatema Ghasia, MD; Arif O. Khan, MD; Virginia M. Utz, MD	Broadway Ballroom West
10:45 AM - 11:45 AM Workshop #30	Difficult Problems Strabismus Linda R. Dagi, MD; Ramesh Kekunnaya, MD, FRCS; Lionel Kowal, MD; Andrea Molinari, MD; Yair Morad, MD; Stacy L. Pineles, MD	Broadway Ballroom West

Notes

OMIC Risk Management Workshop: Consent, Documentation and Reporting

Denise R. Chamblee, MD; John T. Reese, Esq; Michelle A. Pineda, MBA
OMIC (Ophthalmic Mutual Insurance Company)
655 Beach Street, San Francisco, CA 94109

Workshop 1
Monday
2:45 - 4:00 pm

Purpose/Relevance: Medical practitioners can avoid medical malpractice lawsuits but keeping current on laws regarding surgical informed consent, proper medical record documentation and knowledge of regulatory medical reporting requirements.

Target Audience: Ophthalmologists who treat pediatric/minor patients

Current Practice: OMIC's analysis of medical malpractice lawsuits where consent, documentation or reporting were an issue has shown that ophthalmologists need assistance with understanding how to properly document a medical record, obtain proper informed consent and when and where to report abuse or neglect.

Best Practice: Ophthalmologists need help understanding the elements of good documentation, consent and regulatory reporting. Examples of medical malpractice lawsuits where these issues were raised will be discussed in detail and a legal expert will discuss how the courts, juries and regulators view best practices.

Expected Outcomes: Ophthalmologists will have a better understanding of the legal elements required for proper informed consent and good medical documentation. They will also see examples of poor documentation and what could have been done different to avoid patient harm and ultimately a lawsuit.

Format: Presentation of data from OMIC's study of lawsuits where documentation, informed consent or regulatory reporting were raised as an issue in the case. Question and answer period.

Summary: Dr. Denise Chamblee will talk about actual OMIC lawsuits that resulting in a lawsuit where documentation, consent or regulatory reporting was an issue. Jack Reese will discuss actual lawsuits and issues raised at trial where documentation, informed consent or regulatory reporting were criticized. Michelle Pineda will discuss risk management recommendations regarding documentation, informed consent and regulatory reporting.

References: Actual OMIC lawsuits (names of cases will remain private due to HIPAA). Legal statutes regarding informed consent and regulatory reporting will be presented.

2017 AAPOS Practice Management Workshop

Heather Dunn

Workshop 2
Tuesday
8:00 am - 4:00 pm

Purpose/Relevance: To discuss practice management issues specific to pediatric ophthalmologists and their administrators in an interactive format. Subjects to be covered include coding, government reporting, efficiency and production benchmarks, human resource concerns, risk management, as well as other management topics of concern from attendees. Attendee participation in round table discussions.

Target Audience: The target audience for the session is pediatric ophthalmology practice administrators and practice owners.

Current Practice: Proposed topics have been suggested by past attendees and brought to the Social Economic Committee through the year. They evoke elevated interest among AAPOS members and their administrators.

Best Practice: NA

Expected Outcomes: As a result of attending this session, physicians and administrators should be able to have a better understanding of coding rules and regulations, government reporting and incentive plans, how to measure production in their practice, identify and manage risk in everyday practice, and communicate with like practices regarding problem scenarios.

Format: interactive format

Summary: Subjects to be covered include coding, government reporting, efficiency and production benchmarks, human resource concerns, risk management, as well as other management topics of concern from attendees. Attendee participation in round table discussions.

References: Dr. Micheal Bartiss, drbartiss@fecweb.com or kidseyes@earthlink.net

No CME

Workshop 3
Tuesday
7:00 - 8:15 am

How Recent Technology Should Change Your Practice Patterns

Yasmin Bradford; Burt Kushner; Michael Struck; Melanie Schmitt

University of Wisconsin, Madison, Wisconsin

Purpose/Relevance: Recent technology advances that affect clinical practice include extraocular muscle imaging, ophthalmic genetic testing, visual evoked potential testing, and binocular treatments for amblyopia. Each technology will be presented with their benefits and pitfalls, practical use in a clinic setting, specific competing equipment will be discussed, and a conclusion whether the individual technology should be adopted in clinical practice today. The diagnosis of the following clinical entities: glaucoma, anomalous or slipped extraocular muscles, extraocular muscle activity in thyroid disease, inherited ophthalmic diseases, and vision assessment in preverbal children using standard methods is challenging. In addition, current amblyopia treatments are not always effective in children. Newer technologies may offer a clearer diagnosis. With the advent of more sophisticated genetic testing, our knowledge regarding genotype-phenotype correlations in inherited ophthalmic conditions has broadened. Though this expanded knowledge comes with many advantages, it also carries its own challenges. Current trends in ophthalmic genetic testing with patient cases will be presented.

Target Audience: Pediatric Ophthalmologists, General Ophthalmologists

Current Practice: It is difficult to know with a variety of new technologies developing annually, which has the highest clinical utility with cost-effectiveness in a busy clinical practice. In addition, the accessibility of such modern technologies is important for ease of use. Ocular genetics testing is frequently performed, but analyzing the results with appropriate counseling is difficult for the pediatric ophthalmologist.

Best Practice: New technologies which can offer more accurate clinical diagnoses will be presented. Ocular genetics testing and result analysis, extraocular muscle imaging, visual evoked potential testing, and binocular amblyopia treatments will be discussed. The benefits and downsides of each technology including cost, availability, ease of use will be presented.

Expected Outcomes: Audience members will gain practical knowledge of new technologies to apply in their clinics, which equipment of specific technologies perform better, and benefits and downsides of each technology including cost, availability, ease of use.

Format: Case presentations with audience quiz

Summary: The workshop will cover the following: 1. Ocular genetics testing for variety of inherited eye diagnoses- where to get, costs, obstacles; 2. Interpreting results of genetics testing; 3. Use of imaging for strabismus (MRI vs CT, Inform radiology as to type of scan, Muscle heterotopia and anomalies, Lost, slipped muscles, Use of dynamic scans, Muscle edema in Graves); 4. VEP for preverbal vision testing; 5. New binocular therapies for amblyopia

References: 1. Hess RF, Thompson B. Amblyopia and the binocular approach to its therapy. *Vision Res.* 2015 Sep;114:4-16. 2. Birch EE, Li SL, Jost RM, Morale SE, De La Cruz A, Stager D Jr, Dao L, Stager DR Sr. 3. Binocular iPad treatment for amblyopia in preschool children. *J AAPOS.* 2015 Feb;19(1):6-11. 4. Shin A, Yoo L, Demer JL. Independent active contraction of extraocular muscle compartments. *Invest Ophthalmol Vis Sci.* 2014 Dec 11;56(1):199-206.

Workshop 4
Tuesday
7:00 - 8:15 am

Interdisciplinary Management of Children with Craniofacial Malformations (Craniosynostosis)

Meghan Flemmons, MD; Christopher Bonfield, MD; Linda Dagi, MD;

Jane Edmond, MD; Kevin Kelly MD, DDS

Purpose/Relevance: In addition to strabismus and high refractive error, increased intracranial pressure and papilledema are frequently observed co-morbidities in children with craniosynostosis. The purpose of this workshop is to discuss monitoring and intervention for these patients.

Target Audience: Pediatric ophthalmologists, trainees

Current Practice: Papilledema in patients with craniosynostosis can lead to permanent vision loss. Monitoring of afferent visual function, optic nerve changes, and determining if intracranial pressure is elevated can be challenging in craniosynostosis patients and requires a multidisciplinary approach.

Best Practice: This multidisciplinary workshop will address diagnosis and management of children with craniosynostosis through didactics and case presentations. The panel includes a pediatric neuro-ophthalmologist, a pediatric neurosurgeon and a pediatric craniofacial surgeon as well as a strabismus surgeon with expertise in craniofacial syndromes.

Expected Outcomes: The audience will gain knowledge in management of increased intracranial pressure in craniosynostosis patients, including treatment options, timing of treatment, and monitoring intracranial pressure, visual function, and optic nerve appearance.

Format: Didactics and case presentation by panelists with audience participation encouraged through questions and personal experience.

Summary: Craniosynostosis is associated with increased intracranial pressure and papilledema which can result in vision loss. This course will provide details of current management strategies for these complications which will assist the pediatric ophthalmologist in providing care for these children as one of the members of a multidisciplinary team.

References: 1. Iyengar RJ, Klinge PM, Chen WS, Boxerman JL, Sullivan SR, Taylor HO. Management of craniosynostosis at an advanced age: controversies, clinical findings, and surgical treatment. *J Craniofac Surg.* 2016 Jul;27(5):e435-41. 2. Dagi LR, Tiedemann LM, Heidary G, Robson CD, Hall AM, Zurakowski D. Using spectral-domain optical coherence tomography to detect optic neuropathy in patients with craniosynostosis. *J AAPOS.* 2014 Dec;18(6):543-9.

Tips for Understanding Pediatric Ocular Tumors

Carol L. Shields, MD; Jerry A. Shields, MD
Ocular Oncology Service at Wills Eye Hospital
Philadelphia, PA 19107

Workshop 5
Tuesday
7:00 - 8:15 am

Purpose/Relevance: Ocular tumors are well known to masquerade as non-malignant conditions. The clinician cannot afford to miss an ocular tumor, particularly in a child.

Target Audience: Pediatric Ophthalmologists & General Ophthalmologists

Current Practice: Pediatric ophthalmologists are often the first clinicians to evaluate a child with an ocular tumor. With the limited time available, the ophthalmologist must recognize and plan how to co-manage this case.

Best Practice: Recognition of important clinical features, treatment options, and expected outcomes for children with ocular tumors

Expected Outcomes: At the conclusion of this presentation, attendees should be able to recognize characteristic clinical features of the spectrum of pediatric ocular tumors. The attendee should be able to understand the reasoning for specific treatment approaches.

Format: Didactic lecture with audience participation

Summary: A quick overview of the most important pediatric ocular tumors will be presented to provide up-to-date information on tumors of the eyelid, conjunctiva, intraocular structures, and orbit.

References: 1. Shields CL, Sioufi K, Alset AE, et al. Conjunctival tumors in children in 806 cases. Analysis of demographic influence and features differentiating benign from malignant tumors. *JAMA Ophthalmol* 2017;in press. 2. Shields CL, Lally SE, Leahey AM, Jabbour PM, Caywood EH, Schwendeman R, Shields JA. Targeted retinoblastoma management. When to use intravenous, intra-arterial, periocular, and intravitreal chemotherapy. *Curr Opin Ophthalmol* 2014;25:374-85. 3. Shields CL, Jorge R, Say EAT, Magrath G, Al Set A, Leahey AM, Caywood E, Jabbour P, Shields JA. Unilateral retinoblastoma managed with intravenous chemotherapy versus intra-arterial chemotherapy. Outcomes based on the International Classification of Retinoblastoma. *Asia Pac J Ophthalmol* 2016;5:97-103.

Management Pearls in Pediatric Uveitis

Erin D. Stahl; Virginia Utz; Stefanie L. Davidson; Sheila Angeles-Han
Children's Mercy Hospital, Kansas City, MO

Workshop 6
Tuesday
7:00 - 8:15 am

Purpose/Relevance: Increased understanding of the timing of medical and surgical uveitis management in the pediatric ophthalmology community is needed to prevent severe complications and vision loss. The purpose of this course is to provide an updated framework for management of children with uveitis.

Target Audience: Pediatric ophthalmologists

Current Practice: Pediatric ophthalmologists are uncertain as to the timing and appropriateness of systemic treatment in pediatric uveitis. Optimal communication does not always exist between the ophthalmologist and rheumatologist. This often leads to poor control of ocular inflammation leading to ocular damage as well as steroid-related toxicity.

Best Practice: Ideal management of pediatric uveitis includes timely diagnosis, identification of underlying etiology, and implementation of appropriate steroid-sparing medications for persistent inflammation and/or inability to taper topical steroids. Systemic immunosuppression is slowly tapered after inactive disease with close monitoring and coordination of care with rheumatology. In most cases, vision-threatening complications can be avoided when the disease is aggressively treated and closely monitored.

Expected Outcomes: Clinicians will develop an evidence-based approach to the work-up and management of pediatric uveitis patients including 1) diagnostic evaluation 2) treatment algorithm that focuses on timely initiation and duration, 3) overview of common biologic agents for uveitis, 4) updates on treatment of refractory disease 5) surgical management.

Format: Didactic lecture with case presentations, panel discussion

Summary: This workshop will provide an update on current practice patterns in pediatric uveitis. Participants will leave the session with tools to aid with diagnosis and treatment of uveitis including timing and duration of biologic therapy.

References: Angeles-Han ST, Rabinovich CE. Uveitis in children. *Curr Opin Rheumatol*. 2016 Sep;28(5):544-9

Workshop 7
Tuesday
8:30 - 9:45 am

Guidelines for Developing an Exit Strategy for Withdrawal from Practice and Entering Retirement

Albert W. Biglan, MD¹; John D. Baker, MD²

¹University of Pittsburgh School of Medicine, emeritus Pittsburgh, PA ²
Clinical Professor of Ophthalmology, Wayne State University School of Medicine,
Kresge Eye Institute, Detroit MI

Purpose/Relevance: The thought of retirement may seem distant and frightening. This may foster an approach - avoidance conflict. Two members, one completely retired, the other, mostly retired, will share their experiences in making the transition from practice to retirement. Guidelines will be offered to those who are considering retirement. The presentation will cover abrupt, planned retirement and gradual phased out retirement.

Target Audience: Members who are considering retirement and those approaching retirement age.

Current Practice: Retirement from practice may be a frightening thought and may cause the member to put off important decisions.

Best Practice: Members who are proactive can plan for an orderly withdrawal from practice and can enter retirement having a successful transition from one lifestyle to another.

Expected Outcomes: Members will be presented issues to be considered, and to be addressed prior to their exit from practice. The retired life can be satisfying and meaningful when planned activities are chosen. With planning, resources can provide a secure, and satisfying lifestyle for the member and family to enjoy.

Format: Power Point presentation with an open dialogue with the attendees.

Summary: Members nearing retirement will be encouraged to plan for their retirement. An exit strategy for withdrawal from practice, either abruptly or gradually will be presented. Lifestyle changes and considerations during retirement will be covered. Finances of retirement will be discussed.

Workshop 8
Tuesday
8:30 - 9:45 am

AAPOS Genetic Task Force Workshop: Genetic Testing in Pediatric Ophthalmology, A Must or a Bust?

Arlene V. Drack, MD; Elias Traboulsi, MD; Virginia Utz; Debra Costakos;
Arif O. Khan, MD
University of Iowa, Iowa City, IA

Purpose/Relevance: Recent molecular genetic advances mean pediatric ophthalmologists have an increasing responsibility to accurately identify, and either counsel or refer patients with genetic eye diseases. Understanding the role of genetic tests and their interpretation is complex.

Target Audience: Pediatric ophthalmologists, residents and fellows

Current Practice: Pediatric ophthalmologists have varying levels of experience with evaluating genetic eye disorders. Many worry that during a busy clinic there may be patients for whom specific tests or treatments are missed, while for others their confidence in management may not reflect the current standard of care.

Best Practice: Establishing pathways for coordination of care with a genetic eye disease specialist, a genetic counselor or a medical geneticist is vital. Understanding current testing technology's benefits and limitations in relation to clinical phenotype helps to ensure correct diagnosis, counseling, and prompt referral for interventions such as treatment.

Expected Outcomes: (1) Clinicians will develop a systematic approach to the evaluation of major categories of genetic ocular disorders. (2) Clinicians will be able to devise pathways for creating comprehensive care. (3) Clinicians will have the opportunity to present complex cases for input from the task force.

Format: Case-based presentations that focus on algorithms for specific categories of genetic eye disorders, for example, is it a must, or a bust, to refer patients for genetic evaluation if they have coloboma? Nystagmus with poor vision? Early onset cataract?

Summary: In a rapidly changing field, physicians must have algorithms to follow to feel confident they are providing the best care for patients with disorders such as nystagmus, congenital blindness, cataracts and anterior segment dysgenesis.

References: Drack AV, Johnston R, Stone EM. Which Leber congenital amaurosis patients are eligible for gene therapy trials? J AAPOS. 2009; 13(5):463-465.

Strabismus Surgery in Complex Neurologic Disease: Surgical Strategy and Outcomes

Gena Heidary, MD, PhD; Stacy Pineles, MD; Jason Peragallo, MD;
Mitchell Strominger, MD; Jane Edmond, MD; Linda Dagi MD
Boston Children's Hospital, Boston, MA

Workshop 9
Tuesday
8:30 - 9:45 am

Purpose/Relevance: Strabismus occurs frequently in children and adults in the setting of neurologic disease such as brain tumor or cortical visual impairment.¹⁻³ The purpose of this workshop is to discuss and evaluate the approach to strabismus surgery in patients who harbor complex neurologic disease. We seek to highlight important considerations with respect to surgical strategy and discuss surgical outcomes in the context of these neurologic conditions.

Target Audience: Pediatric ophthalmologists and neuro-ophthalmologists

Current Practice: Ophthalmologists may not be familiar with the ophthalmic symptoms/signs suggestive of CNS disease, the significant morbidity of oculomotor dysfunction secondary to CNS disease, and the current literature regarding oculomotor outcomes in this context.

Best Practice: Ophthalmologists should recognize the clinical signs and the types of strabismus that are associated with these CNS conditions and be familiar with the pearls and pitfalls of strabismus management in the context of complex neurologic disease.

Expected Outcomes: The attendee will be empowered to recognize clinical signs suggestive of specific CNS diseases that affect oculomotor function and the pattern(s) of strabismus associated with these disease processes. The clinician will become aware of evidence based ocular motility outcomes for these patients thereby enhancing clinical management.

Format: Panel with case presentations, didactic lectures and question/answer period

Summary: The workshop will focus on the following topics: dorsal midbrain syndrome, internuclear ophthalmoplegia, strabismus after treatment of posterior fossa tumors, pediatric myasthenia gravis, ocular neuromyotonia, and cortical visual impairment. Each topic will be led by one of the authors with a case presentation followed by a didactic talk. The talk will include a brief review of pertinent clinical findings associated with the condition, a discussion of surgical strategy/decision making, and any relevant literature regarding oculomotor outcomes in the context of each topic.

References: 1. Shalev and Repka. *Ophthalmol.* 2000; 107:1880-1883. 2. Peragallo JH, Velez FG, Demer JL, Pineles SL. *J Neuroophthalmol.* 2013 Mar;33(1):40-4. doi: 10.1097/WNO.0b013e318280d630. 3. Binder NR, Kruglyakova J, Borchert MS. *JAAPOS.* 2016; 2016 Apr;20(2):121-5. doi: 10.1016/j.jaapos.2015.12.010.

Teratogens, Neonatal Infections and the Visual System

Alan O. Mulvihill, FRCSEd, FRCSI; Alan B. Richards, MD; Ruth Hamilton, PhD;
Andrew Blaikie, FRCOphth

1. Princess Alexandra Eye Pavilion. 2. LSU Health Sciences Centre.
3. Glasgow Children's Hospital.

1. Edinburgh, United Kingdom. 2. Shreveport, LA. 3. Glasgow, United Kingdom.

Workshop 10
Tuesday
8:30 - 9:45 am

Purpose/Relevance: To update clinicians on the presentation, clinical features and prognosis for the most commonly encountered teratogens affecting the eyes and visual system.

Target Audience: All clinicians seeing children with visual problems.

Current Practice: Many clinicians have limited knowledge of the effects of teratogens on the visual system.

Best Practice: Improved understanding of the visual system consequences of teratogens.

Expected Outcomes: Improved understanding of the visual system consequences of teratogens.

Format: Presentations with illustrative clinical cases plus published and ongoing research by the authors.

Summary: The workshop will firstly address the wide variety of infectious agents (bacteria, viruses, fungi and protozoa) that may have long-term consequences both for the visual system and developing CNS. We will discuss the visual system consequences of exposure to opioids in utero. There has been a five-fold increase in the number of babies born in the United States who are addicted to opioids, between 2000 and 2012 (1). There has been a parallel rise in the numbers of babies with opioid related problems presenting to pediatric ophthalmologists. Clinicians in the United Kingdom have been dealing with large numbers of opioid exposed children for many years and will share their experiences. The workshop will describe the presentation, examination findings and long-term visual consequences of opioids on unborn children (2). Additionally, we will discuss the profound visual evoked potential [VEP] changes observed in these neonates (3). Finally, the workshop will address a perhaps surprising genetic component to this problem. Namely that teratogenic agents may alter DNA in affected individuals and propagate abnormalities into succeeding generations.

References: 1. <https://www.drugabuse.gov/related-topics/trends-statistics/infographics/dramatic-increases-in-maternal-opioid-use-neonatal-abstinence-syndrome>. 2. Gupta M, Mulvihill AO, Lascaratos G et al. Nystagmus and reduced visual acuity secondary to drug exposure in utero: long-term follow-up. *J Pediatr Ophthalmol Strabismus.* 2012 Jan-Feb;49(1):58-63. doi:10.3928/01913913-20110308-01. 3. McClone L, Hamilton R, McCulloch DL et al. Neonatal visual evoked potentials in infants born to mothers prescribed methadone. *Pediatrics.* 2013 Mar;131(3):e857-63. doi:10.1542/peds.2012-2113.

Workshop 11

Tuesday

10:30 - 11:45 am

Oculoplastics: Imaging and Surgical Pearls

Alexandra T. Elliott, MD; Linda Dagi, MD; Suzanne Freitag, MD; Lora Glass, MD
Childrens Hospital, Boston Massachusetts

Purpose/Relevance: Appropriate evaluation and management of the child presenting with peri-ocular trauma, orbital cellulitis and dacryocystitis, lid deformity or exposure after ptosis repair are oculoplastic challenges faced by many pediatric ophthalmologists

Target Audience: Pediatric ophthalmologists.

Current Practice: Acute lid and lacrimal lacerations as well as orbital cellulitis and dacryocystitis and pediatric ptosis are often managed with techniques recalled from residency. Orbital imaging modalities have also evolved.

Best Practice: This workshop will present innovative surgical techniques for peri-ocular trauma including instruments and suture choices. Clinical history and imaging used to direct medical versus surgical management of orbital cellulitis and dacryocystitis will be addressed as well as details of surgical approach. Common pitfalls associated with pediatric ptosis repair and their management, and the relative role of MRI, CT, ultrasound and 3D Printing for evaluation and management of orbital disorders will be covered as well.

Expected Outcomes: Participants will have a more nuanced approach to evaluation of a variety of pediatric orbital and eyelid disorders and an enhanced repertoire of surgical techniques for repair.

Format: The format is a combination of case presentations that address topics above as well as panel discussion

Summary: This workshop will delve into a variety of pediatric oculoplastic topics including but not limited to orbital cellulitis, dacryocystitis and periocular trauma. Through case based presentations, optimal imaging studies, novel surgical techniques and natural history pearls will be presented.

References: Pediatric Acute Dacryocystitis. Ali, Mohammad Javed F.R.C.S. Ophthalmic Plastic & Reconstructive Surgery, Sept/Oct 2015 Vol 31 Issue 5 pp.341-347

Workshop 12

Tuesday

10:30 - 11:45 am

The Zika Virus Epidemic from an Ophthalmologic Perspective

Marilyn T. Miller, MD; Liana Ventura, MD; Camila Ventura, MD; Linda Lawrence, MD
1) Ventura Foundation, 2) U. of Illinois Eye and Ear Infirmary and 3) Private Practice
1) Recife, Brazil, 2) Chicago, Illinois, 3) Salina, Kansas

Purpose/Relevance: The Zika viral epidemic is among the newly emerging diseases worldwide. While infected individuals usually have mild or no symptoms, the appearance of microcephaly in many offspring in the recent Brazilian epidemic has led to a worldwide public health emergency especially in regions where certain types of mosquito vectors exist.

Target Audience: Clinicians, orthoptists and allied health personnel

Current Practice: Ophthalmologists and other physicians working in areas with known or potential Zika viral infections may not be aware of the infants or adults who are potentially exposed to the virus or the characteristic signs and symptoms of infection.

Best Practice: The appropriate health care professionals will be cognizant of the regions where the Zika virus infections are possible and the signs and symptoms of infection in adults and affected offspring.

Expected Outcomes: The participants will have: 1)An improved level of knowledge of some of the basic teratogenic principles as they apply to the Zika epidemic; 2) Information on the scope of the infection in different regions and 3)The appropriate evaluation of affected or potentially affected adults and infants.

Format: The format will include short presentations on the following: 1)The teratogenic characteristics of the Zika virus infections; 2) The retinal and optic nerve findings in affected infants; 3)The Ventura Foundation's (Brazil) experience with the large number of infants with manifestations of the Zika viral infection including their visual and neurologic findings and functional deficits and 5)Summary and questions.

Summary: The recent Zika virus epidemic is characterized by mild symptoms in the most affected individuals. However if the pregnant woman is infected very severe malformations may occur in her fetus.

References: 1. Ventura CV, Maia M, Ventura LV et al. Ophthalmologic findings in infants with microcephaly and presumable intra-uterus zika virus infection. Arq Bras Oftalmol 2016; 79:1-3. 2. Goorhuis A, Grobusch MP. Zika virus: who's next? Lancet Infect Dis. 2016 Sep [Epub ahead of print] PubMed PMID: 27593583.

Case-Based Overview of the Management of Adult Strabismus Secondary to Ocular Surgery

Stacy Pineles; Hilda Capo; Alejandra de Alba Campomanes; Jonathan M Holmes;
Burton Kushner; Federico Velez

Workshop 13
Tuesday
10:30 - 11:45 am

Purpose/Relevance: To summarize the collective experience of our diverse panel in the management of diplopia after ocular surgery in a case-based format.

Target Audience: Pediatric Ophthalmologists and Strabismus Specialists

Current Practice: Diplopia after ocular surgery is common and often 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.

Best Practice: Newer techniques will be discussed as will algorithms for the management of the majority of causes of strabismus after ocular surgery. Peer-reviewed research on the topics will be reviewed.

Expected Outcomes: Participants will be able to form an algorithm for the management of strabismus after ocular surgery, including post-cataract, retinal detachment, pterygium, and glaucoma surgery.

Format: Case-based panel format with short lectures interspersed focused on evidence-based management of these patients. Each panelist will provide their algorithm for management of a particular disorder.

Summary: Five cases will be presented over the course of the workshop, which will frame our discussion regarding the diagnostic and surgical procedures required for this select group of patients. Audience participation will be encouraged.

How to Afford to Practice Pediatric Ophthalmology

Gonzalo (Vike) C. Vicente; David Epley; Kenneth Wright; Marc Greenberg
Eye Doctors of Washington, Chevy Chase, MD

Workshop 14
Tuesday
10:30 - 11:45 am

Purpose/Relevance

Introduction: It is likely that lower payments in pediatric specialties have led to lower applications. The goal of this panel discussion is to present ways in which to maximize earning potential of doctors in private practice and thus support the growth of this specialty. Solutions to expensive financial mistakes in different pediatric ophthalmology private practices will be reviewed.

Methods: The panel members will present reasons for lower reimbursement among pediatric specialties and offer succinct examples of how they solved their financial difficulties in private practice. The audience will be able to take home bullet points of the presenters' financial results with websites, optical shops, surgery centers, commercial property, office testing equipment, pediatric optometrists and ROP contract negotiations. The presenters will avoid discussion regarding price setting.

Results: All panel members were able to afford to practice pediatric ophthalmology in a private practice setting.

Discussion: The examples provided may be applied to most but not all practice settings.

Conclusion: Audience members will be able to apply the recommendations of the panel members to their own practices, and improve their practice's finances in a practical and ethical way.

Target Audience: Pediatric ophthalmologists in private practice and academia

Current Practice: Pediatric ophthalmologist can not see as many patients per day, order as many in-office tests or do as many in office procedures as a general ophthalmologist thus limiting their income potential.

Best Practice: Ethically supplement the income of pediatric ophthalmologists through the use of websites, optical shops, surgery centers, commercial property, office testing equipment, physician extensors such as pediatric optometrists and orthoptists, and ROP contract negotiations.

Expected Outcomes: Attendees will be better able to afford to practice pediatric ophthalmology in a private practice setting, and increase department revenue in an academic setting.

Format: Power point lecture of case presentations of specific economic hurdles presented as a game of life followed by a panel discussion.

Summary: Suggestions on how to avoid financial mistakes in private practice.

References: No previous research has been published in the specific area.

Workshop 15
Tuesday
12:15 - 1:00 pm

Pediatric Anesthetic Neurotoxicity and Complex Coordination of Care

Jill E. Kilkelly; Stephen R. Hays
Vanderbilt University Medical Center, Nashville, TN, USA

Purpose/Relevance: There is increasing concern over possible adverse neurodevelopmental effects of anesthetic exposure in children. In particular, multiple anesthetic exposures are associated with increased risk of learning disability and other deficits. Our institution has developed a program to provide multiple procedures under a single anesthetic.

Target Audience: Practitioners performing or requesting procedures requiring anesthesia in children.

Current Practice: Multiple procedures requiring anesthesia in children are frequently scheduled without communication among requesting services, often resulting in fragmented care, logistical burden on patients and families, and multiple anesthetics.

Best Practice: The Complex Coordination of Care (CCOC) program developed by our division of pediatric anesthesia facilitates communication among requesting services, striving to consolidate multiple procedures requiring anesthesia into a single care encounter with a single anesthetic.

Expected Outcomes: Awareness of our CCOC program may promote similar approaches elsewhere, preventing fragmentation of care, easing logistical burden on patients and families, and reducing need for multiple anesthetics.

Format: PowerPoint presentation by two faculty, with subsequent discussion.

Summary: To our knowledge, our CCOC program is unique in working to consolidate multiple procedures requiring anesthesia into a single care encounter with a single anesthetic. In addition to promoting more efficient clinical care and reducing logistical burden on patient and families, such an approach may reduce risk of neurodevelopmental deficits associated with multiple anesthetic exposures in children.

References: 1. Hays SR, Deshpande JK. Newly postulated neurodevelopmental risks of pediatric anesthesia: theories that could rock our world. *J Urol* 2013 Apr;189(4):1222-8. 2. Kilkelly JE, Kinch JS. An Innovative Paradigm: Coordinating Anesthetic Care for Complex Pediatric Patients requiring Multiple Procedures. *J Anesth Clin Res* 2015;5:490. 3. Sun LS, et al. Incl. Hays SR. Association Between a Single General Anesthesia Exposure Before Age 36 Months and Neurocognitive Outcomes in Later Childhood. *JAMA* 2016 Jun 7;315(21):2312-20.

Workshop 16
Tuesday
1:15 - 2:30 pm

AOC/APOS Workshop:

Controversies in Pediatric Ophthalmology and Orthoptics

Stephen P. Christiansen, MD; Erick D. Bothun, MD; Casey Mickler, MD; David Hunter, MD, PhD;
Kyle Arnoldi, CO, COMT; Cindy Pritchard, CO; Ron Biernacki, CO; Amy Hutchinson, MD

Purpose/Relevance: In our clinics and OR's, patient care is often driven more by our training and personal experience than by high-level evidence. Even when clinical studies exist, the evidence may be compromised by insufficient numbers, intrinsic biases, or poor study design. When clinical practice is experientially driven, it is inevitable that bias and controversy will arise because our clinical settings, our patient cohorts, and our own observations may vary significantly. A discussion of controversial clinical topics is useful as it frames the state of the art but also highlights gaps in our knowledge base that require further study.

Target Audience: Orthoptists, Pediatric Ophthalmologists

Current Practice: The controversy that surrounds initial management of the child with poorly-controlled intermittent exotropia highlights the conundrum that orthoptists and pediatric ophthalmologists confront when no clear, data-driven guidelines exist. Should the child have surgery? Should the child be monitored longer without treatment? Should alternate patching or over-minused glasses be prescribed? All are currently acceptable approaches, and we have little to support our choices. Many controversies like this exist in our day-to-day practices, highlighting the need both for more study and for a more cautious approach with our own preferences and biases as to how best to treat our patients.

Best Practice: Clinical and surgical management supported by high-level evidence.

Expected Outcomes: Attendees will be prepared to treat patients whose management is controversial and not supported by high-level evidence by understanding the limits of existing knowledge and the potential risks and benefits of alternate approaches.

Format: Point-counterpoint discussions of controversial topics in the clinical and surgical care of patients.

Summary: Topics which will be addressed in this workshop include: Bifocals vs single-vision lenses for high AC/A accommodative esotropia; Surgery vs non-surgical modalities for initial treatment of poorly-controlled intermittent exotropia; Refractive surgery vs conservative management of refractory anisometropic amblyopia; and, Incisional surgery vs chemodenervation for small-angle esotropia.

References: 1. Whitman MC, MacNeill K, Hunter DG. Bifocals fail to improve stereopsis outcomes in high AC/A accommodative esotropia. *Ophthalmology*. 2016;123:690-696. 2. Daoud YJ, Hutchinson A, Wallace DK, Song J, Kim T. Refractive surgery in children: treatment options, outcomes, and controversies. *Am J Ophthalmol*. 2009;147:573-582.

AAP Workshop: Gene Therapy for Inherited Retinal Diseases- Answers for Common Questions?

Daniel J. Karr; Arlene Drack; Arif O. Khan; Alex V. Levin; Hannah Scanga;
Elias Traboulsi

AMERICAN ACADEMY OF PEDIATRICS (AAP)

Workshop 17
Tuesday
1:15 - 2:30 pm

Purpose/Relevance: Retinal gene therapy trials are becoming increasingly available. The purpose of the workshop is to discuss the most commonly asked questions about gene therapy for inherited retinal diseases.

Target Audience: Pediatric ophthalmologists, researchers, ophthalmic technicians and orthoptists

Current Practice: Currently while there is much information on the internet about various gene therapies, many pediatric ophthalmologists have not been trained in ocular genetics, so trying to advise parents and patients can be very difficult.

Best Practice: Ideally, all patients with an inherited retinal disease would have a phenotypic evaluation, leading to a specific or focused genotypic investigation. With this molecular diagnosis, practitioners could check the gene therapy trials /availability for that specific molecular diagnosis, counsel or arrange counseling and offer this to their patients.

Expected Outcomes: This workshop will introduce phenotype/genotype correlation, discuss the salient points of genetic counseling, the natural history of the diseases described, the ethics and moral dilemmas of revealing to children and their parents potential blinding conditions and finally discuss the gene therapy trials available and the results of those that have been done.

Format: There will be five 15 minute talks by experts in the field of ocular genetics, using advanced graphics in terms of diagnosis and treatment.

Summary: The workshop discusses the importance of phenotype-genotype correlation to aid diagnosis, which helps define likely natural history of the condition. Counseling and ethical dilemmas are discussed with respect to potential blinding eye conditions' diagnosis in the pediatric population. Availability and success of gene therapy trails for inherited retinal diseases are discussed.

References: Garoon, RB; Stout JT. Update on ocular gene therapy and advances in treatment of inherited retinal diseases and exudative macular degeneration. 268-73;27(3) 2016 Curr Opin Ophthalmol

What Pediatric Ophthalmologists Need to Know about OCTs: Pearls and Pitfalls for Clinical Care

Leah G. Reznick; Allison R. Loh; John P. Campbell; David Y. Huang; Bibiana J. Reiser;
Beth Edmunds

Oregon Health Sciences University -- Casey Eye Institute, Portland, OR

Purpose/Relevance: As Optical Coherence Tomography (OCT) technology has advanced, it has increased availability and utility in pediatric practices. As the technology becomes an integral part of clinical care, 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. Our panel is composed of one of the co-inventors of OCT (David Huang, MD) as well as innovators of OCT imaging of the anterior segment. The purpose of this workshop is to provide fundamental information about OCT interpretation and describe recent advances in OCT. With this basic information, we will be able to explore pearls and pitfalls in utilizing OCT for anterior segment, pediatric glaucoma management, and retinal pathology.

Target Audience: pediatric ophthalmologists, researchers

Current Practice: There are unique challenges to the application of OCT technology in a pediatric practice and few resources to help ophthalmologists adapt 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 experts in OCT educating pediatric ophthalmologists on OCT, a standard of practice will emerge for integration of OCT into care of pediatric ocular problems.

Expected Outcomes: Participants will understand how to interpret OCT findings of the anterior segment, optic nerve, and macula. Ophthalmologists can accurately and effectively incorporate OCT into patient management.

Format: 1) Panel presentations (60 minutes) - each presenter will provide didactic training and an interactive case discussion to test the audience's understanding

2) Open question and answer forum (15 minutes)

Summary: This workshop will discuss fundamentals of OCT interpretation and recent advances in OCT technology. The presenters will then apply this knowledge to OCT for the anterior segment, pediatric glaucoma management, and retinal pathology. With these skills, pediatric ophthalmologists can confidently incorporate OCT into clinical care.

References: 1. Bhoiwala DL, Simon JW, Raghu P, et al. Optic nerve morphology in normal children. J AAPOS. 2015;19(6):531-534. 2. Gao SS, Jia Y, Zhang M, et al. Optical Coherence Tomography Angiography. Invest Ophthalmol Vis Sci. 2016;57(9):OCT27-36. 3. Lee H, Proudlock FA, Gottlob I. Pediatric Optical Coherence Tomography in Clinical Practice-Recent Progress. Invest Ophthalmol Vis Sci. 2016;57(9):OCT69-79.

Workshop 18
Tuesday
1:15 - 2:30 pm

Workshop 19
Wednesday
1:15 - 2:30 pm

Telemedicine for Retinopathy of Prematurity: Why and How

Deborah K. VanderVeen; R.V. Paul Chan; Michael F. Chiang; Michael T. Trese
Boston Children's Hospital, Boston, MA

Purpose/Relevance: Telehealth programs have been developed for detection of eye disease in populations that lack traditional resources for screening. Retinopathy of prematurity (ROP) is a vasoproliferative retinal disease found in premature infants that can lead to blindness without timely detection and treatment. Even in developed countries, a lack of ophthalmologists with expertise in ROP screening and treatment for ROP has resulted in interest and implementation of digital image analysis as a screening modality.

Target Audience: Pediatric ophthalmologists, general ophthalmologists, retina specialists, and trainees

Current Practice: Standard ROP screening is performed for at risk infants using indirect ophthalmoscopy at the bedside. Only a small number of centers routinely use remote digital imaging as part of ROP screening.

Best Practice: An understanding of benefits and limitations of remote telescreening for ROP is needed, and specific components are required in order to establish a safe and reliable telescreening program.

Expected Outcomes: The audience will hear why telescreening might be advantageous, and understand how to safely incorporate this modality into routine ROP screening.

Format: The panel will present scenarios in which ROP telescreening is currently used, review the evidence for safety, validity, and reliability of telescreening, and address common challenges in the implementation of real-world programs, including methods of data acquisition and secure transfer, and training of personnel.

Summary: This workshop will consider situations in which remote image capture for ROP screening may be useful or preferable, review supporting literature, and discuss considerations for real world implementation.

References: Fierson WM, Capone A Jr; American Academy of Pediatrics Section on Ophthalmology; American Academy of Ophthalmology, American Association of Certified Orthoptists. Telemedicine for evaluation of retinopathy of prematurity. *Pediatrics*. 2015 Jan;135(1):e238-54.

Workshop 20
Tuesday
2:45 - 4:00 pm

What's New and Important in Pediatric Ophthalmology and Strabismus in 2017

Darron A. Bacal, MD; Tina Rutar, MD; Chryssa Adamopoulou, MD;
Leah Reznick, MD; Erin Herlihy, MD; Walker Motley, III, MD; Hilda Capo, MD;
Emily McCourt, MD; Wadih Zein, MD; Leemor Rotberg, MD; Elena Gianfermi MD
Professional Education Committee Aapos

Purpose/Relevance: The authors will investigate the literature for articles of interest to the sub-specialty of Pediatric Ophthalmology & Strabismus for the time period March 2016-February 2017. Ophthalmic journals are stressed but journals from other specialties such as pediatrics, neurology & comprehensive medicine will be included. Key findings will be summarized in the major topics, including, but not limited to vision screening, amblyopia, neuro-ophthalmology, retinopathy of prematurity, strabismus, cataract, glaucoma, genetics, retina, orbit, uveitis and practice management. The presentations will summarize and emphasize second-order analyses of the material.

Target Audience: Pediatric Ophthalmologists, Ophthalmologists and Orthoptists who examine, diagnose and treat children and adults with strabismus and other pediatric eye disorders.

Current Practice: Pediatric Ophthalmology is a rapidly evolving sub-specialty. It is difficult to remain current with all of the literature in the field.

Best Practice: The authors will summarize, analyze and present the most current 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 and critical published information in this sub-specialty.

Format: Didactic lecture

Summary: More than 20 medical journals will be reviewed for relevant new findings in the sub-specialty of Pediatric Ophthalmology and Strabismus from March 2016 to February 2017. The material presented will educate the target audience in new research and practice patterns.

References: Journal of Aapos; Ophthalmology, Pediatrics

Abusive Head Trauma: Primer and Mock Trial

Gil Binenbaum; Alex V. Levin; Steve E. Rubin; Brian J. Forbes; P. Leigh Bishop, JD
The Children's Hospital of Philadelphia, Philadelphia, PA

Workshop 21
Tuesday
2:45 - 4:00 pm

Purpose/Relevance: Severe retinal hemorrhage (RH), folds, and retinoschisis are highly suggestive of abusive head trauma (AHT) in young children. Ophthalmologists may testify about the significance of these findings, yet be faced with alternative hypotheses proposed by defense teams in court. Ophthalmologists should be familiar with strengths and limitations of their own expertise, relevant literature, and the process and challenges of giving court testimony.

Target Audience: Ophthalmologists who evaluate children for possible abuse and may be called to appear in court as witnesses.

Current Practice: Physicians may face aggressive challenges by attorneys, who have manufactured a false controversy over the diagnosis of AHT in the media and courtroom and offer outlier theories as causes of ocular findings. As cases move into the judicial system, ophthalmologists may be confused, frustrated and uncomfortable.

Best Practice: Ophthalmologists play an important role in protecting both children and caregivers by providing professional unbiased evidence-based court testimony.

Expected Outcomes: Participants will gain comfort in interpreting the diagnostic significance of RH patterns and testifying within the judicial system.

Format: Short didactics combined with a mock trial, where workshop presenters will act as prosecution and defense attorneys, expert witnesses, and judge. The audience will be jury and vote before and after the initial case presentation, and with variations of the case, which may affect the audience's verdict in interesting ways. Commentary and advice on testifying in court, as well as time for discussion, will be provided.

Summary: In court cases involving AHT, pediatric ophthalmologists may encounter questionable proposed alternative diagnoses, unsupported by peer-reviewed literature, and a manufactured controversy over the diagnosis of AHT. With both mini-lectures and a mock trial, we will emphasize key points for clinical practice and recreate the confrontational tone of the courtroom to better prepare the audience for testifying objectively and effectively.

References: 1. Levin A.V. Retinal hemorrhage in abusive head trauma. *Pediatrics* 2010;126(5):961-70. 2. Binenbaum G, Forbes BJ. The Eye in Child Abuse: Key Points on Retinal Hemorrhages and Abusive Head Trauma. *Pediatric Radiology* 2014. 44(Suppl 4): S571-7.

Lessons Learned about Cataract Surgery from the Infant Aphakia Treatment Study

Scott R. Lambert; Elias I. Traboulsi; David A. Plager; David Morrison;
Sharon Freedman; Erick Bothun; Carolyn Drews-Botsch
Stanford University, Stanford, CA

Workshop 22
Tuesday
2:45 - 4:00 pm

Purpose/Relevance: To share knowledge gained from the Infant Aphakia Treatment Study on the management of unilateral congenital cataracts.

Target Audience: Pediatric cataract surgeons.

Current Practice: The management of unilateral congenital cataracts is largely antidotal or based on small retrospective studies. Important unresolved issues include whether further testing should be performed, how to reduce the incidence of adverse events, what is best type of contact lens to wear in aphakic eyes, how can the risk of glaucoma be reduced, what is the optimal patching regimen to preserve binocularity, how can strabismus be avoided and how do they effect behavioral and motor development.

Best Practice: We have found that less than 5% of these children have systemic disease and the fellow eye rarely develops a cataract. Postoperative adverse events can be reduced by not implanting an intraocular lens. Rigid gas permeable contact lenses are less expensive, available in a wider range of powers and base curves and are easier to insert and remove than silicone contact lenses. The risk of glaucoma can be reduced by waiting until a child is 6 weeks of age to perform cataract surgery. Reduced patching after the first year of life is associated with improved binocularity without compromising visual acuity in the treated eye. Strabismus is less likely to develop if cataract surgery is performed between 4-6 weeks of age. Finally, children who have undergone unilateral cataract surgery should be evaluated for delayed motor development.

Expected Outcomes: Attendees will be provided the latest data from a randomized clinical trial to help them practice evidence based medicine.

Format: The presentations will consist of short didactic lectures, panel discussion and open questions from the audience. Attendees will be polled before and after the workshop.

Summary: The workshop will present the latest findings from the Infant Aphakia Treatment Study regarding the management of children with unilateral congenital cataracts.

References: 1. Lambert SR, Lynn MJ, Hartmann EE, DuBois L, Drews-Botsch C, Freedman SF, Plager DA, Buckley EG, and Wilson ME and the Infant Aphakia Treatment Study Group. Comparison of contact lens and intraocular lens correction of monocular aphakia during infancy. A randomized clinical trial of HOTV optotype acuity at age 4.5 years and clinical findings at age 5 years. *JAMA Ophthalmol* 2014;132:676-682. 2. Plager DA, Lynn MJ, Buckley EG, Wilson ME, Lambert SR. Complications in the first 5 years following cataract surgery in infants with and without IOL in the IATS. *Am J Ophthalmol* 2014;158:892-898 3. Freedman SF, Lynn MJ, Beck AD, Bothun ED, Orge FH, Lambert SR. Glaucoma-related adverse events in the first five years after unilateral cataract removal in the Infant Aphakia Treatment Study. *JAMA Ophthalmol* 2015;33:907-914.

Workshop 23

Tuesday

2:45 - 4:00 pm

Corneal Collagen Crosslinking in KidsPhoebe D. Lenhart; Erin D. Stahl; Asim Ali
Emory University School of Medicine, Atlanta, GA, USA

Purpose/Relevance: Corneal collagen crosslinking (CXL), recently FDA-approved, appears to be safe and effective for adult and pediatric patients, potentially obviating the need for corneal transplantation. There is a need to find ways of reliably testing children in high risk groups. Furthermore, current protocols for performing CXL in children need to be elucidated.

Target Audience: Pediatric Ophthalmologists, particularly those with interest in pediatric cornea

Current Practice: The workshop will begin with a summary of the current situation (what to do with pediatric patients suspected of having keratoconus?) and an overview of CXL. Indications for CXL will be reviewed, as it is a newer procedure with which pediatric ophthalmologists may be unfamiliar. Presently, it is also difficult to know what to do with children with keratoconus who would require general anesthesia in order to have CXL.

Best Practice: The panel will discuss potential ways to improve the management of children referred for evaluation of possible keratoconus. CXL will be the focus of this discussion. Recommendations for intraoperative and postoperative care will be made. Information about treatment under general anesthesia, essential for some pediatric patients requiring CXL and not always discussed in the literature, will be included. Questions from the audience will be encouraged.

Expected Outcomes: Our goal is to provide an opportunity for a group of pediatric cornea experts to engage in meaningful dialogue about and provide recommendations based on best current evidence for the management of pediatric keratoconus.

Format: Brief didactic presentations including audience quizzing/ polling followed by panel discussion and audience participation

Summary: Corneal collagen crosslinking may help some children avoid corneal transplantation, a procedure fraught with peril for this population. Learning to identify which children have keratoconus, progressive keratoconus, or who might benefit from this procedure is a topic of high importance for pediatric ophthalmologists. Panel members will highlight key aspects of the current situation, challenges, and recommendations. The audience will have an opportunity to discuss strategies for improving the management of pediatric keratoconus with panel members.

References: 1. Vinciguerra P, Albe E, Frueh BE, Trazza S, Epstein D. Two-year corneal cross-linking results in patients younger than 18 years with documented progression of keratoconus. *Am J Ophthalmol* 2012;154:520-526. 2. McAnena L, O'Keefe M. Corneal collagen crosslinking in children with keratoconus. *J AAPOS* 2015;19:228-232. 3. Godefrooij DA, Soeters N, Imhof SM, Wisse RPL. Corneal cross-linking for pediatric keratoconus: Long-Term Results. *Cornea* 2016;35:954-958.

Workshop 24

Tuesday

4:30 - 6:00 pm

A Wandering Eye: Peripatetic Adventures of an Ophthalmic Epidemiologist

Alfred Sommer, MD,MHS

Johns Hopkins Bloomberg School of Public Health and Wilmer Institute
Baltimore Md

Purpose/Relevance: To demonstrate a host of epidemiologic methods for asking and answering important research question

Target Audience: pediatric ophthalmologists, general ophthalmologists, researchers and others interested in formulating critical research questions and the epidemiologic methods for answering them

Current Practice: How to treat and prevent vitamin A deficiency in affected pediatric patients and whole populations

Best Practice: One simple and inexpensive approach is described: the use of oral, oil-miscible, vitamin A

Expected Outcomes: Yes. Some will be challenged to think outside the box

Format: Lecture followed by Q&A

Summary: My career has taken me around the globe countless times, caused me to live overseas for years, and conduct research in virtually dozens of countries. Each medical issue provided new challenges and research opportunities; the questions I posed, and the methods I employed, all seemed obvious. As were the answers - once we had them. Perhaps the most iconic was happening upon the most practical treatment for xerophthalmia in third world settings, and along the way, discovering our ability to prevent childhood blindness and death in nearly a million children every year. A global program, launched over two decades ago, helps to prevent vitamin A deficiency, and attendant childhood blindness and mortality, in well over 70 low and middle income countries around the world.

References: 1. Sommer A, West K.P.: Vitamin A Deficiency: health, survival and vision. Oxford University, 1996 2. Sommer, A: 10 Lessons in Public Health. Johns Hopkins University Press, 2013

Developing Contracts and Safety Nets for Retinopathy of Prematurity Care

Lisa Bohra, MD; Shira L. Robbins, MD; Robert Gold, MD;
Rebecca Sands-Braverman, MD; Denise Chamblee, MD; Michael Bartiss, OD, MD;
Robert Wiggins, MD

Children's Eye Care, P.C., West Bloomfield, MI

Workshop 25
Wednesday
2:00 - 3:15 pm

Purpose/Relevance: Retinopathy of prematurity (ROP) screening and treatment require a high level of specialized care, can involve a significant investment of time and travel to neonatal intensive care units, and incur a high amount of liability. As such, ophthalmologists involved in ROP care are increasingly looking to creation of contracts with hospitals to provide appropriate financial remuneration, adequate liability coverage, and strong safety nets to ensure improved patient care.

Target Audience: This workshop will benefit all AAPOS members interested in developing or revising contracts with hospitals for their retinopathy of prematurity services.

Current Practice: Currently, physicians are not always adequately reimbursed for their ROP services when compared to similar time investments in their clinical practices. In addition, they may not be sufficiently covered for the large claims historically associated with ROP litigation. Lastly, there may not be adequate protocols in place by both the physician's office and the hospital to ensure all babies are screened and followed appropriately.

Best Practice: Educating physicians regarding the basic elements of ROP contract development and negotiation will help them to make the provision of these services more medically, financially, and legally viable.

Expected Outcomes: Following this presentation, attendees will be better informed about the benefits of contracting for ROP services.

Format: This workshop will be presented via a panel discussion with open question and answer forum. In addition, there will be a brief presentation of the 2016 Benchmarking Survey results.

Summary: This workshop aims to educate physicians regarding the basics of contracting and safety issues for the rewarding yet risk laden disease of ROP. Information will be presented through panelists and an open question and answer forum. Results from the 2016 Benchmarking Survey will also be presented.

References: 1. Braverman, RS, Enzenauer RW. Socioeconomics of retinopathy of prematurity in-hospital care. Arch Ophthalmol. 2010 Aug;128(8):1055-8. 2. Braverman, RS, Enzenauer RW. Socioeconomics of prematurity care in the United States. Am Orthopt J. 2013;63:92-6. 3. Day S, Menke AM, Abbott RL. Retinopathy of prematurity malpractice claims: the Ophthalmic Mutual Insurance Company experience. Arch Ophthalmol. 2009 Jun;127(6):794-8.

Coding: A Day in the Life of the Pediatric Ophthalmologist 2017

Sue Vicchilli, COT, OCS; Michael J. Bartiss, OD, MD; Heather Dunn, COA;
Robert S. Gold, MD, FAAP
AAO, San Francisco, CA

Workshop 26
Wednesday
3:30 - 5:30 pm

Purpose/Relevance: Audit recoupments are not based upon unique cases. They are based on what pediatric ophthalmologists do every day. Section 1 of his intensive two hour course will begin with testing your coding competency with a rapid fire question and answer session. Section 2 will follow with real life case presentations and coding (CPT and ICD-10) options depending upon the payer. Section 3 will address the most common payer denials and how to rectify them. All sections designed to help pediatric ophthalmologists appropriately maximize reimbursement and bullet proof their documentation in any audit situation. Participants are encouraged to email coding questions to coding@aao.org. Please list AAPOS in the subject line.

Target Audience: Pediatric ophthalmologists, practice managers and billing personnel

Current Practice: Many pediatric ophthalmology encounters and interventions can become difficult to code correctly. Failure to do so results in delayed or denied payments for services provided.

Best Practice: Better understanding correct coding in pediatric ophthalmology will not only result in more timely reimbursement for services thus increasing cash flow, but better practice efficiency by spending less time processing (and re-processing) claims.

Expected Outcomes: Upon completion of this course the participant should be able to:

- Accurately answer questions on the fundamentals of pediatric coding
- Apply principles of chart documentation, testing services requirements, and surgical coding for all payers
- Identify and correct claim submission errors which are costly to the practice
- Know what to do when you receive a comparative billing reporting.
- MIPS reporting options for the pediatric ophthalmologist.

Format: Interactive format with case presentations, questions and answers

Summary: This presentation will review basic pediatric ophthalmology coding, review principles of proper documentation and surgical coding and identify common claim submission errors that result in delayed or denied payments from insurance carriers.

References: 1.. 2016 Ophthalmic Coding: Learn to Code Pediatrics and Strabismus; AAO 2. CD-10-CM for Ophthalmology: The Complete Reference; AAO 3. Ophthalmic Coding Coach; AAO

Workshop 27

Thursday

7:00 - 8:00 am

Heads Up! Concussion: Current Trends in Diagnosis and Management

Nancy M. Benegas, MD; Gary S. Solomon, PhD, FACP; Allan K. Sills, MD, ABPP-CN;
Jennifer V. Wethe, PhD; Jeffrey D. Schall, PhD
Vanderbilt Eye Institute, Nashville TN

Purpose/Relevance: Extraocular motility abnormalities have been described in association with concussion and traumatic brain injury (TBI). The King Devick test has been validated for use in various concussion protocols and incorporates assessment of eye movement abnormalities into concussion and TBI diagnosis. This multi-disciplinary workshop brings together international experts on King-Devick testing, NHL and NFL concussion protocols, anatomical injury from concussion and discusses return to function following a TBI.

Target Audience: AAPOS membership: pediatric ophthalmologists and orthoptists

Current Practice: Many pediatric ophthalmologists have limited knowledge of how concussions are diagnosed, particularly by non-medical providers on the sidelines of youth sporting events.

Best Practice: Understand the role of the King-Devick test in concussion diagnosis, learn about concussion diagnosis and management from youth sports to professional football and hockey. Increase our knowledge base as a subspecialty concerning this important topic with overlaps to our field.

Expected Outcomes: Improved knowledge and understanding of concussion diagnosis, management, and public health implications of concussion. Increase our knowledge and awareness of our role when patients present in our clinics with concussion diagnosis.

Format: Primary author will moderate panel. Each expert will present a didactic lecture, with a Q&A session at the end.

Summary: Use of the King-Devick Test to aid in diagnosing concussion will be presented with discussion of validated data. NFL and NHL concussion protocols will be discussed by a consultant for both leagues. The anatomical injuries and repercussions will be discussed by a neurosurgeon with an emphasis on concussion.

References: 1. Ocular motor assessment in concussion: Current status and future directions. Ventura RE, Balcer LJ, Galetta SL, Rucker JC. *J Neurol Sci.* 2016 Feb 15;361:79-86. doi: 10.1016/j.jns.2015.12.010. Epub 2015 Dec 9. Review. 2. Militana A, Donahue M, Strother M, Sills A, Solomon G, Morgan V: Increased cerebrovascular reactivity in the days following sports-related concussion in college athletes. *ASNR Meeting, Montreal, Quebec, June 2014.* 73. 3. Zuckerman S, Sills AK, Solomon G: Risk factors for post-concussion syndrome in an exclusively sport-related concussion group: Case control study. *CNS Annual Meeting, Boston, MA* 4. Love, S.M., & Solomon, G.S. (2014). Talking with parents of high school football players about Chronic Traumatic Encephalopathy (CTE): A concise summary. *American Journal of Sports Medicine*, in press. 5. Sills AK, Gregory A, Solomon G. "Sports Concussion Update." *Primary Care Clinics in Sports Medicine*, 2012.

Video Demonstrations of Signs, Diseases, and Complex Surgical Procedures in Pediatric Ophthalmology and Strabismus

Sharon F. Freedman, MD; Erick D. Bothun, MD; Mays El-Dairi, MD;
Sonal Farzavandi, MD; Maria Rosario Gomez de Liano, MD; David G. Morrison, MD
Department of Ophthalmology, Duke University Medical Center
Durham, NC, USA

Purpose/Relevance: Video demonstration of unusual and complex signs, diseases, and surgical procedures in pediatric ophthalmology and strabismus

Target Audience: Pediatric Ophthalmologists and Strabismologists, Orthoptists, and Ophthalmologists in training.

Current Practice: Video offers the opportunity to demonstrate signs and complex surgical procedures that are difficult to describe fully in text or with still photographs or diagrams. Some rare conditions and certain surgical approaches are seldom seen outside tertiary referral centers, but are of great interest to all who care for children and those with strabismus.

Best Practice: This workshop allows the attendees to view videos of rare signs and surgical procedures, presented and explained by the ophthalmologist who recorded them first-hand, with discussion by an expert panel and the audience. explanation by the ophthalmologist who recorded it and a discussion with the panelist and the audience.

Expected Outcomes: This workshop is intended to increase the attendee's level of familiarity with, and confidence in examining, diagnosing, and planning treatment for these unusual clinical scenarios.

Format: Six experienced pediatric ophthalmologists and strabismologists will present and discuss videos of signs, diseases, and surgical procedures. Panelists will discuss the differential diagnosis and potential treatment options. Audience participation is encouraged.

Summary: This workshop will feature high quality video presentations as the primary medium for demonstration of classical or rare signs, diseases, and surgical procedures encountered in the practice of pediatric ophthalmology and adult strabismus. The chosen panelists will share cases unknown to the other panelists, and spanning a broad range of conditions and situations. The presenter for each case will be the expert, while the panelists (and audience) will provide interactive and widely representative views concerning the presented case, including those where alternative strategies may be offered.

Workshop 28

Thursday

8:25 - 9:25 am

Difficult Non-Strabismus Problems in Pediatric Ophthalmology

Elias I. Traboulsi, MD, MEd; Sharon Freedman, MD; Fatema Ghasia, MD;
Arif O. Khan, MD; Virginia M. Utz, MD
Cole Eye Institute, Cleveland Clinic
Cleveland, Ohio, USA

Workshop 29
Thursday
9:35 - 10:35 am

Purpose/Relevance: Sharing the difficulties in making the diagnosis and managing rare and atypical cases allows practitioners to benefit from each other's experience and to discuss alternative evaluation and treatment plans. The presentation of several such cases to a broad audience of interested individuals allows the appropriate distribution of such teaching cases.

Target Audience: Pediatric ophthalmologists, orthoptists, vision scientists and trainees

Current Practice: While many pediatric ophthalmologists elect to manage difficult cases, others refer such cases to other pediatric ophthalmologists or subspecialists with advanced or more extensive experience in the particular area of disease or management that the patient needs.

Best Practice: While many difficult diagnostic cases can be addressed via telephone or email communications between the primary treating physician and the expert, others need to visit one or more subspecialists before a final diagnosis is reached and a treatment plan is firmly established. Group presentation of cases in some instances is necessary with the participation of several advanced practitioners, sometimes from specialities outside of ophthalmology.

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 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: Case-based learning experience involving 5 challenging pediatric ophthalmology non-strabismus cases.

Difficult Problems Strabismus

Linda R. Dagi, MD; Ramesh Kekunnaya, MD, FRCS; Lionel Kowal, MD;
Andrea Molinari, MD; Yair Morad, MD; Stacy L. Pineles, MD
Boston Children's Hospital, L V Prasad Eye Institute, Royal Victorian Eye and Ear
Clinic and Univeristy of Melbourne, Hospital Metropolitano of Quito,
Assaf Harofeh Medical Center, and Jules Stein Eye Institute
Boston, Hyderabad, Melbourne, Quito, Tel Aviv, and Los Angeles

Workshop 30
Thursday
10:45 - 11:45 am

Purpose/Relevance: Evaluation and successful remediation of complex strabismus poses diagnostic and therapeutic challenges even for the experienced surgeon. Repair of strabismus secondary to cranial nerve palsy, orbital trauma and deformity, or after multiple prior strabismus or other ophthalmic procedures is particularly problematic. This workshop will address difficult cases like these to fill a potential knowledge gap for the practicing ophthalmologist.

Target Audience: Pediatric ophthalmologists, adult strabismus specialists, ophthalmic residents, fellows and orthoptists

Current Practice: Practitioners utilize strategies and surgical techniques taught in fellowship or addressed at professional meetings, on the list serve, in journals and as a result of peer-to-peer discussion.

Best Practice: Enhancing all of the above with the opportunity to discuss treatment options for particularly challenging cases presented by experienced strabismologists.

Expected Outcomes: As a result of exposure to debate and discussion regarding approaches to six challenging cases, attendees will be introduced to novel strategies and techniques to remedy at least six complex strabismus disorders. Exposure is designed to enhance future practice by enabling participants to apply these concepts.

Format: The workshop will consist of expert panel discussion following presentation of a series of individual cases. Audience questions and participation will be encouraged, time permitting. The result of one expert's surgical intervention will be presented along with a discussion of the pearls and pitfalls of the intervention chosen.

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. The results of surgery performed to address the strabismus will be shared and advantages and drawbacks to this choice addressed.

References: Strabismus Surgery, Basic and Advanced Strategies. Ophthalmology Monographs 17, The American Academy of Ophthalmology, Oxford University Press, 2004

Notes

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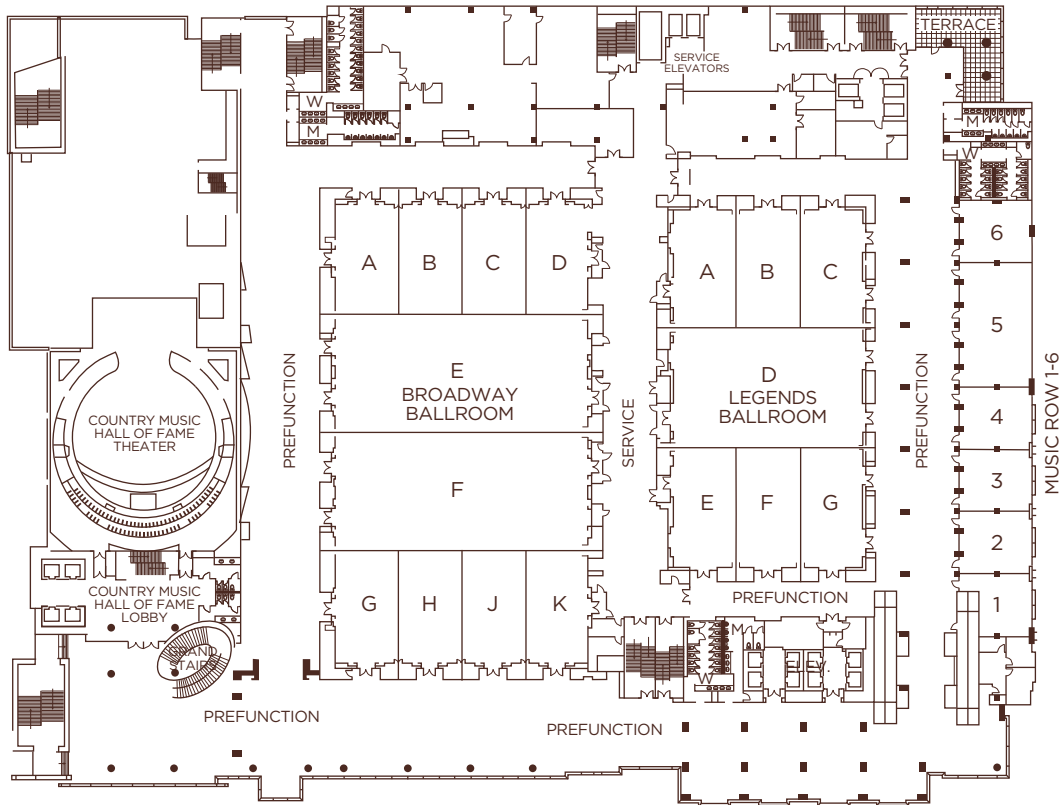
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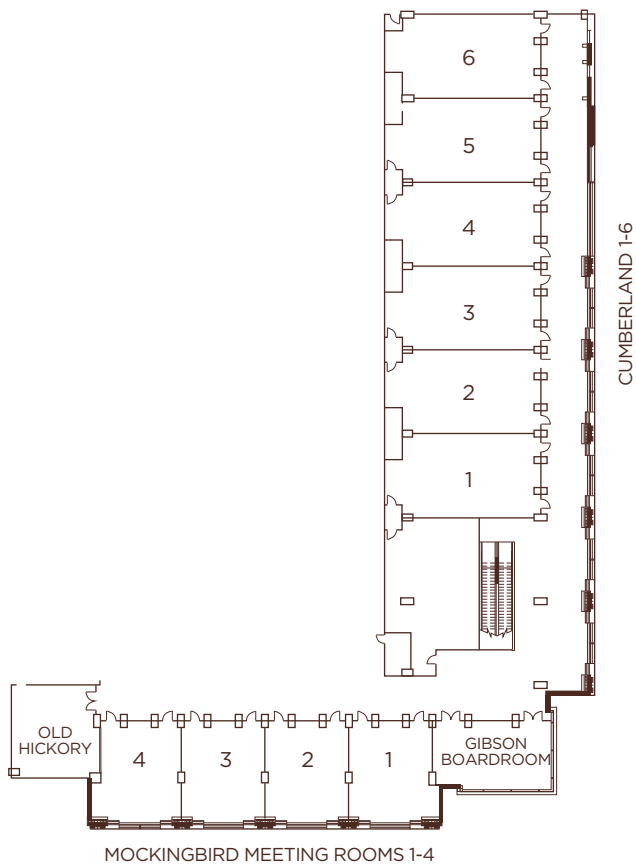
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Omni Nashville Hotel Floor Plan

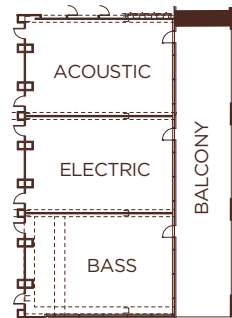
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