The American Ophthalmological Society

ONE HUNDRED AND FIFTY-EIGHTH ANNUAL MEETING

Anne L. Coleman ..... **PRESIDENT**
Hans E. Grossniklaus ..... **EXECUTIVE VICE PRESIDENT**
Hans E. Grossniklaus ..... **EDITOR OF THE TRANSACTIONS**

COUNCIL

Julia A. Haller
William F. Mieler
Preston H. Blomquist
Stephen D. McLeod
David K. Wallace

MAY 19–21, 2022
THE BROADMOOR
COLORADO SPRINGS, COLORADO

The American Ophthalmological Society

Office of the Executive Vice President
Atlanta, GA
May 2022

THE ONE HUNDRED AND FIFTY-EIGHTH ANNUAL MEETING
of the Society will be held at The Broadmoor in Colorado Springs, Colorado

Thursday through Saturday
May 19–21, 2022

COMMITTEE ON PROGRAMS

Peter A. Netland, Chair
Sean P. Donahue
Jennifer I. Lim
Carol L. Karp

The American Ophthalmological Society

THE ONE HUNDRED AND FIFTY-EIGHTH ANNUAL MEETING

TABLE OF CONTENTS

General Information 4

Financial Disclosures 7

Spouse/Personal Guest Schedule 9

Meeting Schedule 10

Friday Symposium & Knapp Symposium Schedule 12

Saturday Symposium Schedule 13

Paper Abstracts 15

- Thursday 16
- Friday 23
- Saturday 30

Poster Abstracts 37

Claim CME Online ..... inside back cover

Future Annual Meetings ..... inside back cover

TARGET AUDIENCE

This activity has been designed to meet the educational needs of ophthalmologists across all subspecialties involved in clinical or surgical eye care, academic, and leadership who are actively involved in or previously cared for patients.

MEETING OBJECTIVES

The objectives of the 2022 Annual Meeting are to:

1. Apply genetic testing strategies to evaluation of patients with retinal, glaucoma, and other ophthalmic diseases.
2. Explain and assess the application of artificial intelligence to the improvement of the clinical practice of ophthalmology, regulatory agencies, and, more broadly, in society.
3. Describe examples of genetic-based strategies for treatment of specific ophthalmic diseases.
4. Recognize and describe new information about diagnosis and treatment of various categories of ophthalmic diseases, including pediatrics, cornea, glaucoma, and retina.
5. Assess the impact of new research in the evaluation and management of ophthalmic disease.
6. Identify current priorities of National Eye Institute (NEI).

ACCREDITATION STATMENT

In support of improving patient care, this activity has been planned and implemented by Medical Education Resources (MER) and American Ophthalmological Society. MER is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

PHYSICIAN CREDIT DESIGNATION STATEMENT

Medical Education Resources designates this live activity for a maximum of 14.0 *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

FINANCIAL DISCLOSURE / CONFLICTS OF INTEREST

It is the policy of Medical Education Resources to ensure balance, independence, objectivity, and scientific rigor in all of its educational activities. In accordance with this policy, MER

identifies conflicts of interest with its instructors, content managers, and other individuals who are in a position to control the content of an activity. Conflicts are resolved by MER to ensure that all scientific research referred to, reported, or used in a continuing education activity conforms to the generally accepted standards of experimental design, data collection, and analysis.

Relevant financial disclosures of all presenting authors, staff, and members of the Committee on Programs are listed on pages 7–8 in the program book. If the presenter has a financial disclosure related to the specific presentation, the disclosure will be stated verbally and presented on the first slide of their presentation. Audience participants are required to state their financial disclosure before they join a discussion of a paper or poster.

FDA STATUS DISCLAIMER

Some material on recent developments may include information on drug or device applications that are not considered community standard, that reflect indications not included in approved FDA labeling, or that are approved for use only in restricted research settings. This information is provided as education only so physicians may be aware of alternative methods of the practice of medicine, and should not be considered endorsement, promotion, or in any way encouragement to use such applications. The FDA has stated that it is the responsibility of the physician to determine the FDA status of each drug or device he or she wishes to use in clinical practice, and to use these products with appropriate patient consent and in compliance with applicable laws.

The Society provides the opportunity for material to be presented for educational purposes only. The material represents the approach, ideas, statement, or opinion of the presenter and/or author(s), not necessarily the only or best methods or procedure in every case, nor the position of the Society. The material is not intended to replace the physician's own judgment or give specific advice for case management. The Society specifically disclaims any and all liability for injury or other damages of any kind for any and all claims that may arise out of the use of any technique demonstrated or described in any material by any presenter and/or author(s), whether such claims are asserted by a physician or any other person.

PARTICIPATION AND CONSENT TO BE RECORDED

The entire 2022 Annual Meeting will be recorded for subsequent posting on the Society's website, including discussion. Submitting questions to discuss a presentation is considered implicit consent to the participant's discussion being included in this recording. Attendees who do not wish to be recorded should refrain from submitting questions.

BYLAWS

The following Bylaws are published each year in the program as a reminder to the members of the Society:

ARTICLE IX, Section 3 – Any member who shall be absent from meetings for three consecutive years without acceptable excuse shall be dropped from the roll, except for Honorary Members, Emeritus Members, Members of twenty years standing or those then serving in the armed forces. An excuse for absence is acceptable only when a member is ill, or when there is illness of a member of his or her immediate family and may not be considered approved until received in written form and acted upon by the Council. The Council shall have the authority to approve other excuses only upon a finding of exceptional circumstances. This Bylaw shall be printed in every call for the Annual Meeting.

CANDIDATES WHOSE THESES WERE APPROVED AFTER THE 2021 ANNUAL MEETING:

Audina Berrocal	Miami, FL
William Foster	Montreal, QC, Canada
Steven Gedde	Miami, FL
Jeffrey Goldberg	Palo Alto, CA
Ula Jurkunas	Boston, MA
Robert Rosa	Chicago, IL
Arun Singh	Cleveland, OH
Lucia Sobrin	Boston, MA
Ingrid Scott	Hershey, PA
Gregory Skuta	Oklahoma City, OK
Russell Van Gelder	Seattle, WA
Deborah VanderVeen	Boston, MA
Robert Weisenthal	East Syracuse, NY

IN MEMORIAM

The Executive Vice President has received notice of the deaths of the following members during the past year:

Taylor Asbury, MD	Cincinnati, OH	Joined in 1966
Jules L. Baum, MD	Bethesda, MD	Joined in 1982
Alan M. Laties, MD	N. Fort Myers, FL	Joined in 1974
Marilyn T. Miller, MD	Chicago, IL	Joined in 1991
Alan B. Scott, MD	Mill Valley, CA	Joined in 1981
Stanley M. Truhlsen, MD	Omaha, NE	Joined in 1965
Thomas O. Wood, MD	Memphis, TN	Joined in 1984

FINANCIAL DISCLOSURES

The following are the relevant healthcare-related financial disclosures of those involved in the preparation or presentation of this AOS event. The AOS Committee on Programs gathered this information to plan the program and has attempted to manage relevant conflicts of interest to present a balanced program. The presenter will indicate on the first slide and verbally at the beginning of the talk, if any of the financial disclosures listed has a relationship to the specific presentation. Participants that might speak from the floor are required to state their financial disclosures before they speak.

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

DONAHUE*, Sean
P – Vanderbilt University

DUPPS, William
C – Alcon

FREITAG, Suzanne
C – Horizon, Viridian, VasaraGen
O – VasaraGen

GELFAND, Bradley
O – DiceRX
P – University of Virginia
S – BrightFocus Foundation, NEI/NIH, Owens Family Foundation

HALLER, Julia
C – Aura Biosciences, Regeneron, Seeing Medicine
O – Eyenovia, Lowy Medical Research Institute, Opthea

HARBOUR, J. William
C – Castle Biosciences, Immunocore
P – Castle Biosciences

HARTNETT, M. Elizabeth
S – NEI/NIH

HUANG, David
P – Optovue
S – Optovue

JONAS, Jost
P – European patent EP 3 271 392, JP 2021-119187, and US 2021 0340237 A1: "Agents for use in the therapeutic or prophylactic treatment of myopia or hyperopia"

KANG-MIELER, Jennifer
P – Biodegradable microsphere-hydrogel ocular drug delivery system (Patent No 10,980,882), Biodegradable extended release microsphere-hydrogel ocular drug delivery system and method (Patent No 11,266,608), Biodegradable extended release microsphere-hydrogel ocular drug delivery system and method (CIP-pending)

KEANE, Pearse
C – Apellis, DeepMind, Novartis, Roche
L – Allergan, Bayer, Topcon
O – Big Picture Medical

KRUEGER, Ronald
C – Alcon, Glaukos
G – Bausch Health

LEVIN, Alex
C – Exicure, Neurogene, REGENXBIO, Taysha

LIM*, Jennifer
C – Aura Biosciences, Cognition, Eyenuk, Genentech, Novartis, Ophthea, Quark, Santen, Unity Biotech, Viridian
S – Aldeyra, Chengdu, Graybug, Genentech, NGM, Regeneron, Stealth

LIND, John
S – Allergan, Nicox

OLSEN, Timothy
S – Novartis

PENG, Lily
E – Google

ROCHA, Karolinne
C – Alcon, Allergan, Bausch + Lomb, Carl Zeiss Meditec, Johnson and Johnson Vision

ROSEN, Richard
C – Optovue

SCHMIDT-ERFURTH, Ursula
S – Appellis Pharmaceuticals

SCHUMAN, Joel
C – Carl Zeiss Meditec, Opticient
S – NIH

SEBAG, J.
C – Alcon

SEDDON, Johanna
O – Appellis Pharmaceuticals, Gemini Therapeutics

SPAETH, George
P – Spaeth Richman Contrast Sensitivity Test

WARING, George
C – Johnson and Johnson Vision

WLADIS, Edward
C – Horizon Therapeutics, Kriya Therapeutics

NO RELEVANT FINANCIAL RELATIONSHIPS TO DISCLOSE

AL-KHERSAN, Hasenin
ALBERT, Daniel
AREVALO, J. Fernando
AZAR, Dimitri
BROWN, Gary
CHAN, Robison
CHAWLA, Harshvardhan
CHEW, Emily
CHIANG, Michael
COLEMAN-BELIN, Janet
ESMAELI, Bita
EVANS, Alissa
FINGERT, John
FULLERTON, Holly
GHASIA, Fatema
GOLDBERG, Jeffrey
GREGORY-EVANS, Cheryl
GROSSNIKLAUS, Hans
JAMPOL, Lee
KARP*, Carol
KEMPEN, John
KITAYAMA, Ken
KOKAME, Gregg
LAUTER, Kristin
LEFFLER, Christopher
MENDEZ, Amber
MILLER, Joseph
MILMAN, Tatyana
NETLAND*, Peter
NEWMAN, Steven
ROBIN, Alan
SAHEL, José-Alain
SETABUTR, Pete
SMALL, Kent
SPAIDE, Richard
STEIN, Joshua
STONE, Edwin
STOUT, J. Timothy
SUH, Donny
SYED, Zeba
TAO, Jeremiah
TSENG, Victoria
VAN GELDER, Russell
WALLACE, David
WANG, Catherine
WEISS, Jayne
WIGGS, Janey
WILSON, David
WILSON, M. Edward
YU, Angeli Christy

**Members of the Committee on Programs*

Spouse/Personal Guest Schedule

THURSDAY, MAY 19		
12:00–5:00 PM	Registration	*Rocky Mountain Foyer*
1:30–3:00 PM	New Member Spotlight Presentations	*Rocky Mountain Ballroom*
6:30–8:30 PM	Reception Welcoming New Members *formal	*Mountain View Terrace*
FRIDAY, MAY 20		
6:30 AM–1:30 PM	Registration	*Rocky Mountain Foyer*
7:00–11:00 AM	Spouse / Guest Hospitality Lounge *Breakfast available from 8:00–9:30 AM	*West Ballroom A & B*
11:00 AM–12:00 PM	The Broadmoor Art & History Tour *advanced sign-up required	*West Lobby*
12:30–1:30 PM	Lunch Session *advanced sign-up required	*Rocky Mountain Ballroom*
12:30–5:00 PM	Golf Tournament *advanced registration required	*Broadmoor West Course*
2:00–4:00 PM	Pickleball Tournament *advanced registration required	*Broadmoor Pickleball Courts*
5:45–8:00 PM	8th Annual Artistic Soiree & Reception *business casual	*West Ballroom*
SATURDAY, MAY 21		
6:00 AM–1:00 PM	Registration	*Rocky Mountain Foyer*
7:00–11:00 AM	Spouse / Guest Hospitality Lounge *Breakfast available from 8:00–9:30 AM	*West Ballroom A & B*
9:30–10:30 AM	Spouse Lecture *Visioning Art - Connecting with Disturbed Minds	*West Ballroom A & B*
12:30–2:00 PM	Emeritus Luncheon *by invitation	*Donald Ross Room*
1:30–4:00 PM	Tennis Tournament *advanced registration required	*Broadmoor Tennis Courts*
1:00–6:00 PM	Fly Fishing *advanced registration required	*West Lobby*
4:00–5:00 PM	Women's Leadership Afternoon Tea *male guests welcome!	*Lake Terrace Dining Room*
6:00–6:45 PM	Closing Reception	*Mountain View Terrace*
7:00–9:00 PM	Gala Banquet *formal	*Rocky Mountain Ballroom*

American Ophthalmological Society
Meeting Schedule

THURSDAY, MAY 19		
12:00–5:00 PM	Registration	*Rocky Mountain Foyer*
12:00–1:00 PM	New Member Luncheon (by invitation)	*Mountain View Terrace*
1:30–3:00 PM	New Member Spotlight Presentations	*Rocky Mountain Ballroom*
3:00–5:00 PM	Scientific Program - Paper Session I	*Rocky Mountain Ballroom*
6:30–8:30 PM	Reception Welcoming New Members (formal/black tie optional)	*Mountain View Terrace*
FRIDAY, MAY 20		
6:30 AM–1:30 PM	Registration	*Rocky Mountain Foyer*
6:30–8:00 AM	Breakfast	*Rocky Mountain Foyer*
7:30–8:00 AM	Miller Lecture - NEI: Past, Present, and Future	*Rocky Mountain Ballroom*
8:00–10:00 AM	Knapp Symposium - The New Normal of Genetics in Ophthalmology	*Rocky Mountain Ballroom*
10:00–10:30 AM	Guided Poster Session I/Coffee Break	*Rocky Mountain Foyer*
10:30 AM–12:30 PM	Scientific Program - Paper Session II	*Rocky Mountain Ballroom*
12:30–1:30 PM	Lunch Session - The 1918 Flu Pandemic, 2020 COVID Pandemic and the AOS	*Rocky Mountain Ballroom*
12:30–5:00 PM	Golf Tournament	*Broadmoor West Course*
2:00–4:00 PM	Pickleball Tournament	*Broadmoor Pickleball Courts*
5:45–8:00 PM	8th Annual Artistic Soirée & Reception (business casual)	*West Ballroom*

American Ophthalmological Society
Meeting Schedule

SATURDAY, MAY 21		
6:00 AM–1:00 PM	Registration	*Rocky Mountain Foyer*
6:00–7:30 AM	Breakfast	*Rocky Mountain Foyer*
6:30–7:15 AM	Executive Session (members only)	*Rocky Mountain Ballroom*
7:30–8:00 AM	Verhoeff Lecture - From Academia to Social Media: My Journey into Artificial Intelligence and Machine Learning	*Rocky Mountain Ballroom*
8:00–10:00 AM	Saturday Symposium	*Rocky Mountain Ballroom*
10:00–10:30 AM	Guided Poster Session II/Coffee Break	*Rocky Mountain Foyer*
10:30 AM–12:30 PM	Scientific Program - Paper Session III	*Rocky Mountain Ballroom*
12:30–2:00 PM	Emeritus Luncheon (by invitation)	*Donald Ross Room*
1:30–4:00 PM	Tennis Tournament	*Broadmoor Tennis Courts*
1:00–6:00 PM	Fly Fishing	*West Lobby*
4:00–5:00 PM	Women's Leadership Afternoon Tea (male colleagues welcome!)	*Lake Terrace Dining Room*
6:00–6:45 PM	Closing Reception	*Mountain view Terrace*
7:00–9:00 PM	Gala Banquet (formal/black tie optional)	*Rocky Mountain Ballroom*

FRIDAY, MAY 20, 2022

Marilyn T. Miller Lecture

NEI: PAST, PRESENT, AND FUTURE

Michael F. Chiang, MD, MA
Director, National Eye Institute
Bethesda, MD

Herman Knapp Symposium

THE NEW NORMAL OF GENETICS IN OPHTHALMOLOGY

GENE THERAPY
Edwin M. Stone, MD, PhD
Seamans-Hauser Chair in Molecular Ophthalmology · Professor of Ophthalmology and Visual Sciences
Carver College of Medicine, University of Iowa · Iowa City, Iowa

GENE-BASED APPROACHES TO AMD
Bradley D. Gelfand, PhD
Associate Professor of Ophthalmology and Biomedical Engineering
University of Virginia School of Medicine · Charlottesville, Virginia

GENE-DIRECTED THERAPY
John H. Fingert, MD, PhD, FARVO
Hadley-Carver Chair in Glaucoma and Director of Glaucoma Service
Professor, Department of Ophthalmology and Visual Sciences
Carver College of Medicine, University of Iowa · Iowa City, Iowa

GENETICS IN GLAUCOMA
Janey L. Wiggs, MD, PhD
Paul Austin Chandler Professor of Ophthalmology · Vice Chair for Clinical Research in Ophthalmology
Harvard Medical School, Massachusetts Eye and Ear Infirmary · Boston, Massachusetts

EPIGENETIC THERAPY
Cheryl Y. Gregory-Evans, PhD
Professor, Department of Ophthalmology and Visual Sciences
University of British Columbia · Vancouver, British Columbia

GENE-BASED PROGNOSIS AND BEYOND IN OCULAR ONCOLOGY
J. William Harbour, MD
Professor and Chair of Ophthalmology · The David Bruton, Jr. Chair in Ophthalmology
University of Texas Southwestern Medical Center · Dallas, Texas

SATURDAY, MAY 21

Frederick H. Verhoeff Lecture

FROM ACADEMIA TO SOCIAL MEDIA: MY JOURNEY INTO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Kristin E. Lauter, PhD
West Coast Head of Research Science, Facebook AI Research
Seattle, WA

Saturday Symposium

CODE TO CLINIC: AN INSIDERS' UPDATE ON THE PROMISE & CHALLENGE OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

BUILDING & TRANSLATING AI FOR HEALTHCARE

Lily Peng, MD, PhD
Director, Product Management, Google Health
San Francisco, CA

REIMAGINED REGULATORY PARADIGM FOR HIGH-QUALITY DIGITAL HEALTH INNOVATION

Malvina B. Eydelman, MD
Director, Office of Health Technology, FDA
Silver Spring, MD

AUTONOMOUS GLAUCOMA DETECTION – NEWS FROM THE COLLABORATIVE COMMUNITY FOR OPHTHALMIC IMAGING

Joel S. Schuman, MD, FACS
Elaine Langone Professor, NYU Grossman School of Medicine
New York, NY

THE MOORFIELDS-GOOGLE DEEPMIND COLLABORATION - GOING FROM CODE TO CLINIC

Pearse A. Keane MD, FRCOphth
Consultant Ophthalmologist, Moorfields Eye Hospital NHS Foundation Trust
Professor of Artificial Medical Intelligence, University College London
London, England

AOS 2022

Paper Abstracts

The following abstracts of papers selected to be presented at the meeting are printed in presentation order. The order of presentations has been arranged as follows by the Committee on Programs.

Papers presented at this meeting may be published in other medical journals after this meeting PROVIDED THE AUTHORS ADHERE TO THE STRICT GUIDELINES IN THE AUTHOR INSTRUCTIONS LISTED AT aosonline.org AND CONSULT WITH THE EDITOR OF THE TRANSACTIONS.

Papers are limited to 6 minutes and the first discussant to 3 minutes.
General discussion will be limited to 7 minutes.

Please note the following program key:

Bold = *AOS Member*
* = *Presenter*
♦ = *Financial Disclosure*

(Presenters will indicate their financial disclosure verbally and in the first slide.)

PA-01 3:00–3:16 PM

IMPROVED OCULAR SURVIVAL AND VISUAL FUNCTION USING NEO-ADJUVANT IMMUNOTHERAPY AND TARGETED BIOLOGIC THERAPY IN PATIENTS WITH LOCALLY ADVANCED PERIOCULAR CANCER

Bita Esmaeli*, Jiawae Zhao, Jeremy Goldfarb

Purpose: Ocular adnexal malignancies account for a significant proportion of cancers in ophthalmic oncology. Surgery remains the mainstay treatment; however, newer medical treatments such as immunotherapy and targeted biologic drugs have been a welcome addition and have significantly decreased the need for orbital exenteration and have overall decreased ocular morbidity in patients with periocular cancers.

Methods: Retrospective review of patients at one center was carried out. Eligibility criteria included a designation of "T4" per AJCC 8th edition criteria for periocular carcinomas, which essentially means eyelid or periocular lesions with orbital invasion or conjunctival melanoma cases in whom orbital exenteration was the only remaining surgical alternative to achieve local control. All patients were treated with either targeted therapy or immunotherapy prior to definitive surgery. For patients with BCC, vismodegib was uses. For patients with SCC or conjunctival melanoma an anti-PD1 immunotherapy was used.

Results: 28 patients with locally advanced (T4) basal cell carcinoma (BCC), 8 patients with locally advanced conjunctival melanoma (at least T3 per AJCC for conjunctival melanoma), and 10 patients with locally advanced periocular squamous carcinoma (SCC) with orbital invasion (T4) were included. In all but one patient with basal cell carcinoma there was measureable response to the neoadjuvant systemic drug therapy. In all cases an orbital exenteration was avoided and eye sparing surgery was achieved. Representative cases and response rates (partial vs. complete) and types of eye sparing surgery needed for each case will be shared through photos. Follow up time ranged from 6 months to 8 years; median: 38 months). During the follow up period there have been no cases of local recurrence.

Conclusion: Targeted biologic therapy and immunotherapy are relatively new and effective treatment options to consider in the neo-adjuvant setting for patients with locally advanced periocular BCC, SCC, and conjunctival melanoma with the overall goal to avoid orbital exenteration and achieve cancer control while maintaining visual function.

Discussant: **Suzanne K. Freitag**

PA-02 3:17–3:33 PM

COST-EFFECTIVENESS OF ARTIFICIAL INTELLIGENCE SYSTEMS VERSUS SPECIALIST REFERRAL FOR DIABETIC RETINOPATHY SCREENING: THE IMPACT OF ANTI-VEGF THERAPY SELECTION

Harshvardhan Chawla*, Joshua H. Uhr, Jonathan S. Williams, Maria A. Reinoso, **Jayne S. Weiss**

Purpose: Artificial intelligence-based fully automated retinal image screening (FARIS) has emerged as an alternative for high-volume diabetic retinopathy (DR) screening. However, little is known about the tradeoff between decreased up-front screening costs and the potential drawbacks of increased costs (from unnecessary referrals) and visual morbidity (from missed diagnoses). The objective of this economic modeling study was to compare the cost-effectiveness of FARIS versus traditional screening for DR in the United States. The secondary objective was to examine how anti-vascular endothelial growth factor (VEGF) drug choice for diabetic macular edema (DME) influences the cost-effectiveness of FARIS.

Methods: A Markov transition-state model was used to simulate the event pathways for FARIS versus traditional screening and subsequent management in newly diagnosed diabetics. Costs (2021 United States dollars), quality-adjusted life year (QALY) gains, and incremental cost-effectiveness ratio (ICER) were quantified at five, ten, and twenty years. Bevacizumab 1.25 mg was the base case anti-VEGF agent for DME, with sub-analyses substituting Ranibizumab 0.3 mg and Aflibercept 2 mg. Inputs were derived from national epidemiologic data and the Diabetic Retinopathy Clinical Research Network Protocol T. Model assumptions were tested with deterministic and probabilistic sensitivity analysis against a $50,000/QALY willingness-to-pay threshold, representing the healthcare payer perspective.

Results: FARIS demonstrated cost savings of 6.6% to 18.8%, which varied by the specific anti-VEGF agent used for DME treatment. Net QALY gains were identical to those of traditional screening in all drug-stratified analyses. Cost-effectiveness was dependent on FARIS detection specificity, with threshold values ranging from 54.8% to 57.5%.

Conclusion: Systems-level FARIS implementation was associated with potential savings of $1.6 (five years) to $13.2 billion (twenty years). Artificial intelligence-powered retinal image analysis represents an economically advantageous DR screening modality, offering equivalent utility with significant potential cost-savings based on current anti-VEGF drug utilization trends.

Discussant: **Richard B. Rosen**

PA-03 3:34–3:50 PM

CORRELATIONS BETWEEN ANNUAL CHANGES IN CLINICAL VERSUS FUNCTIONAL AND QUALITY OF LIFE MEASURES IN PATIENTS WITH MODERATE-STAGE GLAUCOMA

George L. Spaeth*♦, Eric Shiuey, Benjamin E. Leiby, Sheryl S. Wizov, Carina Sanvincente, Michael Waisbourd

Purpose: To investigate correlations between clinical visual measurements, vision-related performance (VRP), and vision-related quality of life (VRQoL) in patients with moderate-stage glaucoma.

Methods: Prospective, longitudinal, observational cohort study. Patients (N=161) with moderate-stage glaucoma (Disc Damage Likelihood Scale stages 5-8) were recruited at Wills Eye Hospital and followed-up for 4 annual visits. Subjects received a complete ocular exam, automated visual field (VF) test, and spectral domain optical coherence tomographic (SD-OCT) scan. Contrast sensitivity was measured using the Pelli-Robson (PRCS) and Spaeth-Richman Contrast Sensitivity (SPARCS) tests. VRP was assessed with the Compressed Assessment of Ability Related to Vision (CAARV). VRQoL was assessed using the National Eye Institute Visual Function Questionnaire 25 (VFQ-25) and a modified Glaucoma Symptom Scale (GSS). Mixed effects models estimated the rate of change of each variable over time per subject and correlation coefficients were calculated with p-values adjusted to control the false discovery rate.

Results: Annual changes in better (by baseline mean deviation [MD]) eye SPARCS scores, PRCS, and bilateral visual acuity (VA) correlated moderately with total CAARV score changes (r=0.3-0.59). SPARCS lower quadrant scores correlated strongly with the motion detection subscale (both r=0.62). Change in better eye PRCS correlated moderately with total CAARV (r=0.53) and the motion detection subscale (r=0.54). Better eye MD correlated weakly with total VFQ-25 score and most subscales (r=0.19-0.37). Better eye MD and SPARCS scores correlated weakly with GSS FUNC-4 subscale changes (r=0.21-0.31, all p<.05), but retinal nerve fiber layer thickness (RNFLT) and worse eye clinical measure changes did not correlate strongly with VRP or VRQoL.

Conclusion: In patients with moderate-stage glaucoma, a full-field contrast sensitivity test (SPARCS) correlated better with a test of patients' ability to perform various activities (CAARV) than Humphrey automated perimetric VF examination or SD-OCT RNFLT measurement. VRQoL correlated weakly with SPARCS and VF changes but not with RNFLT.

Discussant: **Alan L. Robin**

PA-04 3:51–4:07 PM

STAND-ALONE XEN GEL MICROSTENT TRANSSCLERAL IMPLANTATION COMPARED WITH STAND-ALONE KAHOOK DUAL BLADE GONIOTOMY

Peter Netland*, Ryan Duong, Andrew Pittner, Tina Roa, Arjun Dirghangi

Purpose: To evaluate outcomes of stand-alone Xen Gel microstent implantation compared to stand-alone Kahook Dual Blade (KDB) goniotomy for moderate to severe glaucoma.

Methods: A retrospective, single-center, case-series analysis comparing outcomes of Xen Gel microstent implantation and KDB goniotomy stand-alone cases in 75 eyes. Primary outcomes included intraocular pressure (IOP) reduction, glaucoma medication reduction, surgical success, and complications. Subjects were followed for at least 24 months after surgery.

Results: At post-operative month 24, both Xen Gel microstent placement (N = 57) and KDB goniotomy (N = 18) led to a significant reduction in intraocular pressure (IOP) from baseline by 32.7% and 40.4% respectively (p=0.018, p=0.049). While the mean IOP was significantly lower during the first month after Xen Gel microstent implantation, no difference in mean IOP was observed between the two treatment groups at 24 months after surgery (p=0.416). Mean reduction of glaucoma medications from baseline at 24 months was 1.69 drops after Xen implantation (p=.008) compared with 1.67 drops after KDB goniotomy (p=0.038). Post-operative complications were non-vision-threatening and were not significantly different between the two groups (p=0.550). With IOP threshold <21 mmHg, surgical success was not significantly different between the two groups (p=0.06). At lower IOP threshold (<18 mmHg), surgical success was higher after Xen Gel microstent implantation compared with KDB goniotomy (p=0.001).

Conclusion: Both stand-alone Xen Gel microstent implantation and stand-alone KDB goniotomy can effectively and safely reduce IOP for moderate to severe glaucoma. Transscleral filtration with the Xen Gel microstent was associated with higher surgical success at a lower IOP threshold.

Discussant: **Joshua D. Stein**

PA-05 4:08–4:24 PM

OUTCOMES OF CATARACT SURGERY IN CHILDREN 7 TO 18 YEARS OF AGE

M. Edward Wilson*, Rupal Trivedi, Anastasia Alex, Alaa Alsuradi

Purpose: To evaluate the outcomes of cataract surgery in older children, aged 7-18 years, who are typically considered to be outside the amblyopic age range.

Methods: The medical charts of children who underwent unilateral or bilateral cataract surgery between the ages of 7-18 years of age with minimum follow-up of 2 years were analyzed. Outcomes of unilateral and bilateral cataract surgery are reported separately and compared. For the bilateral cohort, complications are reported for the first operated eye.

Results: For the unilateral cohort, 42 children with a median follow-up of 5.5 years were analyzed while for the bilateral cohort, 74 eyes of 37 children with a median follow-up of 7.5 years were analyzed. Postoperative adverse events were observed in 5% of the unilateral cohort and 8.1% in the bilateral cohort. Unplanned intraocular reoperations were required in 5% and 10.8% for the unilateral and the bilateral cohort respectively. No cases of glaucoma or glaucoma-suspect were observed. The median postoperative BCVA was 20/32 for the unilateral group. The median postoperative BCVA of the bilateral group was 20/25 for both the better and the worse seeing eye.

Conclusion: The current study highlights the satisfactory visual acuity outcomes and reduced complications of cataract surgery with IOL in older children as compared with the often-reported results in babies and younger children. These data can help surgeons give accurate age-specific prognostic information to parents of children undergoing cataract surgery.

Discussant: **David K. Wallace**

PA-06 4:25–4:41 PM

DEVELOPMENT AND VALIDATION OF THE "OPTIC DISC EDEMA INDEX" TO DISTINGUISH PAPILLEDEMA FROM PSEUDOPAPILLEDEMA.

Sean Donahue*♦, Alexis Flowers, Reid Longmuir, Cindy Chen

Purpose: We used measurements of variability within consecutive clock hours of OCT optic nerve head (ONH) NFL thickness to design a model that produces an outcome metric that separates true from pseudopapilledema in a cohort of adult patients and validated that metric on a separate cohort.We developed a pediatric measurement and a user-friendly website.

Methods: Model development used both eyes of 116 adults with elevated ONH and classified clinically as papilledema or pseudopapilledema. Mean NFL thickness of ONH and absolute consecutive difference in NFL thickness between clock hours were compared using mixed-effect models adjusting for age and clock-hour. The area under the receiver operating characteristics (ROC) curve (AUC) was calculated. Validation analyzed a separate cohort of 176 eyed, 46 with papilledema. A pediatric cohort of eyes were subjected to a similar analysis, (80 eyes, 42 with papilledema).

Results: The adult papilledema group had thicker ONH NFL than did pseudopapilledema eyes (163 + 68 um vs 82 + 22 um, $p < 0.001$), and larger differences in thickness between clock hours (57 + 20 um vs 26 + 11 um, $p < 0.001$). A linear combination of each patient's average values produced an outcome metric that separated the two groups with AUC of 96% (95% CI 92.4%-98.8%)," and gave optimized sensitivity of 90.3% and specificity of 90.9%. During validation the original model had similar results using the validation cohort with respect to NFL thickness and consecutive clock hour variability and achieved AUC 95% (CI 90.7%-98.4%) with optimized sensitivity of 87.7% and specificity of 89.1%. The model developed for the pediatric cohort gave AUC 88.6%.

Conclusion: Patients with papilledema have high variability of their OCT NFL. Our formula, which was created and validated in separate adult patient cohorts, distinguishes papilledema from pseudopapilledema with high sensitivity and specificity, and is available at www.opticdiscedema.com.

Discussant: **Steven A. Newman**

PA-07 4:42–4:58 PM

VISUAL FIELD CHANGES IN THYROID EYE DISEASE-COMPRESSIVE OPTIC NEUROPATHY

Suzanne Freitag*

Purpose: To create a novel nomenclature to characterize the longitudinal sequence of visual field (VF) defects in patients with progression of thyroid eye disease-compressive optic neuropathy (TED-CON).

Methods: A retrospective review of records from one institution identified patients with progressive Humphrey VF defects secondary to TED-CON. The VF defects were analyzed by two independent reviewers and classified into one of 10 categories: inferior spot, inferior blob, inferior altitudinal, inferior altitudinal with superior creeping, inferior altitudinal with superior arcuate, scatter pattern, superior defect, central/paracentral, enlarged blind spot, or total loss.

Results: Of 234 VF in 37 eyes of 23 subjects, inferior defects were most common including: inferior spot 22/234 (9.4%), inferior blob 112/234 (47.9%), and inferior altitudinal 11/234 (4.7%). Inferior altitudinal with superior creeping above the horizontal meridian occurred in 41/234 (17.5%). The longitudinal sequence of VF defects from the 37 eyes of 23 patients was analyzed. Thirty-one of 37 eyes (83.8%) demonstrated a predictable progression pattern from least to more severe: inferior spot, inferior blob, inferior altitudinal, inferior altitudinal with creeping into superior field, inferior altitudinal with superior arcuate and total loss, although not all reached the most severe categories. The reverse order of VF defect progression was noted in patients with improving TED-CON. A minority of progression patterns (16.2%) originated from central/paracentral, enlarged blind spot, and scatter.

Conclusion: Humphrey visual field defects resulting from TED-CON are most often inferior, very often have a predictable pattern of progression and can be categorized into a novel descriptive nomenclature system.

Discussant: **Edward J. Wladis**

PA-08 10:30–10:46 AM

GENE THERAPY RESCUES CONE FUNCTION IN RHESUS MACAQUES WITH PDE6C-ASSOCIATED ACHROMATOPSIA

J. Timothy Stout*, Rui Chen, Jeffrey Rogers, Tawfik Issa, Antonio Lopex, Sangwa Park, Eliza Bliss-Moreau, Sara Thomasy, Ala Moshiri

Purpose: To determine the age of disease onset and the degree to which viral mediated gene therapy can rescue cone function in a nonhuman primate model of an inherited cone disorder.

Methods: We performed deep DNA sequencing in 1600 macaques to identify mutations in genes associated with macular or optic nerve disease. Infant rhesus macaques homozygous for the PDE6C R565Q mutation were generated through a selective breeding program at the California National Primate Research Center (CNPRC). At age 9 months, two of the homozygous animals were treated in the right eye with a mix of a high (1.5 x 11 vg/eye) or low (1.5 x 10 vg/eye) dose of adeno-associated virus (AAV5) carrying the rhesus macaque PDE6C gene under the control of the PR1.7 cone-specific promoter and AAV5 viruses containing the eGFP gene. The left eye served as a control. Animals were tested by full-field and multifocal electroretinography (ERG) before and after injection. Behavioral testing was performed to assess visual acuity and color perception.

Results: All offspring homozygous for the PDE6C R565Q mutation had an absent cone signal and foveal autofluorescence abnormalities from early infancy. Subretinal injection and a short course of systemic corticosteroids was safe without significant inflammation or toxicity. Therapeutic virus was expressed specifically in cone photoreceptors. The high dose restored cone responses on ERG within one month of injection. The responses were sustained and durable for at least 6 months without evidence of decline. Chromatic ERG testing showed restoration of amplitudes in all three cone subtypes. Behavioral testing to assess visual acuity and color perception is in progress.

Conclusion: AAV-mediated gene therapy for PDE6C-associated achromatopsia in a nonhuman primate model. These results suggest similar approaches in human patients warrant investigation.

Discussant: **José-Alain J. Sahel**

PA-09 10:47–11:03 AM

REGIONAL SCLERAL THICKNESS AS A RISK FACTOR FOR CENTRAL SEROUS CHORIORETINOPATHY

Richard Spaide*, Yale Fisher, Wei Kiong Ngo, Irene Barbazetto

Purpose: To evaluate regional sclera thicknesses as possible risk factors for central serous chorioretinopathy (CSC).

Methods: Patients with CSC and controls were evaluated with contact B-scan ultrasonography using a 20 Mhz concentric phased array ultrasound unit and enhanced depth imaging optical coherence tomography to measure the scleral thickness at the equator and posterior pole. The resultant data were evaluated using univariate analysis and generalized estimating equations.

Results: There were 40 patients with CSC with a mean age of 58 years and 23 controls with a mean age of 60.7 years (P=.31). The mean subfoveal scleral thicknesses were 1.3 mm in the CSC group an 0.86 mm in the control group (P<.001). The mean equatorial scleral thickness was 0.61mm in the CSC group and 0.42 mm in the control group (P<.001). Using generalized estimating equations, the equatorial scleral thickness (P=.001), posterior scleral thickness (P <.001) and subfoveal choroidal thickness (p=.032) were independent predictors of CSC. Once these variables were entered into the equation, neither sex nor age were significant predictors. Generalized estimating equation analysis showed that equatorial, but not posterior, scleral thickness was a significant predictor of subfoveal choroidal thickness.

Conclusion: Scleral thicknesses of both the posterior and equatorial portions of the eye were found to be significant predictors of CSC, consistent with what was proposed in the theory venous overload choroidopathy. Direct measurement by high resolution ultrasonography provides independent information about specific regions of the sclera and also avoids making speculative assumptions derived from anterior segment measurements.

Discussant: **Jost B. Jonas**

PA-10 11:04–11:20 AM

DYNAMIC MICROVASCULAR IMAGING USING OCT ANGIOGRAPHY (OCT-A)AND ADAPTIVE OPTICS SLO (AOSLO)- NEW TOOLS FOR OBJECTIVE ASSESSMENT OF SICKLE CELL DISEASE SEVERITY AND RESPONSE TO TREATMENT

Richard Rosen*♦, Davis B. Zhou, Maria Castanos Toral, Alexander Pinhas, Peter Gilette, Justin V. Migacz, Rishard Weitz, Jeffrey Glassberg, Alfredo Dubra, Toco Chui

Purpose: Capillary occlusion is the hallmark of sickle cell disease. Prior to complete closures, temporary blockages occur at variable frequency and could serve as an objective measure of disease activity. We developed an index of intermittent retinal capillary perfusion using OCT-A, which we interpreted with dynamic AOSLO sequences.

Methods: 13 sickle cell disease patients and 14 healthy controls were imaged at baseline and 1-hour follow-up imaging sessions. At each session, 10 sequential 3x3 mm OCT-A scans were acquired, registered, and averaged at 2 locations, the parafovea and 9° temporal. Using controls, a normative distribution was established from the inter-session differences in pixel intensity. Bland-Altman statistics were used to determine the limits of agreement (LOA) at 0.01st and 99.99th percentile. The inter-session intermittent perfusion index (IPI) was defined as the total percent area with inter-session difference in pixel intensity outside the LOA of controls. Intra-session intermittent perfusion events were defined as capillaries perfused in one scan and non-perfused on a subsequent or previous scan. AOSLO videos examined and interpreted perfusion events.

Results: Intermittent perfusion maps documented capillary segments flickering between non-perfusion (red) and re-perfusion (cyan) at baseline and at 1-hour follow-up. Inter-session intermittent perfusion indexing showed statistical differences between controls vs HbSS patients on hydroxyurea treatment (P=0.027; P=0.032) and controls vs HbSS patients without treatment (P=0.004; P=0.005) at the parafovea and temporal retina. Intra-session intermittent perfusion events were seen in 4 of 14 healthy controls and all 13 sickle cell disease patients. AOSLO sequences revealed rouleaux and various forms of erythrocyte congestion.

Conclusion: Intermittent Perfusion Index metrics revealed significant variation in capillary perfusion, in sickle cell disease patients, compared to healthy controls. Perfusion fluctuation could serve as an objective assessment of vaso-occlusive burden for individuals with sickle cell disease, useful as an indicator of disease severity, treatment success, and mortality risk.

Discussant: **Richard F. Spaide**

PA-11 11:21–11:37 AM

2-YEAR RESULTS FROM THE PHASE 3 YOSEMITE AND RHINE TRIALS: EFFICACY, DURABILITY, AND SAFETY OF FARICIMAB IN DIABETIC MACULAR EDEMA

Jennifer Lim*♦, John A. Wells, David A. Eichenbaum, Carl Danzig, Kemal Asik, Zdenka Haskova, Shaun Mohan, David Silverman, Yannan Tang, Hugh Lin

Purpose: Year 1 data from the phase 3 YOSEMITE/RHINE trials support the hypothesis that dual angiopoietin-2/vascular endothelial growth factor (VEGF)-A pathway inhibition with faricimab, the first bispecific antibody designed for intraocular use, may promote vascular stability and durable efficacy beyond current anti-VEGF therapies for diabetic macular edema (DME). Year 2 provides longer-term efficacy, durability, and safety data.

Methods: YOSEMITE (N = 940) and RHINE (N=951) were randomized, double-masked, active comparator–controlled, 100-week trials of faricimab in both treatment-naïve and previously anti-VEGF–treated center-involving DME. Patients were randomized 1:1:1 to faricimab 6.0 mg q 8 weeks (Q8W) after 6 Q4W doses, faricimab 6.0 mg per personalized treatment interval (PTI) after 4 Q4W doses, or aflibercept 2.0 mg Q8W after 5 Q4W doses. The PTI algorithm (protocol-driven treat-and-extend regimen) intervals were extended, maintained or reduced (from Q4W up to Q16W) based on central subfield thickness (CST) and best-corrected visual acuity (BCVA) change at active dosing visits. Primary efficacy was mean BCVA change from baseline at 1 year, averaged over weeks 48, 52, and 56. 2-year outcomes included mean BCVA change from baseline averaged over weeks 92, 96, and 100; proportion of PTI patients achieving Q4W, Q8W, Q12W, or Q16W dosing at week 96; mean CST change from baseline; proportion of patients with ≥ 2-step Diabetic Retinopathy Severity Scale improvement from baseline; and incidence and severity of adverse events.

Results: At 1 year, faricimab Q8W or per PTI resulted in vision gains that were noninferior to aflibercept Q8W and achieved with Q16W dosing in > 50% of patients in PTI arms. Faricimab Q8W or per PTI showed anatomic improvements compared with aflibercept Q8W and was well tolerated, with low rates of intraocular inflammation. Year 2 results from YOSEMITE/RHINE will be presented.

Conclusion: Year 2 data from YOSEMITE/RHINE reports whether year 1 vision gains, anatomic improvements, and extended dosing with faricimab are maintained.

Discussant: **Julia A. Haller**

PA-12 11:38–11:54 AM

AFLIBERCEPT AND DEXAMETHASONE COMBINATION THERAPY USING SUSTAINED DRUG DELIVERY SYSTEM

Jennifer Kang-Mieler*, Kayla Rudeen, Wenqiang Liu, **William Mieler♦**

Purpose: While the anti-vascular endothelial growth factor (anti-VEGF) treatment is effective, a subset of age-related macular degeneration (AMD) patients does not fully respond to anti-VEGF monotherapy. Recent studies suggest that combination therapy of corticosteroids and anti-VEGF may be beneficial. The purpose of this study was to demonstrate that simultaneous release of aflibercept (AFL) and dexamethasone (DEX) can be achieved from a single biodegradable ocular drug delivery system (DDS).

Methods: AFL-loaded microspheres and DEX-loaded nanoparticles were suspended within a single, injectable biodegradable thermo-responsive hydrogel DDS (combination-DDS). Release studies were performed to determine released drugs' release kinetics and bioactivity. Choroidal neovascularization (CNV) rodent model was used to test treatment efficacy: control (no treatment), blank-DDS (5ul, no drug), and AFL+DEX combination-DDS (5ul, 1.5ug AFL, 20ug DEX, respectively). Multi-Otsu Thresholding image analysis based on fluorescein angiogram was used to quantify the CNV lesion areas to determine treatment efficacy.

Results: Both AFL and DEX were encapsulated into biodegradable particles with a drug encapsulation efficiency of 78±2% and 92±4%, respectively. AFL release profiles from the combination-DDS were slightly faster than the AFL monotherapy-DDS release. However, the presence of DEX nanoparticles did not significantly affect the AFL release. Similarly, DEX release profiles from the combination-DDS were also similar to the single DEX monotherapy-DDS release, and the presence of AFL microspheres did not affect the DEX release. The combination-DDS released bioactive agents for ~225 days. The combination-DDS group significantly reduced CNV lesions areas (-30±4% at week 22), demonstrating the treatment efficacy.

Conclusion: The combination of AFL and DEX DDS achieved a controlled, sustained release for over seven months. The combination treatment significantly decreased the CNV lesion areas. This study suggests that an extended simultaneous release of both AFL and DEX from our combination-DDS can be achieved and maybe advantageous over the current monotherapy treatment.

Discussant: **Timothy W. Olsen**

PA-13 11:55 AM–12:11 PM

ASSOCIATION BETWEEN DYSFUNCTIONAL COMPLEMENT FACTOR I (CFI) RARE VARIANT STATUS AND PROGRESSION TO ADVANCED AGE-RELATED MACULAR DEGENERATION

Johanna Seddon[*♦], Bernard Rosner

Purpose: To evaluate dysfunctional CFI rare variant carrier status and progression to advanced age-related macular degeneration (AMD), geographic atrophy (GA) and neovascular disease (NV).

Methods: Prospective analyses were performed using the Seddon Longitudinal Cohort Study (SLCS) of AMD (N=2116 subjects, 3901 eyes, mean follow-up 8.3 years, 22% progression rate to advanced AMD, PMID 30389371) and the Age-Related Eye Disease Study (N=2837 subjects, 5200 eyes, mean follow-up 9.2 years, 18% progression rate). CFI rare variants with low serum factor I levels and decreased function in a serum based assay (PMID's 24036952 and 32908800), and other common and rare genetic variants related to AMD, demographic and behavioral factors, and baseline and follow-up macular status were evaluated.

Results: Among the 4953 subjects (9101 eyes), 1% were carriers of rare, dysfunctional CFI variants and 44% of the carriers progressed to overall AMD compared with 20% of non-carriers ($P < .0001$). For the advanced AMD subtypes, 30% of carriers versus 10% of non-carriers progressed to GA ($P < .0001$), and 18% of carriers and 11% of non-carriers progressed to NV ($P=.049$) over a 12-year follow-up period. CFI carriers were more likely to have a family history of AMD (CFI variant: 36% with 1 family member affected and 14% with 2+ family members affected; no CFI variant: 19% with 1 family member affected and 8% with 2+ affected; P for trend =.035). CFI variant carrier status was associated with progression to GA (OR 1.91, 1.03-3.52) but not with NV (OR 0.96, 0.54-1.71), after adjustment for demographic and ocular factors and other AMD genetic variants. CFI rare variant carrier status was associated with the common CFI (PMID 18685559) and hepatic lipase C (LIPC, PMID 20385826) genetic variants.

Conclusion: These new findings suggest that carriers of dysfunctional CFI rare variants are at higher risk for progression to GA.

Discussant: **M. Elizabeth Hartnett**

PA-14 12:12–12:28 PM

CHARACTERIZATION OF DISEASE PROGRESSION IN GEOGRAPHIC ATROPHY (GA) BASED ON MANUAL AND AUTOMATED QUANTIFICATION OF RPE AND PHOTORECEPTOR LOSS ON OCT

Ursula Schmidt-Erfurth*♦, Julia Mai, Sophie Riedl, Wolf-Dieter Vogl, Dmitrii Lachinov, Gregor Reiter, Hrvoje Bogunovic

Purpose: To investigate global and focal geographic atrophy (GA) progression using manual and deep learning-based quantification of retinal pigment epithelium (RPE) and photoreceptor (PR) loss on OCT imaging.

Methods: SD-OCT images from the phase 2 FILLY clinical trial were analyzed. Manual annotation of RPE and PR loss was performed on whole baseline and year one OCT volumes and compared to GA areas measured on FAF. Additionally, deep learning-based RPE and PR layer thickness was quantified. The focal GA progression rate (LPR) was determined from a level-set based growth model. Topographic and structural features were computed for each baseline GA margin point and correlated to local GA growth.

Results: A total of 11,074 manually annotated B-scans were included. There was a high correlation of GA measurements between FAF and OCT ($r = 0.97$). At baseline, PR loss was consistently larger than RPE loss in all manually annotated cases ($p < 0.001$). Fully automated segmentation included a total of 31,556 B-Scans from baseline to month 12. The speed of GA growth increased with higher baseline PR loss/RPE loss ratio quartiles. Lesions in the highest quartile showed statistically significantly increased lesion growth ($p = 0.006$) compared to lesions in the lowest quartile. Overall, LPR was higher for areas with low distance to the fovea and thinner PR layer thickness in the proximity of GA margin points.

Conclusion: SD-OCT imaging provides consistent results in the measurement of GA growth compared to FAF. In addition to RPE loss, PR alteration can be reliably visualized by OCT, offering more detailed information on the heterogeneity in local GA progression. The PR/RPE loss ratio is a strong predictive factor for future GA progression, highlighting the importance of OCT imaging as a screening and monitoring tool in GA disease.

Discussant: **Lee M. Jampol**

PA-15 10:30–10:46 AM

A CONVOLUTIONAL NEURAL NETWORK FOR OCT-BASED DETECTION OF KERATOCONUS AND FUCH'S ENDOTHELIAL DYSTROPHY

David Huang[*♦], Elias Pavlatos, Yan Li, Winston Chamberlain

Purpose: To use artificial intelligence (AI) to classify three types of corneas - normal, keratoconus, and Fuch's endothelial dystrophy) - based on OCT corneal mapping.

Methods: Fuch's patients were identified using the simplified slitlamp edema scale (grades 1-3) and the modified Krachmer guttae scale (grades 0-6). All of the keratoconus eyes exhibited topographic signs (e.g. asymmetric skewed bowtie, inferior steep zone) on Pentacam (Oculus) or Orbscan (Bausch & Lomb) slit-scanning topography/tomography systems. Spectral-domain OCT (Avanti, Optovue, Inc.) was used to acquire 6 mm wide maps of the central cornea based on radial spoke scans of 16 hemimeridians. Custom algorithms were used to generate maps of pachymetry, epithelial thickness, posterior topography (mean curvature and enhanced float elevation), and Descemet's guttae map (hyper-reflective spots). All of the maps were downsampled to a16x16 square array, and each map type was treated as a different color channel in the convolutional neural network (CNN), a type of deep learning AI algorithm. A multi-label classification approach was implemented using two output neurons with sigmoid activation. Classification accuracy was computed for different model architectures using repeated 5-fold cross validation.

Results: 52 normal, 105 keratoconus, and 35 Fuch's dystrophy eyes were included. The CNN algorithm with the best performance consisted of three convolutional and max pooling layers followed by four densely connected layers. The disease classification accuracy, averaged over 5 runs of cross validation, was 98.1 ± 3.9% for the normal eyes, 99.0 ± 1.9% for the keratoconus eyes, and 93.7 ± 10.8% for the Fuch's eyes.
Not all ancillary studies show retinopathy at the time of diagnosis of HCR. mfERG shows a floor effect. Once response densities are low, detecting further progression of toxicity by this modality is not possible. A greater breadth of retinopathy progression is possible with 10-2 VF, SS/SD OCT, and FAF.

Conclusion: Our CNN algorithm was able to accurately detect and distinguish keratoconus and Fuch's endothelial dystrophy by using maps of various corneal layers captured by OCT. This approach has the potential to be extended to create a comprehensive classification system for corneal diseases.

Discussant: **Ronald R. Krueger**

PA-16 10:47–11:03 AM

IN VIVO DETERMINATION OF THE HUMAN CORNEAL ELASTIC MODULUS BY VOCT

Zeba Syed*, Marcos Crespo, Hiram Jimenez, Dominick Benedetto, **Jose Pulido**, Tanmay Deshmukh, **Christopher Rapuano**, Fred Silver

Purpose: Vibrational optical coherence tomography (VOCT) supplements traditional optical coherence tomography with soundwaves to obtain the resonant frequency (RF) and the elastic modulus of anatomical structures. In this prospective study, we used VOCT to determine the in vivo elastic modulus of the human cornea.

Methods: Central corneal thickness measurements obtained from VOCT were correlated with those of Pentacam® (Oculus; Wentzler, Germany) pachymetry. VOCT measurements were performed at two different locations [central cornea (CC) and inferior cornea (IC)] in 32 normal eyes from 16 subjects. The RF and thickness values obtained from VOCT were employed in a calibration equation to calculate the corresponding modulus value. Repeated measurements were obtained in a subset of 10 eyes to assess the effect of anesthetic drops on the agreement of measurements.

Results: VOCT thickness values demonstrated a positive (r2=0.97) and linear correlation (y = 0.939x -13.92) to those of Pentacam. Five peaks (#1-5) were identified on the weighted displacement vs. frequency plots, although their presence was variable across eyes. The mean RF values for peaks #1-5 on the CC were 73.5±4.9, 120.4±2.0, 148.7±8.0, 207±7, and 239±3 Hz, respectively. The mean RF values for peaks#1-5 on the IC were 72.1±6.3, 120.3±1.8, 147.2±6.7, 205±7, and 238±4 Hz. Based on the corresponding RF, the calculated elastic modulus for peaks #1-5 on the CC were 1.023±0.104, 2.05±0.16, 2.94±0.40,5.31±0.37, and 6.87±0.33 MPa, respectively. The IC elastic modulus for peak #1-5 were 0.975±0.150,1.991±0.236, 2.76±0.28, 5.08±0.73, and 6.52±0.79 MPa. The effect of topical anesthesia in elastic modulus values for each peak was not significant ($p>0.05$), except for peak #2 in the CC ($p<0.05$).

Conclusion: This pilot study demonstrates the utility of VOCT as an in vivo, non-invasive technology to measure the elastic modulus in human corneas. The structural origin of the various moduli obtained can be hypothesized based upon reported in vitro studies, but further analyses are necessary for confirmation.

Discussant: **Dimitri T. Azar**

PA-17 11:04–11:20 AM

REMISSION OF NON-INFECTIOUS ANTERIOR SCLERITIS: INCIDENCE AND PREDICTIVE FACTORS

John Kempen*, Maxwell Pistilli, Nirali Bhatt, **C. Stephen Foster**, **Douglas Jabs**, Grace Levy-Clarke, James Rosenbaum, **H. Nida Sen**, Eric Suhler, Jennifer Thorne

Purpose: To assess how often non-infectious anterior scleritis remits and identify predictive factors.

Methods: Our retrospective cohort study at four ocular inflammation subspecialty centers collected data for each affected eye/patient at every visit from center inception (1978, 1978, 1984, 2005) until 2010. Remission was defined as inactivity of disease off all suppressive medications at all visits spanning at least three consecutive months or at all visits up to the last visit (to avoid censoring patients stopping follow-up after remission). Factors potentially predictive of remission were assessed using Cox regression models

Results: During 1,906 years' aggregate follow-up of 832 affected eyes, remission occurred in 214 (170 of 584 patients). Median time-to-remission of scleritis=7.8 years (95% confidence interval (CI): 5.7, 9.5). More remissions occurred earlier than later during follow-up. Factors predictive of less scleritis remission included scleritis bilaterality (adjusted hazard ratio (aHR)=0.46, 95% CI: 0.32-0.65); and diagnosis with any systemic inflammatory disease (aHR=0.36, 95% CI: 0.23-0.58), or specifically with Rheumatoid Arthritis (aHR=0.22), or Granulomatosis with Polyangiitis (aHR=0.08). Statin treatment (aHR=1.53, 95% CI: 1.03-2.26) within ≤90 days was associated with more remission incidence.

Conclusion: Our results suggest scleritis remission occurs more slowly in anterior scleritis than in newly diagnosed anterior uveitis or chronic anterior uveitis, suggesting that attempts at tapering suppressive medications is warranted after long intervals of suppression. Remission is less frequently achieved when systemic inflammatory diseases are present. Confirmatory studies of whether adjunctive statin treatment truly can enhance scleritis remission (as suggested here) are needed.

Discussant: **Russell N. Van Gelder**

PA-18 11:21–11:37 AM

LONG TERM STUDY OF TOPICAL INTERFERON A-2B EYE DROPS AS PRIMARY TREATMENT OF OCULAR SURFACE SQUAMOUS NEOPLASIA

Carol Karp*, Wathanee Sripawadkul, Daniela Reyes-Capo, Adam Wylegala, Ghada AlBayyat, **Anat Galor**

Purpose: To assess the efficacy of topical interferon α-2β(IFN) eye drops as a primary treatment for ocular surface squamous neoplasia (OSSN) and evaluate factors that impact response to treatment and recurrence of OSSN.

Methods: A retrospective study of 127 OSSN patients treated with topical IFN(1MIU/ml) from January 2009 to June 2021. The diagnosis was based on clinical examination and anterior segment optical coherence tomography. Histologic confirmation was present in 44% of patients. Data on demographic, tumor characteristics, treatment outcome, and side effects were collected. The primary outcomes were tumor resolution frequency and recurrence rate. Secondary outcomes were predictive factors for resolution and recurrence and side effects of treatment.

Results: Participants were mostly older (mean age, 69 years, SD 12.4, range 29-97), white (92%) males (76%). Complete tumor resolution was achieved in 78% of individuals with a mean time to resolution of 5 months (SD 4.4, range 1.6-36 months). On multivariable analysis, non-Hispanic ethnicity (HR: 0.48, p=0.003, 95% CI: 0.29 to 0.78) and self-reported sun exposure (HR: 0.55, p=0.02, 95%CI: 0.34-0.91) reduced the risk of tumor resolution, while a prior history of OSSN (HR: 4.26, p<0.001, 95%CI: 1.82-9.97) increased the risk of resolution. With a mean follow-up time of 36.3 months (SD 33.8, 0-124 months), the recurrence rate was 1.2%, 3.8% and 6.2% at 1, 2, and 5 years respectively. Mild hyperemia (18.2%) and pain (12.1%) were the two most common side effects.

Conclusion: Topical IFN eye drops are a safe and effective primary treatment modality for OSSN with a reasonable side effect profile.

Discussant: **Hans E. Grossniklaus**

PA-19 11:38–11:54 AM

STATIC AND DYNAMIC FACTORS ASSOCIATED WITH EXTENDED DEPTH OF FOCUS IN MONOFOCAL INTRAOCULAR LENSES

Karolinne M. Rocha[*♦], Larissa Gouvea, **George O. Waring**, IV, Jorge Haddad

Purpose: To analyze factors affecting depth of focus (DOF) and near vision functionality in eyes implanted with aspheric monofocal intraocular lenses (IOLs).

Methods: This prospective study included 111 eyes of 74 patients that underwent phacoemulsification with mono- focal IOL implantation. Ninety-one normal eyes were randomized to receive aberration-free (n [30) or negative- spherical aberration (SA) IOLs (n [61). Twenty post– hyperopic femto-LASIK eyes received aberration-free IOLs. Corneal higher-order aberrations (SA, coma, trefoil, and corneal asphericity) for a 6 mm pupil were measured by Scheimpflug tomography. Ray-tracing metrics (visual Strehl optical transfer function [VSOTF], effective range of focus [EROF], sphere shift [SS], EROFLSS), pupil size measurements at far and near, and ocular and corneal SA were obtained using ray-tracing aberrometry. Distance-corrected near visual acuity (DCNVA) and subjective defocus curves up to ±4.0 diopters were evaluated.

Results: Multivariable logistic regression found corneal profile and IOL type to be determinants of extended DOF with monofocal IOLs. The aberration- free IOL group showed significantly better DCNVA and higher total SA than the negative-SA group. Post– hyperopic LASIK eyes showed significantly better DCNVA; higher negative SA, coma, and Q value ($P < .05$), and smaller pupil size ($P < .05$) than normal eyes implanted with aberration-free IOLs.

Conclusion: Corneal profile and type of IOL implanted were the most important factors influencing near vision functionality with aspheric monofocal IOLs. Higher positive SA in the aberration-free group potentially led to better DCNVA than the negative-SA group in normal eyes. Hyperprolate corneas had better DOF curves and DCNVA than normal corneas.

Discussant: **William 'BJ' Dupps**

PA-20 11:55 AM–12:11 PM

VITRECTOMY IMPROVES CONTRAST SENSITIVITY IN MULTIFOCAL PSEUDOPHAKIA

J. Sebag[*♦], Justin Nguyen

Purpose: Multifocal (MF) IOLs degrade contrast sensitivity (CS), which is also caused by vitreous opacities. The effect of vitrectomy on CS in eyes with MFIOLs was evaluated to determine the efficacy of limited vitrectomy.

Methods: Vitreous structure, assessed with quantitative ultrasonography (QUS), and visual function (Snellen visual acuity and Freiburg Acuity Contrast Testing of CS, %W) were prospectively evaluated in one eye of 180 patients (55 MFIOLs, 60 monofocal (MIOL)s, 65 phakic) with clinically significant vitreous floaters.

Results: 86 of 180 subjects elected vitrectomy. Within the observation group (n=94), vitreous echodensity was the same in all lens cohorts, but CSF in MFIOL was 20% worse than MIOL ($p<0.05$), and 48.7% worse than phakic eyes ($p<0.001$). In the vitrectomy group, vitreous echodensity was 67.5% greater ($p<0.001$), and CS was 31% worse ($p<0.001$) than the observation group. Comparing lens cohorts pre-operatively, vitreous echodensity was the same in MFIOL, MIOL, and phakic eyes, yet CS was 25% worse in MFIOL than MIOL eyes ($p=0.014$). Post-operatively, vitreous echodensity improved by 71% in phakic ($p<0.0001$), 76% in MIOL ($p<0.0001$), and 86% in MFIOL ($p<0.0001$) eyes. CS improved by 41% in phakic ($p<0.0001$), 48% in MIOL ($p=0.001$), and 37% in MFIOL ($p=0.0004$) eyes. Despite this improvement, post-operative CS in MFIOL was still 50% worse than MIOL ($p<0.001$) and 24% worse than phakic eyes ($p<0.05$).

Conclusion: Patients with Vision Degrading Myodesopisa (VDM) who elect vitrectomy have greater vitreous echodensity and worse CS than controls. MFIOL eyes have even worse CS than MIOL and phakic eyes, likely due to additive effects of the MFIOL and vitreous opacification. Limited vitrectomy substantially reduces echodensity and improves CS in all eyes, including MFIOLs which were 37% better, despite not attaining the same level as MIOL or phakic eyes. Thus, unhappy MFIOL patients who have VDM merit consideration of limited vitrectomy.

Discussant: **R.V. Paul Chan**

PA-21 12:12–12:28 PM

LARGE DIAMETER LAMELLAR KERATOPLASTY WITH AND WITHOUT ENDOTHELIAL TRANSPLANTATION SIGNIFICANTLY IMPROVES LONG TERM SURVIVAL OF GRAFTS PERFORMED IN EYES WITH HERPETIC SCARS

Angeli Christy Yu*, **Massimo Busin**

Purpose: To evaluate the outcomes of lamellar keratoplasty with and without endothelial transplantation for the treatment of eyes with high-risk vascularized herpetic corneal scars.

Methods: This prospective interventional case series evaluated the outcomes of consecutive eyes that underwent keratoplasty for herpetic corneal scars in the presence of otherwise healthy endothelium at a tertiary referral center (Ospedali Privati Forlì, Villa Igea). Deep anterior lamellar keratoplasty (DALK) was attempted in 120 eyes, of which 22 required a conversion to 2-piece mushroom keratoplasty (MK). Main outcome measures were best spectacle-corrected visual acuity (BSCVA), refractive astigmatism (RA), endothelial cell loss (ECL), as well as immunologic rejection, herpetic recurrence, and graft failure rates.

Results: Average BCVA at 5years was 0.10±0.12 in the DALK group and 0.09 ± 0.15 in the MK group (p = 0.75). Five-year ECD was significantly higher in the DALK group than in the MK group (DALK: 1826.36 ± 466 cells/mm2, MK: 1162 ± 274 cells/mm2; P < 0.001). Mean refractive astigmatism after complete suture removal was 2.8±1.4 D in the DALK group and 3.0±1.7 D in the MK group. The five-year cumulative risk for immunologic rejection (DALK: 3%, MK: 6%, p = 0.38), herpetic recurrence (DALK: 6%, MK: 9%, p=0.38), and graft failure (DALK: 4%, MK: 5%, p=0.75) was comparable in both groups.

Conclusion: Large diameter lamellar keratoplasty achieves satisfactory visual outcomes that remain stable beyond 5 years after surgery with minimal risk of immunologic rejection, herpetic recurrence and graft failure. Excellent clinical outcomes associated with a 2-piece MK in cases converted from intended DALK support the use of large-diameter DALK (9 mm) as a feasible and practical primary surgical approach for vascularized herpetic scars.

Discussant: **Jayne S. Weiss**

AOS 2022

Poster Abstracts

Posters will be displayed on Thursday, May 19 through Saturday, May 21.

Poster authors will be available to discuss their work during guided poster sessions scheduled on Friday, May 20 from 10:00–10:30 AM and on Saturday, May 21 from 10:00–10:30 AM.

Please note the following program key:

Bold = *AOS Member*
* = *Presenter*
♦ = *Financial Disclosure*

(Posters will indicate relevant financial relationships.)

PO-01

RESULTS OF COST-FREE PANEL-BASED GENETIC TESTING FOR SUSPECTED INHERITED RETINAL DISEASES IN A PEDIATRIC RETINA CLINIC

Hasenin Al-khersan*, Anne Kunkler, Ashley López-Cañizares, Catherin Negron, Kenneth Fan, Nimesh Patel, Carlos Mendoza-Santiesteban, **Audina Berrocal**

Purpose: To characterize the results of a cost-free panel-based genetic test for suspected inherited retinal disease (IRD) in a pediatric retina clinic.

Methods: Retrospective case series of patients ≤18 years of age with suspected IRD presenting to a single pediatric retina specialist in a tertiary referral center from July 2019 to December 2020. Inclusion required completion of a cost-free genetic testing panel (Invitae Corporation, San Francisco, CA and Spark Therapeutics, Inc., Philadelphia, PA) with blood or saliva samples. Information collected from the electronic medical record included demographics, pathogenic variants identified, and variants of unknown significance reported. A genetic test was considered positive if pathogenic variants correlating with the patient's phenotype were identified.

Results: Of the 197 patients who qualified for the study, 106 (53.8%) were male. The mean age was 102 months. Seventy-eight (39.6%) patients were Hispanic, 57 (29%) were white, 53 (26.9%) were black, 4 (2%) were Asian, and 5 (2.5%) had unknown race. Blood samples were used for 167 (85%) patients and saliva for 30 (15%). Overall, 37 (18.8%) patients had a positive genetic test while 20 (10.2%) had variants of unknown significance thought to correlate to their phenotypic presentation. The genetic tests confirmed a suspected diagnosis in 36 (18.3%) cases, changed the diagnosis in 21 (10.7%) cases, and were inconclusive in 140 (71.1%) cases.

Conclusion: Cost-free panel-based genetic testing can be a helpful tool in identifying and characterizing IRD, confirming or changing a suspected diagnosis in 29% of cases in the present study. However, variants of unknown significance remain challenging to interpret. Further studies are needed to characterize these variants to determine their pathogenicity.

PO-02

VITRECTOMY VERSUS VITRECTOMY WITH SCLERAL BUCKLING IN THE TREATMENT OF GIANT RETINAL TEAR RELATED RETINAL DETACHMENTS: AN INTERNATIONAL MULTICENTER STUDY

J. Fernando Arevalo*, Ishrat Ahmed, Abdullmajeed Al-Fakhri, Hamad Al-Subaie, Faisal Al-Qahatani, Sluaiman Alsulaiman, Marco Mura, Mauricio Maia, Dante Akira, Natalia Trench Maia, Maria Berrocal, James Handa

Purpose: To determine the practice pattern for treating giant retinal tear (GRT) related detachments, and their anatomic and visual outcomes with pars plana vitrectomy (PPV) with or without scleral buckling (SB).

Methods: Retrospective cohort study. Eyes with GRT detachments repaired from 2008-2020 with at least 6 months of follow-up from seven institutions in North and South America, Europe, and Asia. Eyes repaired using PPV versus PPV/SB were compared. Main outcome measures included anatomic and functional outcomes.

Results: A comparable number of eyes underwent PPV (n=101) and PPV/SB (n=99). Most eyes underwent laser retinopexy (100% of PPV and 98% of PPV/SB). A similar number of eyes had C3F8 (32.7% of PPV and 34.4% of PPV/SB eyes) and silicone oil tamponade (62.4% of PPV and 59.6% of PPV/SB). Overall single surgery anatomic success at 6 months and 1 year was similar between the groups (82.2% and 77.2% of PPV and 87.9% and 85.7% of PPV/SB). However, when stratified by age, the 1-year single surgery anatomic success rate was higher for PPV/SB (88.5%) than PPV (56.3%) (p=0.03) in children less than 18 years of age. The mean time to first redetachment was 7.9 months in the PPV group and 5.5 months in the PPV/SB group (p=0.8). PVR was the most common cause for redetachment (70.4% of PPV and 93.8% of PPV/SB in redetached eyes; p=0.1). Postoperative complications were also similar between the two groups.

Conclusion: PPV and PPV/SB are equally popular among surgeons globally for managing GRT detachments and have comparable anatomic outcomes in adults. In children, PPV/SB is superior to PPV for anatomic success at one year. In adults, the relief of traction by the GRT may reduce peripheral traction and obviate the need for a SB. However, in children, a supplemental SB can be beneficial as complete vitreous shaving and posterior hyaloid detachment, and postoperative positioning are difficult in this group.

PO-03

SAFE AND EFFECTIVE COMMUNITY OUTREACH DURING A PANDEMIC: IS IT POSSIBLE?

Janet Coleman-Belin*, **Anne Coleman**, Bartly Mondino

Purpose: Healthcare workers are at an increased risk of reporting a positive COVID-19 test[1]; ophthalmologists in particular have high risks of infection due to patient proximity[2]. The UCLA Mobile Eye Clinic (UMEC) – a provider of free vision screenings, eye exams, and glasses to over 300,000 individuals in medically underserved communities in Los Angeles County – suspended operations in March 2020 due to the pandemic. Upon implementing thorough hygiene, disinfection, ventilation and PPE protocols, UMEC resumed outreach in August 2020. This retrospective analysis assesses ophthalmologist, staff, and volunteer safety along with UMEC's effectiveness since resuming screenings.

Methods: The authors examined yearly UMEC reports from January 1 until December 31 in 2019, 2020, and 2021. Safety is defined as COVID-19 testing status of ophthalmologists, staff, and volunteers on UMEC during this time period. Effectiveness is defined as number of patients seen in a given pandemic year compared with patient numbers in 2019.

Results: In 2020, zero out of eight UMEC providers tested positive for COVID-19 out of 3,694 patient interactions; in 2021, zero out of 47 providers (five ophthalmologists, three ophthalmic techicians, three fellows/residents, and 36 medical students) tested positive out of 2,750 patient interactions. In 2020 and 2021, UMEC's effectiveness was 42.1% and 31.3%, respectively. In 2021, 47.9% of those served were individuals experiencing homelessness while in 2019, 74.8% were preschoolers.

Conclusion: Since UMEC resumed operations in August 2020, no ophthalmologists, staff, or volunteers have tested positive with COVID-19 despite interactions with 6,444 patients in the past two years. This is likely due to implementing a strict PPE guidance and thorough hygiene protocol in a controlled environment. The number of medically underserved individuals screened and examined was significantly reduced in 2020 (42.1% of 2019 population served) and 2021 (31.3% of 2019 population served) due to the pandemic.

PO-04

PREVALENCE OF THE INFANTILE STRABISMUS COMPLEX IN CHILDREN WITH CEREBRAL VISUAL PATHWAY WHITE MATTER INJURY

Fatema Ghasia*, Sangeeta Khanna, Aseem Sharma, **Lawrence Tychsen**

Purpose: To determine: 1. if the prevalence of infantile strabismus differs in infants born with or without cerebral visual pathway white matter injury (CVPWMI); and 2. if the prevalence of the ocular motor signs of infantile strabismus and/or optic neuropathy increases as a function of the severity and extent of CVPWMI.

Methods: Magnetic resonance images (MRI) obtained ≥ age 2 yrs were analyzed using a standardized scoring system in 98 children; 67 (mean GA 31 wks; mean BW 1885 g) who had CVPWMI, including periventricular leukomalacia (PVL); and 31 without CVPWMI (mean GA 28.9 wks, mean BW 1101 g). CVP for the purposes of this study was defined as the posterior optic radiations and the splenium of the corpus callosum. Ophthalmologic and orthoptic examination data were collated to assess the presence of any ocular motor deficits and/or optic neuropathy. The prevalence of these signs was compared to the severity of CVPWMI (grade 1 to 3, mild to severe).

Results: Infantile strabismus (esotropia: exotropia ratio 3.5:1) was documented in 61% of children with grade 1, 74% with grade 2, and 88% with grade 3 CVPWMI. Other ocular motor signs of the infantile strabismus complex also increased systematically with CVPWMI grades 1-3: latent ("fusion maldevelopment") nystagmus (20%; 47%; 48% respectively), DVD (15%; 28%; 30%), and nasotemporal pursuit/OKN asymmetry (14%; 38%, 39%). CVPWMI grade was related as well to the prevalence of retrograde optic neuropathy (grade 1, 7%; 2, 26%; 3, 38%). The prevalence of each of these abnormalities was lower substantially ($p < .05$) in children who did not have CVPWMI.

Conclusion: Children who suffer CVPWMI have increased risks of developing the ocular motor signs of the infantile strabismus complex (prevalence in healthy full-term infants = 1.0 to 0.5%). The prevalence of these signs increases systematically as a function of CVPWMI severity. These findings provide further evidence that infantile strabismus is linked to perinatal damage to cerebral vergence and gaze pathways.

PO-05

MOVING FROM NEUROPROTECTION BENCH TO CLINIC: UPDATE ON GLAUCOMA CLINICAL TRIAL DATA

Jeffrey Goldberg*

Purpose: To describe advances in clinical trials for neuroprotection in glaucoma.

Methods: Recent open label and randomized clinical trials were initiated testing topical nerve growth factor, encapsulated cell technology designed to deliver ciliary neurotrophic factor, and antibodies against complement protein C1q.

Results: Thus far, tested therapeutic candidates show strong safety profiles in human glaucoma patients, with no treatment-emergent or investigational product-related serious adverse events. Efficacy endpoints including anatomic measures are able to readily confirm target engagement and in some cases, biological response at the level of the ganglion cell complex and nerve fiber layer. Functional outcome testing lags behind in demonstrating efficacy to date, but analyses from real-world trials point to changes in trial design to enhance power.

Conclusion: Trial completion has generated safety and efficacy data on each of these therapeutic candidates. Functional and anatomic endpoint data suggest plausibility of moving candidate therapies into clinical testing. Improvements to trial design and a widening pipeline of candidate treatments are expected to enhance testing protocols over the next few years.

PO-06

INTRAVITREAL PANITUMUMAB FOR PREVENTION OF MYOPIC AXIAL ELONGATION IN HIGHLY MYOPIC ADULT EYES WITH MYOPIC MACULAR DEGENERATION. A CLINICAL PHASE-1 STUDY

Jost B. Jonas*♦, Gyulli M. Kazabbaeva, Frank G. Holz, Songhomitra Panda-Jonas, Leisan Gilemzianova, Mukharram M. Bikbov

Purpose: Recent histomorphometric studies suggested that axial myopic elongation occurs through an equatorial ocular wall enlargement, changing the eye shape from a sphere to a prolate ellipsoidal configuration. The equatorial ocular wall enlargement may be achieved by a growth of the equatorial Bruch´s membrane (BM), leading to a backward push of the posterior BM and secondary choroidal thinning. Since BM is produced by the retinal pigment epithelium, which contains epidermal growth factor (EGF) receptors, EGF may be a myopic axial elongation-associated messenger molecule. Subsequently, experimental studies in guinea pigs showed that the intravitreal application of blockers of EGF family members and of the EGF receptor led to a decrease, and intravitreal injection of EGF family members themselves to an increase in axial elongation. The findings suggest that the intravitreal application of EGF receptor blockers such as panitumumab may prevent further axial elongation in adult highly myopic patients. We here examined the safety and tolerability of intravitreally applied panitumumab (Vectibix®).

Methods: The phase 1 study included highly myopic patients with myopic macular degeneration. The eyes received a single intravitreal injection of 0.6 mg (60 µL) panitumumab in a standardized manner.

Results: The study included two patients, age: 56 and 68 years, with a best corrected visual acuity (BCVA) of 0.05 and 0.12, and an axial length of 29.10mm and 30.86 mm. Examinations performed at one day, and 2 and 4 weeks after the injection did not show any intraocular inflammation or morphological change, change in BCVA, retinal electroretinography, perimetry, optical coherence tomography-based clinical histomorphometry of the retina and optic nerve, and intraocular pressure.

Conclusion: The preliminary observations of the first two patients receiving an intravitreal application of the EGF receptor antibody panitumumab do not contradict the assumption of an intraocular tolerability of panitumumab injected in a dose of 0.6 mg.

PO-07

THE SOCIOECONOMIC IMPACT OF COVID-19 ON ADULTS WITH SENSORY IMPAIRMENT IN CALIFORNIA

Ken Kitayama*, Victoria Tseng, Deyu Pan, Fei Yu, **Anne Coleman**

Purpose: To explore associations between sensory impairment (vision and/or hearing) and socioeconomic outcomes due to the early Coronavirus disease 2019 (COVID-19) pandemic in the adult 2020 California Health Interview Survey (CHIS) population.

Methods: A cross-sectional study was conducted using the 2020 CHIS, the nation's largest state health survey. The exposure of interest was having sensory impairment, defined as answering "Yes" to the question, "Are you blind or deaf, or do you have a severe vision or hearing problem?" The outcomes of interest were: (1) whether the participant experienced working from home due to COVID-19 and (2) whether the participant was treated unfairly based on their race due to COVID-19. Multivariable logistic regression models were constructed to determine the odds of these socioeconomic COVID-19 outcomes by sensory impairment status, controlling for the following covariates: age, sex, race/ethnicity, self-reported general health status, and annual household income. All analyses were weighted according to the CHIS sampling design.

Results: A total of 21,949 sampled participants were included, representing a weighted estimate of 29,684,882 individuals. The weighted prevalence of sensory impairment was 5.9% (95% confidence interval [CI] 5.4-6.4%). Those with sensory impairment were less likely to experience working from home due to the COVID-19 outbreak compared to those without sensory impairment (odds ratio [OR]: 0.69, 95% CI: 0.50-0.94). Those with sensory impairment were more likely to report being treated unfairly based on their race due to the COVID-19 pandemic compared to those without sensory impairment (OR: 1.66, 95% CI: 1.02-2.70).

Conclusion: In the 2020 CHIS adult population, individuals with vision and/or hearing impairment were less likely to work from home and were more likely to experience unfair treatment based on their race due to the COVID-19 pandemic. Sensory impairment may represent an important risk factor for socioeconomic disadvantage during the COVID-19 pandemic, though additional studies are necessary.

PO-08

LASER TREATMENT AFTER MINIMIZED EYE MOVEMENT (LTMEM) FOR REPAIR OF RETINAL DETACHMENT

Gregg Kokame*, Sydney Yee, Jase Omizo, Leslie Villanueva, Jonathan Liu

Purpose: To evaluate the effectiveness of laser treatment (LT) to seal retinal breaks and resolve retinal detachment after decreasing subretinal fluid with minimized eye movement (MEM) by avoiding reading, writing, computer use, and physical activity, while allowing watching television.

Methods: Retrospective study of patients evaluated at the Retina Consultants of Hawaii, who developed retinal detachment and were willing to initially minimize eye movement prior to having a more invasive surgery for retinal detachment, such as pneumatic retinopexy, scleral buckle or vitrectomy. Charts were reviewed for baseline characteristics, success of retinal detachment repair, subsequent surgical procedures, and recurrence of retinal detachment with long term follow-up.

Results: This study included 39 eyes of 35 patients with 31 patients having unilateral retinal detachment treated with LTMEM and four patients having bilateral retinal detachment treated with LTMEM. Follow up ranged from three months to 30 years. Reattachment of the retina with LTMEM was noted in 31 of 39 eyes (79%) and final reattachment rate following further surgery with scleral buckle resulted in 100% retinal reattachment rate (39 of 39 eyes).

Conclusion: LTMEM can provide a low risk, minimal intervention, low cost procedure that can be an effective means of treating selected retinal detachments, usually but not always with peripheral shallow detachment around the existing breaks.

PO-09

CHESELDEN'S 1728 REPORT OF EYE SURGERY IN THE CONGENITALLY BLIND: NEW INFORMATION

Christopher Leffler*, Stephen Schwartz, Natario Couser, Abdul-Rahman Salman

Purpose: To investigate the eye surgery performed by William Cheselden (1688-1752) in a previously unidentified 13-year-old boy, the report of which has contributed to extensive debates over the last 3 centuries among philosophers and scientists.

Methods: A retrospective review of historical newspapers, books, journals, and letters was conducted.

Results: In 1728, a report signed "Chesselden" described recovery of vision following eye surgery for possibly congenital cataracts in a 13-year-old boy whom we have identified as Daniel Dolins (1713-1743). Philosopher George Berkeley (1685-1753) claimed that this report vindicated his theories about the perceptions of one suddenly made able to see for the first time. Daniel's older brother had congenital cataracts, and was operated on by an oculist named Mrs. Jones twice in one eye. Daniel was still unable to read after his surgery, and there is no evidence that the procedure improved his ability to conduct visual tasks. Both Dolins brothers died prematurely. Daniel's father was a professional associate of Berkeley, Daniel was presented to Berkeley's royal patron (Caroline, the Princess of Wales), and the report uses concepts and language more characteristic of Berkeley's writing than of Cheselden's.

Conclusion: The Dolins brothers probably had hereditary cataracts. Despite the 1728 report, there is no evidence that Daniel's vision improved. Berkeley is linked to the patient's family and might have written the report said to validate his theories. Daniel's case cannot reliably inform debates about perceptions after the sudden acquisition of vision.

PO-10

EXPERIENCES OF GENETIC TESTING AMONG INDIVIDUALS WITH RETINITIS PIGMENTOSA

Alex Levin*♦, Emily Krauss, Jared Macher, Jenina Capasso, Barbara Bernhardt, Zohra Al-Khan Catts, Rachel Brandt

Purpose: Retinitis pigmentosa (RP) is a genetically heterogeneous retinal dystrophy which results in progressive vision loss. This pilot study establishes a qualitative methodology for examining the experiences of genetic testing in patients with RP.

Methods: Patients with a clinical diagnosis of RP who received genetic testing at the Wills Eye Ocular Genetics clinic between 2016 and 2020 were recruited. Interviews were conducted over telephone using a semi-structured guide designed to elicit participant experiences with genetic testing. A thematic analysis was performed to describe patterns in participant responses.

Results: Twelve patients participated. Seven participants identified as female and 5 as male, with ages ranging from 22 to 70. Ten patients had positive genetic test results, while 2 had negative genetic testing. Interview length ranged from 18 to 50 minutes (mean of 31.5 minutes). Reported motivations for genetic testing included qualification for clinical trials (58% of total participants), determination of etiology or causal gene (50%), reproductive concerns (50%), and prognostic outlook (50%). Most participants (75%) expressed satisfaction about their decision to pursue genetic testing. Participants with both positive and negative genetic testing reported persistent uncertainty regarding their prognosis for visual decline (50%). Genetic confirmation of disease lead to initiation of safety and vision-protecting health behaviors (42%).

Conclusion: Patients with RP are generally satisfied with their testing experience, despite approaching testing with a wide range of motivations and expectations. Future research can leverage this methodology to identify targets for improvement in pre- and post-test counselling.

PO-11

UNDERSTANDING THE EFFECTS OF THREE GLAUCOMA MEDICATIONS ON TRABECULAR MESHWORK PROTEOME

John Lind*♦, Chevy Singh, Avinash Soundararajan, Rekha Sundararajan, **Louis Cantor**, **David Wallace**, Padmanabhan Pattabiraman

Purpose: The effects of anti-hypertensive glaucoma medications are incompletely understood. This study is designed to understand the effect on the trabecular meshwork proteome of three ocular hypotensive topical medications currently in market – Lumigan (bimatoprost), a prostaglandin drug thought to increase outflow primarily via uveoscleral outflow pathway; Rhopressa (netarsudil), a rho kinase inhibitor that targets trabecular meshwork (TM) outflow pathway; and Vyzulta (latanoprostene bunod), a nitrogen oxide contributing prostaglandin targeting TM and uveoscleral outflow systems.

Methods: Two primary lines of normal human TM cells were treated with Lumigan (0.01micrograms/ml), Rhopressa (0.02 micrograms/ml), and Vyzulta (0.024 micrograms/ml) for 5 days and TMT labeled quantitative proteomics was performed on whole cell lysates prepared in 8M urea. Pathway enrichment and protein-protein interaction analyses were performed using Shiny GO v0.741 based on fold change greater than 1.5-fold for increase and lesser 0.75-fold for decrease in both lines compared to sham controls.

Results: Lumigan upregulated proteins including integrin-[beta]1 and insulin-like growth factor-binding protein 7 and downregulated PDZ and LIM domain protein 2 (PDLIM2), an actin binding protein and enhancer of cell-matrix interactions; Ephrin-B2 (EFNB2), cell-surface ephrin receptor, which increases actomyosin contraction; Tubulin-[beta]8 (TUBB8) known to upregulate microtubule assembly; Rho guanine nucleotide exchange factor 5 (ARHGEF5) involved inactivation of RhoGTPase, and Antxr cell adhesion molecule 1 (ANTXR1) inducing cell adhesion. Rhopressa induced TF pathway inhibitor2 (TFPI2), a Kunitz-type serine protease inhibitor, implicated in attenuating tissue fibrosis; lowered PDLIM2 and major RNA splicing and cell junction-related proteins including SH3 domain-binding protein 1 (SH3BP1), and Serine/threonine-protein kinase (WNK4). Vyzulta upregulated TFPI2 and [alpha]2-HS glycoprotein (AHSG), a TGF[beta] signaling inhibitor and decreased structural constituent of cytoskeleton like catenin-[alpha]2 (CTNNA2) and CD2-associated protein (CD2AP).

Conclusion: In this first of a kind pilot study, we propose a common mechanistic evidence of decreased TM actin-cell adhesion-ECM interactions in the TM outflow pathway using three different intraocular pressure lowering drugs.

PO-12

TELEMEDICINE LENSOMETRY: DETERMINATION OF SPECTACLE PRESCRIPTION BY ANALYSIS OF CELL PHONE IMAGES OF COINS THROUGH SPECTACLE LENSES

Joseph Miller*, Jim Schwiegerling, Erin Harvey

Purpose: We wished to determine sphero-cylindrical lens (SCL) prescriptions from cell phone photos of coins viewed the lenses.

Methods: Reference sizes are required at the table and glasses. Digital Image metadata provides camera lens focal length, and often pixel spacing. When pixel spacing is not provided, a second image is required. We used trial lenses (TL) (-10 to +10 DS in 1D steps, and +1 to +4 DC in 1 D steps), a Google Pixel 6 mobile, and two US quarter dollar coins. The TL was hand-held about 2 inches above the lens coin (LC), adjacent to the table coin (TC). The image of the TL, LC and TC was taken from about 12 inches. A micrometer measured coin and TL diameters. Photos were measured using ImageJ (NIH). The perimeter pixel coordinates were determined for 8 points around the TC (for table distance), TL (for lens distance) and LC (for lens magnification) and entered into an Excel Spreadsheet (Microsoft Inc). Implicit equations based upon thin lens approximations and ray tracing were solved iteratively using the Excel Solver Function.

Results: 28 images (20 from spheres and 8 from cylinders) were analyzed. Any astigmatism measured from a spherical lens represents error. The Spherical Equivalent (SE) of the SCL did not differ from known sphere power (t=-0.0674, 27 df), 95% CI (-0.192 to 0.180 D). Cylinder error in the sphere measurements averaged 0.45 D, with 75% of the observations being less than 0.75 D. No systematic effects of decreasing accuracy with either lens power (from lens tilt) or minification were observed.

Conclusion: We can determine lens power from cell phone photos of coins through spectacles. The resulting accuracy is sufficient to characterize sphere and cylinder power within a diopter. The Excel spreadsheet is available from the author.

PO-13

CYCLIN D1 EXPRESSION AND MOLECULAR GENETIC FINDINGS IN PERIOCULAR HISTIOCYTIC-DENDRITIC NEOPLASMS

Tatyana Milman*, Maya Eiger-Moscovich, Roger Henry, Cristiane Ida

Purpose: Histiocytic-dendritic neoplasms (HDN) can involve the eye and other organs leading to significant morbidity and even mortality. Prior studies largely on non-periocular histiocytic-dendritic neoplasms demonstrated mutations in mitogen-activated protein kinase (MAPK) genes resulting in MAPK pathway activation. CCND1 (cyclin D1) protein is consistently upregulated as a result of MAPK signaling activation. CCND1 immunohistochemical stain has been shown to be a helpful ancillary diagnostic marker and to correlate with MAPK gene mutations in non-periocular HDN. The goal of this study was to determine whether periocular histiocytic-dendritic neoplasms express CCND1 by immunohistochemistry and to further characterize their genetic basis.

Methods: Pathology records were retrospectively searched for all patients with histiocytic-dendritic neoplasms diagnosed between 1995-2020. Select cases with non-specific histiocyte-rich ocular adnexal inflammation served as controls. Immunohistochemistry with CD68, S100, CD1a, and CCND1 was performed. A subset of histiocytic-dendritic neoplasms was evaluated via next generation sequencing (NGS) and digital droplet PCR (ddPCR).

Results: There were 36 patients with histiocytic-dendritic neoplasms: 9 juvenile xanthogranuloma, 8 adult onset asthma and periocular xanthogranuloma, 7 Langerhans cell histiocytosis, 5 Rosai-Dorfman disease, 5 adult isolated xanthogranuloma, 1 Erdheim-Chester disease, and 1 histiocytic sarcoma. Eleven patients with non-specific histiocyte-rich inflammation were selected as controls. When compared to non-specific inflammation, histiocytic-dendritic neoplasms demonstrated strong nuclear staining for CCND1 in >50% lesional cells [23/36 (64%) vs. 0/11 (0%), $p<0.001$]. In contrast, CCND1 nuclear expression was seen in <10% in all tissues with non-specific inflammation. NGS and ddPCR on a subset of 17 histiocytic-dendritic neoplasms demonstrated MAPK gene mutations in all 16 cases with amplifiable DNA.

Conclusion: CCND1 immunohistochemical stain is a useful diagnostic marker for periocular histiocytic-dendritic neoplasms, correlating with underlying mutations in MAPK genes.

PO-14

RETURN OF THE KING

Steven Newman*

Purpose: Although spirochaetes have been present in both hemispheres, the venereal aspects of syphilis first manifested itself in 1495 when the French Army, mostly Mercenaries, took the city of Naples. Celebrating the victory with debauchery, a new disease was recognized. Returning to France the mercenaries scattered, spreading this disease through Europe. Initially, this disease was much more serious than it currently is, with abscesses, ulcers, general sores, and significant mortality, although less than the bubonic plaque. It was referred to as Great Pox to distinguish it with small pox which was also rampant at that time. It was recognized that it had three phases with genital sores and chancres, followed by a generalized rash and systemic symptoms, and after a long latent period, patients could develop abscesses, ulcers, cardiac, and CNS involvement. Interstitial keratitis and neuro-ophthalmic manifestations were noted. With increased production of penicillin in the 1940s it was recognized that penicillin would cure syphilis. With this advent, syphilis seemed to decline in frequency, although remained a significant disease during the two world wars. Since the advent of HIV, there has been a marked resurgence of syphilis, both systemically and ophthalmically.

Methods: A retrospective review of 21 patients seen in a university setting with some of the myriad aspects of syphilis.

Results: Syphilis can involve the eye, most commonly causing uveitis, which may be both anterior and posterior. Since this may be mistaken for other forms of uveitis, whereas syphilis is specifically treatable, it is imperative that this be recognized. Although far less frequent now, the late manifestations of syphilis are less, there has been a resurgence and it is imperative that generalist recognize the myriad aspects of syphilis so that it is not missed and allowed to progress third stage.

Conclusion: Although syphilis has changed substantially over the last more than 500 years, it still is a frequent cause of neuro-ophthalmic manifestations and uveitis. It is eminently treated if recognized, which prevents these severe complications of tertiary involvement.

PO-15

AUTOPTOSIS: INTRODUCING ARTIFICIAL INTELLIGENCE TO THE OCULOFACIAL SURGERY

Pete Setabutr*, **Jeremiah Tao**, Darvin Yi, Abdullah Aleem, Manoj Nallabothula, Joelle Hallak

Purpose: Ptosis is an eye condition where the upper eyelid droops. The current method to assess for ptosis involves manual measurements that are prone to inaccuracies. This work presents a fully automated dual model system for detection of ptosis that is objective, accurate, reliable, and reproducible.

Methods: The data for this study were queried from the Illinois Ophthalmic Database Atlas (I-ODA) that was developed by the Department of Ophthalmology at the University of Illinois Chicago. The dataset consisted of 820 facial images collected in a clinical setting and was augmented by Flickr-Faces-HQ images. A subset of 100 images was hand-selected by an expert oculoplastic surgeon to create a held-out test set. All values reported in the results were derived from this test set. The eye regions were extracted from the facial images and were fed into two pipelines. AutoPtosis was a combination of both these pipelines, where a predictive model to predict ptosis.

Results: The deep learning pipeline performed well giving a 0.955 accuracy, 0.978 precision, 0.93 recall, while the clinically inspired pipeline gave 0.73 accuracy, 0.802 precision, 0.61 recall. When both pipelines were combined accuracy was 0.94, precision was 1.00, and recall was 0.88.

Conclusion: AutoPtosis combined the preferable aspects of both deep learning and automated eyelid analysis to create a rapid and automatic system for detection of ptosis all while achieving results almost as good as an expert physician. The models performed optimally and can be deployed there as a helping tool to generate results which can then be verified.

PO-16

CLOSURE OF MACULAR HOLES WITH TOPICAL THERAPY AND WHY THE HYDRATION THEORY OF MACULAR HOLE FORMATION MAY BE INACCURATE

Kent Small*, Jessica Avetisjan, Fadi Shaya

Purpose: Idiopathic macular holes are generally a surgical disease. While small, early macular holes may rarely close spontaneously, most require surgery for repair. Edema surrounding the edge of the hole is thought to be contributory and treating the edema is thought to possibly be able to close the hole. Herein, we report our experience with a non-surgical approach to repairing macular holes.

Methods: A retrospective chart review of 13 consecutive patients with macular holes from 2018-2021. Topical therapy consisted of a steroid, a non-steroidal and a carbonic anhydrase inhibitor. The setting was a solo retinal surgeon's practice. Follow-up ranged from 6 months to 2 years. Data collected included size, stage and duration of macular hole, topical agents used and duration, grading scale of macular edema present, lens status and complications from topical or surgical therapy. The grading scale ranged from 0 (no intraretinal edema at all) to 4 (maximum, large amount of edema). If the hole failed to close after 3 months of topical therapy, intravitreal ocriplasmin (Jetrea) was offered and / or vitrectomy with membrane peeling and fluid gas exchange. Best corrected visual acuities (BCVA) were converted to logMAR pre and post hole closure with topical therapy or surgery. SD-OCT images were captured of all patients.

Results: Seven of the 13 (54%) eyes initially treated topically experienced successful macular hole closure. Small holes (less than 230 microns) with better initial vision (0.474 vs 0.796 logMAR) were more likely to respond favorably to topical therapy (121 microns vs 499 microns). Additionally, holes with less surrounding edema responded better. Of the holes not responding to topical therapy, all were subsequently closed with pars plana vitrectomy (PPV), membrane peel and fluid / gas exchange.

Conclusion: Topical therapy is a reasonable first line treatment for macular holes with a better than 50% success rate. This is especially true for small, early onset holes with minimal or no edema. There was no apparent deleterious effect of a 1-3 month delay while treating with eye drops as surgery still had a very high success rate.

PO-17

OVERMINUS LENS THERAPY FOR CHILDREN 3 TO 10 YEARS OF AGE WITH INTERMITTENT EXOTROPIA: A RANDOMIZED CLINICAL TRIAL

Donny Suh*, PEDIG Members

Purpose: To evaluate the effectiveness of overminus spectacles to improve distance intermittent exotropia (IXT) control.

Methods: This randomized clinical trial conducted at 56 clinicalsites between January 2017 and January 2019 associated with the Pediatric Eye Disease Investigator Group enrolled 386 children aged 3 to 10 years with IXT, a mean distance control score of 2 or worse, and a refractive error between 1.00 and −6.00 diopters (D).

Results: The mean (SD) age of 196 participants randomized to overminus therapy and 190 participants randomized to nonoverminus treatment was 6.3 (2.1) years, and 226 (59%) were female. Mean distance control at 12 months was better in participants treated with overminus spectacles than with nonoverminus spectacles (1.8 vs 2.8 points; adjusted difference, −0.8; 95% CI, −1.0 to −0.5; P < .001). At 18 months, there was little or no difference in mean distance control between overminus and nonoverminus groups (2.4 vs 2.7 points; adjusted difference, −0.2; 95% CI, −0.5 to 0.04; P = .09). Myopic shift from baseline to 12 months was greater in the overminus than the nonoverminus group (−0.42 D vs −0.04 D; adjusted difference, −0.37 D; 95% CI, −0.49 to −0.26 D; P < .001), with 33 of 189 children (17%) in the overminus group vs 2 of 169 (1%) in the nonoverminus group having a shift higher than 1.00 D.

Conclusion: E Children 3 to 10 years of age had improved distance exotropia control when assessed wearing overminus spectacles after 12 months of overminus treatment; however, this treatment was associated with increased myopic shift. The beneficial effect of overminus lens therapy on distance exotropia control was not maintained after treatment was tapered off for 3 months and children were examined 3 months later.

PO-18

A DIGITAL MIRCRO SCREEN FOR THE ENHANCED APPEARANCE OF OCULAR PROSTHETIC MOTILITY

Jeremiah Tao*, Emily Charlson, Ian Harris

Purpose: To improve the apparent motility of ocular prosthetic devices using technology. Prevailing ocular prostheses are acrylic shells with a static eye image rendered on the convex surface. A limited range of ocular prosthetic movement and lack of natural saccadic movements commonly causes the appearance of eye misalignment that may be disfiguring. Digital screens and computational systems may obviate current limitations in eye prosthetic motility and help prosthetic wearers feel less self-conscious about their appearance.

Methods: We applied convoluted neural networks (CNN) to track pupil location in various conditions. These algorithms were coupled to a micro screen digital prosthetic eye (DPE) prototype to assess the ability of the system to capture full ocular ductions and saccadic movements in a miniaturized, portable, and wearable system.
Results: The CNN captured pupil location with high accuracy. Pupil location data were transmitted to a miniature screen ocular prosthetic prototype that displayed a dynamic contralateral eye image. The transmission achieved a full range of ocular ductions and with grossly undetectable latency. Lack of iris and sclera color and detail, luminosity, dimensionality constraints, and some image instability limited the real eye appearance. Yet, the digitally rendered eye moved in the same amplitude and velocity as the native, tracked eye.

Results: The CNN captured pupil location with high accuracy. Pupil location data were transmitted to a miniature screen ocular prosthetic prototype that displayed a dynamic contralateral eye image. The transmission achieved a full range of ocular ductions and with grossly undetectable latency. Lack of iris and sclera color and detail, luminosity, dimensionality constraints, and some image instability limited the real eye appearance. Yet, the digitally rendered eye moved in the same amplitude and velocity as the native, tracked eye.

Conclusion: Real-time image processing using convoluted neural networks coupled to micro cameras and a mini screen DPE may offer improvements in amplitude and velocity of apparent prosthetic eye movement. These developments, along with ocular image precision, may offer a next generation eye prosthesis.

PO-19

ASSOCIATION BETWEEN SOCIAL VULNERABILITY SCORES AND GLAUCOMA IN THE CALIFORNIA MEDICARE POPULATION

Victoria Tseng*, Ken Kitayama, Deyu Pan, Fei Yu, **Anne Coleman**

Purpose: To examine associations between Centers for Disease Control and Prevention Social Vulnerability Index (CDC SVI) scores and glaucoma in the California Medicare population.

Methods: The study included all 2019 California Medicare beneficiaries ≥65 years old. SVI scores for each beneficiary were determined by the beneficiary's zip code of residence using 2018 US census data. SVI scores included overall SVI and SVI within 4 themes of socioeconomic status (SVI-SES), household composition and disability (SVI-HCD), minority status and language (SVI-MSL), and housing type and transportation (SVI-HTT). All SVI scores were analyzed by quartiles where higher quartile indicated higher social vulnerability. Glaucoma was defined by International Classification of Diseases, 10th Revision, Clinical Modification diagnosis codes and included any glaucoma, primary open angle glaucoma (POAG), secondary open angle glaucoma (SOAG), and angle closure glaucoma (ACG). Associations between SVI scores and glaucoma prevalence were examined using logistic regression modeling, adjusting for age, sex, race/ethnicity, Charlson Comorbidity Index, pseudophakia, and age-related macular degeneration.

Results: Of 5,856,492 California Medicare beneficiaries, there were 220,662 (3.8%) with any glaucoma, 171,988 (2.9%) with POAG, 8,827 (0.2%) with SOAG, and 12,978 (0.2%) with ACG. In adjusted analyses, higher overall SVI quartiles were associated with decreased prevalence of any glaucoma (odds ratio [OR]=0.83, 95% confidence interval [CI]=0.82, 0.84, Q4 vs. Q1). However, higher SVI quartiles were associated with increased prevalence of ACG for the SVI-MSL (OR=1.48, 95% CI=1.40, 1.57, Q4 vs. Q1) and SVI-HTT (OR=1.06, 95% CI=1.01, 1.12, Q4 vs. Q1) themes.

Conclusion: Associations between SVI scores and glaucoma in the California Medicare population vary by glaucoma type. The etiologies of these differences are unclear and require further investigation of access to care and sociodemographic variations in glaucoma diagnosis rates.

PO-20

COMPUTER VISION SYNDROME (CVS) IN UNDERGRADUATE AND MEDICAL STUDENTS DURING THE COVID-19 PANDEMIC

Catherine Wang*, Katherine Joltikov, Sasha Kravets, **Deepak Edward**

Purpose: The purpose of this study was to evaluate Computer Vision Syndrome (CVS) in undergraduate and medical students since transitioning to online learning during the COVID-19 pandemic.

Methods: This was a single center survey based study using a validated CVS questionnaire (CVS-Q). The survey was distributed to 20,080 undergraduate students and 680 medical students at the University of Illinois at Chicago. The primary outcome measures were prevalence of CVS (based on CVS severity score of 6 or more), frequency of CVS and intensity of CVS symptoms.

Results: The survey was completed by 2300 undergraduate students (11.4% response rate) and 154 medical students (22.6% response rate). The prevalence of CVS was found to be 77.1% in undergraduate students and 69.1% in medical students. CVS-Q severity scores were highest for headaches and eye dryness, with more than half of students reporting worsening of symptoms since March 2020. For both undergraduate and medical students, increased time spent on online learning, blue light glasses usage, and increased number of device usage were associated with higher CVS severity scores ($p<0.05$).

Conclusion: CVS among undergraduate and medical students has increased since the start of the COVID-19 pandemic. Greater time spent on online learning, use of blue light glasses, and use of a higher number of devices were associated with increased symptom severity of CVS.

PO-21

CORRELATION OF INTRAOPERATIVE OPTICAL COHERENCE TOMOGRAPHY OF CRYSTALLINE LENS DIAMETER, THICKNESS AND VOLUME WITH BIOMETRY AND AGE

George O. Waring, IV*♦, **Karolinne Rocha**, Larissa Gouvea, Rapheal Penatti

Purpose: To characterize crystalline lens dimensions derived from in-vivo spectral-domain optical coherence tomography (SD-OCT) and identify associations between these parameters, ocular biometry and age.

Methods: In this retrospective study, lens thickness (LT), lens diameter (LD) and lens volume (LV) were measured intraoperatively with SD-OCT in 293 eyes undergoing lens surgery. Correlations among LT, LD, LV, age, axial length (AL) and anterior chamber depth (ACD) were analyzed. Multiple regression analysis was performed to determine whether a combination of biometric data could predict LD and LV.

Results: Wide variation was observed in LT (3.6 to 5.7mm), LD (7.5 to 11.9mm) and LV (119.9 to 312.4 mm3) of aging eyes. Correlations among the 3 lens dimensions were statistically significant (LV-LT: r=0.785; P<.001; LV-LD: r=0.696; P<.001; LT-LD: r=0.121; P=.039). With age, the correlation coefficients of LT, LD and LV were 0.526, 0.326 and 0.573 respectively (P<.001). While there was significant correlation of AL with LT (r=-0.137; P=.002) and LD (r=0.268; P<.001), it was not significant with LV (r=0.084; P=.15). Subgroup analysis revealed that 19.8% of the long eyes had LD >1 standard deviation (SD) above and 5.2% had LD <1 SD below the mean LD.

Conclusion: The dimensions of the aging lens vary considerably, and are most accurately characterized by direct measurement of LT, LD, and LV rather than assumptions based on AL. These findings challenge historically proposed relationships between LD and AL, and represent a normative dataset of contemporary geometric features of the aging lens, possibly aiding in surgical decision making and future developments in lens surgery.

PO-22

TREATMENT OF SMALL POSTERIOR UVEAL MELANOCYTIC LESIONS

David Wilson*

Purpose: Recent demonstration that BAP1 mutations occur very early in the course of uveal melanocytic neoplasms warrants renewed consideration of treatment of smaller tumors than what is current clinical practice. The purpose of this report is to evaluate the safety and efficacy of cryotherapy and "en bloc" resection in the treatment of small posterior uveal neoplasms.

Methods: Inclusion criteria consisted of the presence of a posterior uveal tumor with clinical features of a melanoma, measuring less than 2.5 mm in thickness, and occurring in a location such that treatment with radiation would predictably lead to severe loss of vision. The surgical procedure consisted of pars plana vitrectomy followed by triple freeze thaw cryotherapy using an endocryoprobe. A visual endpoint was utilized to assess depth and margin of freezing. Following the cryotherapy procedure, lesions in which full thickness choroidal resection was possible underwent removal of the tumor "en bloc" using endodiathermy to incise the retina and choroid. Endolaser application to the margin of resection and a gas fluid exchange completed the procedure. A total of nine tumors were treated from 1996 to 2006.

Results: Success, defined as an excavated chorioretinal scar with no local occurrence was achieved in five of nine cases. These five cases maintained visual acuity better than 20/40. Complications of the procedure consisted of segmental optic atrophy (n=3), choroidal neovascularization (n=1), and recurrent tumor growth (n=2). Two patients died of metastatic disease.

Conclusion: In this small series, with long clinical follow up, there were substantial local complications to this treatment approach. However, some patients did remarkably well. This surgical procedure could be refined and possibly utilized as a vision sparing approach to treat small melanocytic tumors as is likely necessary to reduce metastatic spread of uveal melanoma.

Notes

CLAIM YOUR CME CREDITS ONLINE!

Visit **www.cmesurvey.site/AOS22**
to complete the post meeting evaluation that will direct you
to the CME credit statement form upon completion.

Scan this QR code with your mobile device for quick access to the evaluation:

FUTURE ANNUAL MEETINGS

2023 AOS Annual Meeting

The Omni Grove Park Inn
Ashville, North Carolina
May 18–20

2024 AOS Annual Meeting

The Lodge at Torrey Pines
La Jolla, California
May 16–18

2025 AOS Annual Meeting

The Ritz-Carlton, Naples
Naples, Florida
May 15–17

The American Ophthalmological Society
Established 1864

American Ophthalmological Society
655 Beach Street, San Francisco, CA 94109
T: (415) 561-8578 · F: (415) 561-8531 · E: admin@aosonline.org
Website: aosonline.org · Facebook: @aosonline · Twitter: @aostweets