Wills Eye Hospital at ARVO 2024 Annual Meeting

Congratulations to the Wills Eye Attendings/Faculty and Trainees who are delivering **25** presentations (**2** papers and **23** posters) and are coauthors on a total of **71** presentations (**13** papers and **58** posters) at this year's Annual meeting.

Note: 1- Wills faculty/staff/trainees are highlighted in bold; 2- presentations by Wills faculty/staff/trainees are highlighted with purple shading

Sunday, May 5, 2024 Wills Eye Presenters	
POSTERS	
8:00 - 9:45 AM Pacific	
Poster Session: AMD-1 (anti-VEGF) (108)	
Poster Number: ***B0284***	Frequency of anti-VEGF injections before and after pars plana vitrectomy in eyes with neovascular age-related macular degeneration ****Turner Wibbelsman**, **Bita Momenaei**, **Roselind Ni**, **Anthony Obeid**, **Sandy Wong**, **Michael Cohen***
1:00 - 2:45 PM Pacific	
Poster Session: Retina miscellaneous I (136)	
Poster Number: ***B0411***	Accuracy and readability of after visit summaries for retinal conditions generated by a large language model ***Nikhil Bommakanti**, **Fatima Rizvi**, **Anza Rizvi**, **Hana A. Mansour**, **Bita Momenaei**, **Jordan Safran**, **Michael Yu**, **Anthony Obeid**, **Yoshihiro Yonekawa***

Poster Session: Vitreoretinal surgery and retinal detachment I (138)	
Poster Number: ***B0550***	Outcomes of Vitreoretinal Surgery for Retinal Detachment Associated with Retinal Hemangioblastoma in Von Hippel-Lindau Disease ***Fatima Rizvi, Asad Farooq Durrani, Hana A. Mansour, Anza Rizvi, Bita Momenaei, Carol Shields, Jose S. Pulido***
Poster Number: ***B0579***	Incidence of Management Changes on Postoperative Day One After Epiretinal Membrane Peel ***Hannah E. Anderson, Fatima Rizvi, Anza Rizvi, Hana A. Mansour, Bita Momenaei, Sunir Garg***
Poster Number: ***B0583***	Outcomes of Eyes with Retinoschisis-Related Retinal Detachment ***Bita Momenaei, Asad Farooq Durrani, Kristine Wang, Jason Hsu***
Poster Number: ***B0588***	Postoperative Rhegmatogenous Retinal Detachment Following Vitrectomy and Subretinal Tissue Plasminogen Activator for Submacular Hemorrhage ***Jordan Safran, Bita Momenaei**, **Jonathan Lee Martin**, Benjamin Crain, **Hana A. Mansour**, **Collin Richards**, **Jason Hsu***

Sunday, May 5, 2024

PAPERS	
1:30 - 1:45 PM Pacific	
Paper Session: AMD: Clinical research I (114)	
6E - Seattle Convention Center - Arch Building	Photobiomodulation Using the Valeda Multiwavelength Light Delivery System Demonstrates Significant Reduction in Risk for Vision Loss and Onset of Geographic Atrophy in Dry Age-Related Macular Degeneration *Todd Schneiderman, Victor H. Gonzalez, David S. Boyer, Richard B. Rosen, Samantha Xavier, Allen Hu, David Warrow, Eleonora M. Lad, Diana V. Do, **Allen Ho**, Glenn J. Jaffe, Marion Ronit Munk, Cindy Croissant, Stephanie Tedford, Rene Ruckert, Clark Tedford*
1:45 – 2:00 PM Pacific	
Paper Session: Development of computational modeling, machine learning and artificial intelligence approaches in glaucoma (113)	
6A - Seattle Convention Center - Arch Building	How Far in the Future Can a Deep Learning Model Forecast Pointwise Visual Field (VF) Data Based Solely on One VF Data Input *Hiroshi Ishikawa, Ashkan Abbasi, Sowjanya Gowrisankaran, Bhavna Josephine Antony, Xubo Song, **Gadi Wollstein, Joel S. Schuman***
Paper Session: Retina miscellaneous: Translational (118)	

612 - Seattle Convention Center - Arch Building	OCU400 Nuclear Hormone Receptor-Based Gene Modifier Therapy: Safety and Efficacy from Phase 1/2 Clinical Trial for Retinitis Pigmentosa Associated with NR2E3 and RHO Mutations **Byron L. Lam, Arun K. Upadhyay, Shankar Musunuri, Murthy Chavali, Sahar Matloob, Nalin Mehta, David G. Birch, Paul Yang, Benjamin Bakall, Nieraj Jain, **Jose S. Pulido**, Borooah Shyamanga*
Paper Session: Neuro-ophthalmology and genetics (120)	
620 - Seattle Convention Center - Arch Building	Lenadogene Nolparvovec Gene Therapy for Leber Hereditary Optic Neuropathy in the Real-Life Setting **Jose Alain Sahel, Catherine Vignal-Clermont, Valerio Carelli, Chiara La Morgia, **Mark L. Moster, Robert C. Sergott**, Sean P. Donahue, Helene Dollfus, Thomas Klopstock, Rabih Hage, Vasily Smirnov, Catherine Cochard, Francis Munier, Pauline Zoppe, Magali Taiel, Patrick Yu-Wai-Man*
POSTERS	
1:00 - 2:45 PM Pacific	
Poster Session: Retinoblastoma (127)	
Poster Number: A0002	International Retinoblastoma Liquid Biopsy Consortium (IRB-LBC): A Multi-Center, Multi-National Collaborative Study on Aqueous Humor as a Liquid Biopsy Tool for Retinoblastoma **Brianne Brown, Drishti Pandya, Liya Xu, **Carol Shields**, Hans E. Grossniklaus, Andrew W. Stacey, Alison Skalet, Matthew W. Wilson, Janice Lasky Zeid, Armin Afshar, Brenda L. Gallie, Eric Hansen, Junne Kamihara, Bhavana Chawla, Talita de Toledo Lima, Jesse L. Berry*
Poster Session: Beyond associations: Studies in functional characterization, gene regulation and multi-omics (132)	
Poster Number: A0509	The Vitreous Proteome and its Association with Intrinsic Protein Disorder **Michael Antonietti, David J. Taylor Gonzalez, **Mak B. Djulbegovic**, Jason Greenfield, Vladimir Uversky, Jayanth Sridhar, Carol Karp*
Poster Number: A0517	Multi-omics of retinas from free-ranging primates with naturally occurring thin retinal nerve fiber layer **Amanda Melin, David Young, Arthur Fernandes, Rachel Munds, Arturo Barron-Arrambide, Palaiologos Alexopoulos, CBRU Cayo Biobank Research Unit, Michael Montague, Armando Burgos-Rodriguez, Melween I. Martinez, Daniel Promislow, **Gadi Wollstein**, John Danias, James Higham, Qingrun Zhang*
Poster Session: Retina miscellaneous I (136)	

Poster Number: *B0362*	Endophthalmitis Following Pars Plana Vitrectomy: Clinical Features, Visual Outcomes, and Risk Factors **Brandon Bates, Caroline Rosanky, Jared Moon, Saima A. Khan, Maitri Pancholy,* ***Sunir Garg****, Philip Storey*
3:15 – 5:00 PM Pacific	
Poster Session: Novel ideas in microbiology and immunology (155)	
Poster Number: *A0217*	Distinct Immunoregulatory Properties of Immune Cells that Associate with the Lens Capsule Surface in Response to Different Eye Pathologies **Phuong Le, Sonali Pal-Ghosh, Mary J. Mattapallil, Rachel R. Caspi, Mary Ann Stepp,* ***A Sue Menko (TJU)***
Poster Session: Ocular flow and biomechanics (159)	
Poster Number: *B0001*	Visual stimulation-induced cerebrospinal fluid dynamics are impaired in glaucoma **Ji Won Bang, Carlos Parra, Kevin Yu****, Gadi Wollstein, Joel S. Schuman,*** *Kevin C. Chan*

Monday, May 6, 2024 Wills Eye Presenters	
PAPERS	
4:15-4:30 PM Pacific	
Paper Session: Retinitis pigmentosa (236)	
612 - Seattle Convention Center - Arch Building	Longitudinal BCVA analysis of low- or high-dose MCO-010 mutation agnostic optogenetic therapy for retinitis pigmentosa: 12-month results from a Phase 2b/3 randomized, sham-controlled, patient- and assessor-masked clinical trial (RESTORE) ****Allen Ho***
POSTERS	
8:30 – 10:15 AM Pacific	
Poster Session**:** Diabetic retinopathy - Epidemiology (222)	
Poster Number: ***B0124***	Characterizing Patients with a History of Diabetic Retinopathy: A Survey Study ****Anthony Obeid, Rebecca Soares, Diego Arias, Ankur Nahar, Christopher Ahmed, Bita Momenaei, Allen Ho***
Poster Number: ***B0139***	Biomarker-based stress measures as risk factors and mediators of diabetic retinopathy racial disparities ****Young Sheng, Binod Acharya, Brandon George, Leslie Hyman***
Poster Session: Tools and advancements in glaucoma diagnosis, monitoring, medications, and lasers (224)	
Poster Number: ***B0272***	Safety and longevity of IOP control after bimatoprost implant administration ****Marlene Moster**, James Berdahl, James Paauw, Steven R. Sarkisian, Dana J. Wallace, Marina Bejanian, Jenny Jiao, Jyotsna Maram, Ashley Nguyen, William Christie*
3:00 – 4:45 PM	
Poster Session: Big data and EHR analysis (250)	
Poster Number: A0316	Are Treatment Patterns for Endophthalmitis After Cataract Surgery Following the EVS Trial Recommendations?: An IRISÂ® Registry (Intelligent Research in Sight) Analysis ****Maurizio Tomaiuolo, Jordan Deaner,** Brian L. VanderBeek**, Zeba A. Syed, Binod Acharya, Qiang Zhang, Joel S. Schuman, Leslie Hyman***
Poster Session: Glaucoma and biomechanics (252)	

Poster Number: *A0428*	In Vivo Longitudinal Biomechanical Changes of the Lamina Cribrosa Under Chronic Elevated Intraocular Pressure ****Gabriela Cavagnoli Schwantes****, Leon Kamen,* ***Ronald Zambrano****, Timothy K. Chung, John Danias, Jonathan Pieter Vande Geest****, Gadi Wollstein***
Poster Session: Structure and function of the optic nerve and posterior segment (253)	
Poster Number: *A0471*	Long-Term Visual Field Progression in Patients with Optic Disc Drusen with or without Glaucoma ****Rohit Reddy, Wesam Shalaby, Sagar Shah, Kartik Kumar, Qiang Zhang, Jonathan S. Myers, Ping Huang***

Monday, May 6, 2024

PAPERS	
9:30 – 9:45 AM	
Paper Session: Structure and function of the optic nerve and posterior segment (202)	
6A - Seattle Convention Center - Arch Building	Structural and Functional Deterioration along the Visual Pathways in Patients with Glaucoma or Non-glaucomatous Optic Neuropathies **Kevin Yu, Ji Won Bang,* ***Gadi Wollstein, Joel S. Schuman****, Kevin C. Chan*
9:45 – 10:00 AM	
Paper Session: Novel findings in inherited retinal disorders (212)	
Tahoma 3 - Seattle Convention Center - Arch Building	PFKFB1 is a novel candidate gene identified in a family with a complex retinal disorder **Megan C. Fischer, Linda M. Reis, Sanaa Muheisen, Elena Sorokina, Samuel Thompson,* ***Rebecca Procopio, Jose S. Pulido****, Elena V. Semina*
POSTERS	
8:30 – 10:15 AM Pacific	
Poster Session: Retinal vascular diseases and ROP I (220)	
Poster Number: *B0067*	Anti-VEGF Therapy for Stages 3 and Stage 4 Proliferative Sickle Cell Retinopathy Results in Improved Anatomic and Visual Outcomes **Jennifer I. Lim, Ogugua Okonkwo,* ***Carl Regillo****, Charles Clifton Wykoff, Jessica Cao,* ***Hana Mansour****, Bernadette A. Miao*
Poster Number: *B0082*	Proposed Mechanism of Sea Fan Neovascularization Using a Computational Model of Diffusion Limited Aggregation **Joshua Ong, Jonah E. Yousif, Rachana Haliyur,* ***Nikhil Bommakanti****, Mark W. Johnson, Benjamin Young, Jason Matthew Lewis Miller*

Poster Session: Visual impairment and visual quality of life (223)	
Poster Session: *B0190*	Prospective multicenter observational study to assess the burden of herpes zoster ophthalmicus: Baseline results **Emily Gower, Laura T. Pizzi, **Benjamin E. Leiby (TJU)**, David Chu, Beth R. Friedland, Haresh Ailani, **Ayako Shimada (TJU)**, Katherine M. Prioli, Samantha N. Valliant, Lydia Y. Lee, David Singer, Justin D. Gatwood, **Ann P. Murchison***
Poster Session: Corneal imaging and biomechanics (228)	
Poster Number: *B0483*	Biomechanical assessments of high-fluence corneal crosslinking with supplemental oxygen using Optical Coherence Elastography in ex vivo rabbit eyes **Behrouz Tavakol, Stuart Elmhurst, Jason Hill, **Clark Chang**, Alex Yildizyan, David Usher*
3:00 – 4:45 PM	
Poster Session: Melanoma (246)	
Poster Number: *A0102*	Does melanoma tumor size matter in long term patient outcomes: A simplified approach **Rolika Bansal, Carol Shields*
Poster Session: AI in the retina I (248)	
Poster Number: *A0201*	Applications of Multimodal Generative AI in a Real-World Retina Clinic Setting **Seyyedehfatemeh Ghalibafan, David J. Taylor Gonzalez, Louis Z. Cai, Brandon Chou, Sugi Panneerselvam, Spencer Conrad Barrett, **Mak B. Djulbegovic**, Nicolas A. Yannuzzi*
Poster Session: Machine learning: Progress on segmentation and other developments (249)	
Poster Number: *A0253*	A Unified Framework for Visual Field Test Estimation and Forecasting using Convolution and Attention Networks **Ashkan Abbasi, Sowjanya Gowrisankaran, Bhavna Josephine Antony, Xubo Song, **Gadi Wollstein, Joel S. Schuman**, Hiroshi Ishikawa*
Poster Number: *A0272*	Self-Supervised OCT Denoising: Streamlined Image Enhancement without Clean Targets or Repeated Scans **Shijie Li, Palaiologos Alexopoulos, **Ronald Zambrano**, Anse Vellappally, **Joel S. Schuman, Gadi Wollstein**, Guido Gerig*
Poster Number: *A0273*	Automated motion artifact detection in en face OCT images using deep learning algorithm

	Papis Wongchaisuwat, Ashkan Abbasi, Sowjanya Gowrisankaran, Bhavna Josephine Antony, Xubo Song, **Gadi Wollstein, Joel S. Schuman**, Hiroshi Ishikawa*
Poster Number: *A0318*	The Association Between Food Insecurity and Chronic Eye Disease in the National Institutes of Health All of Us Research Program ****Ramin Talebi (TJU)**, Fei Yu, Victoria L. Tseng, Anne Coleman*
Poster Number: *A0325*	Unified Group Sequential Designs for Randomized Eye Trials **Guoqing Diao, Emily Y. Chew, **Julia A. Haller, Leslie Hyman, Qiang Zhang***
<u>Poster Session:</u> Structure and function of the optic nerve and posterior segment (253)	
Poster Number: *A0467*	Regional differences in optical coherence tomography (OCT) optic nerve head and macula parameters for detecting glaucoma in eyes with and without high axial myopia **Jasmin Rezapour, Evan Walker, Akram Belghith, Christopher Bowd, Massimo Antonio Fazio, Anuwat Jiravarnsirikul, **Leslie Hyman**, Jost B. Jonas, Robert Weinreb, Linda M. Zangwill*

Tuesday, May 7, 2024 Wills Eye Presenters	
POSTERS	
8:30 – 10:15 AM	
Poster Session: Anterior segment, ocular trauma and surgery - Epidemiology (314)	
Poster Number: A0050	Retinal Detachment after Commotio Retinae: Prevalence and Clinical Characteristics ***Olufemi E. Adams, Hana A. Mansour, John W. Hinkle, Yoshihiro Yonekawa***
1:15 – 3:00 PM	
Poster Session: AO, functional imaging, and new OCTA developments (340)	
Poster Number: ***A0344***	Reproducibility of Scleral Vasculature Measurements with Anterior Segment OCT Angiography in POAG ****Ronald Zambrano,*** *Rozita Ghassabi****, Denisse J. Mora-Paez, Jaime Guedes, Sarah Segal, Gadi Wollstein, Qiang Zhang, Joel S. Schuman, Fabio Lavinsky***
3:30 – 5:15 PM	
Poster Session: Other ophthalmic tumors (371)	
Poster Number: B0543	Topical 5-fluorouracil 1% for ocular surface squamous neoplasia: Primary versus secondary treatment ***Irwin Leventer, Hartej Singh, Bahram Pashaee, Sara Lally, Carol Shields***

Tuesday, May 7, 2024	
PAPERS	
1:15 – 1:30 PM	
Paper Session: Retinoblastoma (329)	
608 - Seattle Convention Center - Arch Building	High-risk histopathological features of retinoblastoma: A global study of 1426 patients from 5 continents **Swathi Kaliki, Tatiana Ushakova, Alia Ahmad, Yacoub A. Yousef, Soma Roy, Devjyoti Tripathy, Juan Garcia Leon, Jesse L. Berry, Shahar Frenkel,* ***Carol Shields****, Anasua Kapoor, M Ashwin Reddy, Hans E. Grossniklaus, John D. McKenzie, Ido Didi Fabian, Rosdali Yesenia Diaz Coronado*
1:30 – 1:45 PM	
Paper Session: Lens cell development, morphogenesis, and physiology (330)	

609 - Seattle Convention Center - Arch Building	FOXO Function in Lens Cell Differentiation ****Rifah Gheyas (TJU), A Sue Menko (TJU)***
Paper Session: Large-scale omics analysis in ocular disease (335)	
Chelan 2 - Seattle Convention Center - Arch Building	Tears proteomics as a source of biomarkers associated with increased intraocular pressure **Arthur Fernandes, Luiz Almeida, Daniel Young, CBRU Cayo Biobank Research Unit, Armando Burgos-Rodriguez, Melween I. Martinez,* ***Gadi Wollstein****, John Danias, James Higham, Antoine Dufour, Amanda Melin*
POSTERS	
8:30 – 10:15 AM	
Poster Session: Clinical and experimental advances in the analysis of ocular inflammation (317)	
Poster Number: A0156	Early inflammatory response in the eye following induction of autoimmune uveitis. ***JodiRae DeDreu** ***(TJU)***, Mary J. Mattapallil, Rachel R. Caspi, Mary Ann Stepp, **A Sue Menko** ***(TJU)***
Poster Session: Retinitis pigmentosa and macular diseases (320)	
Poster Number: A0365	Possible Treatment Approach for Retinitis Pigmentosa by Targeting Inhibition of PTEN in the PI3K-Akt Signaling Pathway **Pamella C. Morello, Amanda C. Morello, Dillan Cunha Amaral, Adriano Cypriano Faneli,* ***Denisse J. Mora-Paez, Jaime Guedes****, Sergio Morello Jr*
1:15 – 3:00 PM	
Poster Session: AI in epidemiology and clinical research (347)	
Poster Number: B0396	A Novel Interpretable Transfer Learning Framework for Analyzing High-Dimensional Longitudinal Ophthalmic Data **TingFang Lee,* ***Gadi Wollstein, Ronald Zambrano****, Andrew Wronka,* ***Lei Zheng, Joel S. Schuman****, Jiyuan Hu*
3:30 – 5:15 PM	
Poster Session: Vitreoretinal surgery and retinal detachment II (368)	
Poster Number: B0115	Outcomes and complications of vitrectomy and intraocular lens implantation in eyes with retained lens fragments ****Jonathan Lee Martin (TJU)****,* ***Asad Farooq Durrani, Bita Momenaei, Taku Wakabayashi, Ajay Kuriyan***

Poster Number: *B0139*	Long term outcomes of Yamane Technique Combined with Pars Plana Vitrectomy in Various Indications: A Retrospective Study **Adriano Faneli, Dillan Cunha Amaral,* ***Jaime Guedes,*** *Ricardo Chagas*
Poster Session: Teaching, training and education (374)	
Poster Number: *B0675*	Demographic and Research Characteristics of Matched International Medical Graduates (IMGs) Ophthalmology Residency: A Bibliometric Study **Chandana Sooranahalli, Roshni Koul,* ***Sagar J. Shah****, Justin Flood, Roshni Vasaiwala, Jhansi Raju*

Wednesday, May 8, 2024 Wills Eye Presenters	
POSTERS	
10:30 – 12:15 AM	
Poster Session: Retina miscellaneous II (417)	
Poster Number: A0149	Google Search Trends to Assess Public Interest and Concern about Syfovre for the Treatment of Geographic Atrophy ***Hana A. Mansour, Ajay Kuriyan***
Poster Number: A0159	Visual Outcomes in Eyes with No Light Perception Prior to Vitrectomy ***Anza Rizvi, Asad Farooq Durrani, Bita Momenaei, Fatima Rizvi, Hana A. Mansour, Carl Regillo***
Poster Session: Keratoconus and collagen crosslinking (420)	
Poster Number: A0243	Rates of Failure of Corneal Crosslinking for Keratoconus in the United States ***Bryce Hwang**, Margaret Pecsok, **Brian T. Cheng**, Scott R. Lambert*
Poster Session: Glaucoma - Epidemiology (422)	
Poster Number: A0418	Visual field loss is associated with decreased bone mineral density among adults in the United States ***Brian T. Cheng**, Angelo Peter Tanna*

Wednesday, May 8, 2024	
PAPERS	
11:15 – 11:30 AM	
Paper session: Lens fibrosis and stress (405)	
609 - Seattle Convention Center - Arch Building	Comparative dynamic pattern analysis of the lens injury response to identify molecular transitions governing wound healing versus fibrosis outcomes ***Catherine Lalman (TJU)**, Morgan D. Basta, **Rajanikanth Vadigepalli (TJU), Janice L. Walker (TJU)***
3:00 – 3:15 PM	
Paper Session: Diabetic macular edema (427)	
6E - Seattle Convention Center - Arch Building	Port Delivery System with ranibizumab (PDS) met primary endpoint and key secondary outcomes with > 75% of patients preferring PDS treatment in phase 3 Pavilion trial for diabetic retinopathy (DR) **Paul Latkany, **Carl Regillo**, Charles C. Wykoff, Margaret Chang, Andres Emanuelli, Nancy Holekamp, Varun Malhotra, Dena Howard, Anjana*

	Santhanakrishnan, Monica Wetzel-Smith, Carlos Quezada-Ruiz, Dante Joseph Pieramici
POSTERS	
10:30 – 12:15 AM	
Poster Session: Functional testing and visual fields (424A)	
Poster Number: *B0455*	Associations between Visual Cortex Metabolism and Visual Field Loss Patterns in Glaucoma **Yueyin Pang, Ji Won Bang, Carlos Parra, **Gadi Wollstein, Joel S. Schuman**, Mengyu Wang, Kevin C. Chan*
Poster Number: *B0456*	Barriers to automated visual field perimetry data extraction, harmonization, and representation in OMOP **Shahin Hallaj, Swarup S. Swaminathan, Sophia Wang, Benjamin Y. Xu, **Dilru Amarasekera**, Michael V. Boland, Brian Craig Stagg, Michelle Hribar, Kaveri Thakoor, Kerry E. Goetz, **Jonathan S. Myers**, Aaron Y. Lee, Mark Christopher, Linda M. Zangwill, Robert Weinreb, Sally Liu Baxter*
Poster Number: *B0470*	Binocular Visual Field Loss Patterns in Glaucoma and Their Associations with Demographic Groups **Jinghan Wang, Luo Song, Lucy Q. Shen, Louis R. Pasquale, Michael V. Boland, Sarah Wellik, Carlos Gustavo De Moraes, **Jonathan S. Myers**, Tobias Elze, Nazlee Zebardast, David S. Friedman, Mengyu Wang*
2:15 – 4:00 PM	
Poster Session: Lens physiology and stress (439)	
Poster Number: *A0265*	Analysis of Post-translational Modifications Associated with Age and Insolubilization in Rhesus Macaque Lenses **Billy Hayden, Owen Kelley, Keith Zientek, Ashok Reddy, Phillip Wilmarth, Rachel Munds, Arturo Barron-Arrambide, Michael Montague, Melween I. Martinez, **Gadi Wollstein**, James Higham, John Danias, Amanda Melin, Larry L. David, Jeremy A. Whitson*
Poster Number: *A0266*	Assessment of Anti-Cataract Properties of Flavonoids Using an In Vitro Model of UV-Induced Photooxidation and Protein Aggregation **Rilee Bahner, Hailee Gosart, Kiernan McDonald, Billy Hayden, Rachel Munds, Arturo Barron-Arrambide, Michael Montague, Melween I. Martinez, **Gadi Wollstein**, John Danias, James Higham, Amanda Melin, Nicole Hughes, Jeremy A. Whitson*
Poster Session: Retinal diseases - Epidemiology (442)	
Poster Number: *A0361*	Screen failures in clinical trials in retina **Nasiq Hasan, Kunaal Mehrotra, Carl J. Danzig, David Aaron Eichenbaum, Amy Ewald, **Carl Regillo, Bita Momenaei**, Veeral Sheth, David Ryan Lally, Jay Chhablani*

Poster Session: OCT and OCT angiography II (456)	
Poster Number: *B0609*	Outer Retina Involvement in Mild Cognitive Impairment Alzheimer's Dementia. **Maroun Khreish,* ***Ronald Zambrano****, TingFang Lee, Jiyuan Hu, Philip Martinez, Julia L Diamond, Allison Toyos, Laura J Balcer, Arjun Masurkar,* ***Joel S. Schuman, Gadi Wollstein***

Thursday, May 9, 2024 Wills Eye Presenters	
PAPERS	
2:00 – 2:15 PM	
Paper Session: Retinal detachment (540)	
609 - Seattle Convention Center - Arch Building	A Novel Approach to Estimating Rhegmatogenous Retinal Detachment Chronicity using Optical Coherence Tomography ****Michael Yu, Hana A. Mansour, Yoshihiro Yonekawa***

Thursday, May 9, 2024	
PAPERS	
3:15 – 3:30 PM	
Paper Session: Functional testing and visual fields (539)	
608 - Seattle Convention Center - Arch Building	Dual-Level Pattern Tree for Visual Field Characterization in Glaucoma Improves Predicting Progression and Polygenic Risk Score **Luo Song, Lucy Q. Shen, Louis R. Pasquale, Michael V. Boland, Sarah Wellik, Carlos Gustavo De Moraes,* ***Jonathan S. Myers****, Tobias Elze, Nazlee Zebardast, David S. Friedman, Jae H. Kang, Mengyu Wang*
2:00 – 2:15 PM	
Paper Session: Retinal detachment (540)	
609 - Seattle Convention Center - Arch Building	Surgical Outcomes of Primary Noncomplex Rhegmatogenous Retinal Detachment in Young Adults **JESSICA Jiamei LEE, Michael J. Ammar, Louis Z. Cai,* ***Anthony Obeid****,* ***Omesh Gupta****,* ***Jason Hsu****, Matthew Starr,* ***Luv Patel****,* ***Taku Wakabayashi,*** *Antonio Capone, Geoffrey G. Emerson, Dean Eliott, Daniel P. Joseph,* ***Carl Regillo, Edwin Ryan, Yoshihiro Yonekawa***
POSTERS	
8:00 – 9:45 AM	
Poster Session: AMD-4 (clinical research) (505)	
Poster Number: *B0112*	The Topographical Effects of Geographic Atrophy on The Deeper Choroidal Vasculature **Enrico Borrelli,* ***Francesco Cappellani****,* ***Jose S. Pulido****, Daniel Pauleikhoff, Michele Reibaldi, Malia Michelle Edwards*
Poster Session: Novel approaches in imaging, processing and analysis (511)	

Poster Number: *B0558*	Normative variability in retinal nerve fiber layer thickness: Does it matter where the peaks are? **Sowjanya Gowrisankaran, Ashkan Abbasi, Xubo Song,* ***Joel S. Schuman, Gadi Wollstein****, Bhavna Josephine Antony, Hiroshi Ishikawa*
11:45 – 1:30 PM	
Poster Session: Diabetic macular edema (530)	
Poster Number: *B0143*	Port Delivery System With Ranibizumab (PDS) in diabetic macular edema (DME): additional primary analysis results of the phase 3 Pagoda trial **Varun Malhotra,* ***Michael A. Klufas****, Dennis M. Marcus, Jordan M Graff, Peter A. Campochiaro, Salman Rahman, Paul Latkany, Shamika Gune, Stephanie DeGraaf, Ashwini Bobbala, Mel Rabena, Carlos Ruiz, Arshad M. Khanani*
Poster Session: Ophthalmology health and healthcare research (534)	
Poster Number: *B0696*	Sustainability in eye care: factors influencing solid waste generation and opportunities for co-benefits **Christina Rapp Prescott, Brooke Sherry, Gerardo Elgeuzabal, Yash Patil, Shaina Shiwdin, Emma Pak,* ***Joel S. Schuman****, Cassandra Thiel*
2:00 – 3:45 PM	
Poster Session: Neuroinflammation and neurodegeneration I (552)	
Poster Number: *B0959*	Longitudinal Changes in RNFL and GCIPL Thicknesses in Rhesus Macaques with Chronic Ocular Hypertension **Leon Kamen,* ***Gabriela Schwantes****, Palaiologos Alexopoulos, Arturo Barron Arrambide,* ***Ronald Zambrano****, Ezekiel Ede, TingFang Lee, John Danias,* ***Gadi Wollstein***

ON DEMAND	
IM on-demand presentations	
Presentation Number: OD45	Using Google Forms to Create a HIPPA Compliant Database for Rare and Poorly Coded Diseases in Uveitis ****Shreya Swaminathan (TJU)****, **James P. Dunn, Jordan Deaner***
MOI on-demand Presentations	
Presentation Number: OD50	Prediction of late stage AMD based on deep learning models using multimodal AREDS data ****Qiang Zhang****, Qi Yan, Yifan Peng, Mingquan Lin,* ***Joel S. Schuman, Julia A. Haller****, Emily Y. Chew*
RE on-demand Presentations	
Presentation Number: OD70	Growth Rates of Geographic Atrophy in Eyes with Advanced Dry Age-Related Macular Degeneration Compared to Macular Atrophy in Fellow Eyes Treated for Neovascular Age-Related Macular Degeneration ****Michael K. Nguyen, Hana A. Mansour, Francesco Cappellani, Carl Regillo, Sunir Garg, Allen Chiang, Allen Ho, Jason Hsu***
Presentation Number: OD75	Factors associated with better visual outcomes after repair of recurrent rhegmatogenous retinal detachment without proliferative vitreoretinopathy ****Kristine Wang, Michael Nguyen, Bita Momenaei, Taku Wakabayashi, Hana A. Mansour, Jason Hsu***
Presentation Number: OD80	The Role of Steroids in the Treatment of Ocular Hypotony Associated with Proliferative Vitreoretinopathy ****Breanne McDermott (TJU), Bita Momenaei, Scott Kozarsky (TJU), Jason Hsu***

TABLE OF CONTENTS

ABSTRACTS

A NOVEL APPROACH TO ESTIMATING RHEGMATOGENOUS RETINAL DETACHMENT CHRONICITY USING OPTICAL COHERENCE TOMOGRAPHY

PAPER PRESENTATION

Abstract Number: 6479
AuthorBlock: ***Michael Yu[1], Hana A. Mansour[1], Yoshihiro Yonekawa[1]***
[1]Retina, Wills Eye Hospital, Philadelphia, Pennsylvania, United States;

Purpose
The duration of macula-off rhegmatogenous retinal detachment (RRD) is an important consideration when determining the urgency of surgical repair but may be inaccurately reported by patients. Herein, we investigate a novel technique for the estimation of macula-off RRD duration using subretinal fluid (SRF) optical density (OD) data derived from optical coherence tomography (OCT) scans.
Methods
A consecutive series of patients seen in the Retina Service at Wills Eye Hospital (Philadelphia, PA) from July 2023 to December 2023 and diagnosed with first-onset macula-off primary RRD underwent complete clinical examination and swept source OCT (Heidelberg Engineering, Heidelberg, Germany). Using ImageJ (National Institutes of Health, Bethesda, MD, USA), average pixel intensities ("optical density" [OD]) of the SRF and overlying vitreous were obtained. The ratio between both values was then calculated ("optical density ratio" [ODR] = $OD_{SRF}/OD_{vitreous}$). The onset of macula-off status was determined by first signs of central visual loss as reported by the patient. ODR was plotted against duration of macula-off status in weeks. The significance of the relationship between both variables was assessed by linear regression analysis. Patients were categorized into two primary groups by RRD duration: acute (<1 week) and sub-acute/chronic (>1 week).
Results
Thirty-nine RRD (24 acute, 15 sub-acute/chronic) of 39 patients met inclusion criteria and were evaluated. ODR values were significantly lower in acute cases of RRD (mean 0.98, SD +/-0.05) than in sub-acute and chronic cases (1.22 + 0.20, $p<0.001$), and on linear regression analysis correlated well with duration of symptoms ($R^2 = 0.74$). Receiver operator characteristic curve analysis yielded an optimal cutoff of ODR = 1.05 (sensitivity of detection of acute RRD = 100%, specificity = 91.6%).
Conclusions
The chronicity of an RRD can be estimated based on the optical density of its SRF. SRF OD increases over time, possibly reflecting a change in SRF composition or retinal transmissibility.

A NOVEL INTERPRETABLE TRANSFER LEARNING FRAMEWORK FOR ANALYZING HIGH-DIMENSIONAL LONGITUDINAL OPHTHALMIC DATA

POSTERBOARD#: B0396

Abstract Number: 3733 - B0396

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Purpose

Various transfer learning (TL) approaches have been developed in deep learning model schemes to address data inequality and discrepancies between datasets and domains. While TL has recently been introduced to enhance health equity in healthcare, particularly ophthalmology and vision health, persistent challenges include adequately modeling complex dependency structures such as longitudinal and multi-modal data, along with ensuring the interpretability. This study aims to develop a novel TL machine learning framework for analyzing high-dimensional longitudinal ophthalmic data, prioritizing model interpretability and accounting for temporal and inter-eye correlations.

Methods

The TL framework adopts a generalized linear mixed-effects regression model to investigate the association of longitudinally measured covariates, efficiently handling complex data dependencies such as repeated measurements. A two-step transfer algorithm is implemented to leverage information from source domain for enhancing the prediction task in the target domain. L_1-regularization techniques are used to address high dimensionality. We conducted a simulation study with a target sample size of 500, and source sample size ranging from 200 to 1200 with 5 temporal repeated measurements for each sample. We compared the proposed TL method with Naïve lasso regression model fitted using only the target domain, evaluating model prediction accuracy and parameter estimation through mean square errors (MSE) and L_2-estimators of estimated coefficients, respectively.

Results

The simulation study demonstrates that the TL method outperforms the naïve lasso method, evidenced by lower MSE and L_2-estimators. Furthermore, L_2-estimators of the proposed TL method exhibit a clear trend of decreasing as the sample size of the source domain increases, indicating the benefit of borrowing information from the source domain (Figure 1).

Conclusions

The proposed TL framework enhances model prediction accuracy compared with the naïve method. The selected features from the TL framework, along with corresponding estimated coefficients, offer a comprehensive interpretation of each feature's contribution to the outcome of interest. This TL framework provides an efficient and flexible solution to address sample size constraints in the target domain, mitigate data imbalance issues, and handle complex data structures in clinical research.

A UNIFIED FRAMEWORK FOR VISUAL FIELD TEST ESTIMATION AND FORECASTING USING CONVOLUTION AND ATTENTION NETWORKS

POSTERBOARD#: A0253

Abstract Number: 2361 - A0253

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Purpose

Different methods have been reported for visual field (VF) estimation from optical coherence tomography (OCT) or forecasting future VF using prior VFs. These methods are modality-specific and hard to compare with each other. Our goal is to test the efficacy of our unified framework to estimate and forecast VF using different input data (2D or 3D OCT, and VF).

Methods

From our longitudinal glaucoma cohort, we collected 8,390 pairs of 2 consecutive VFs (Humphrey, 24-2 SITA Standard, Zeiss, Dublin, CA) and their corresponding 3D OCT images (Cirrus HD-OCT, 200x200 ONH Scan, Zeiss). The average number of days between sessions was 342 days (range 90-2400). The dataset was split to perform 10-fold cross-validation without patient overlap. We utilized a hybridized convolution and transformer network (CoTrNet) architecture (Table 1) composed of inverted residual convolution and transformer (relative self-attention and a fully connected layer) blocks to capture local and global patterns. In VF estimation, either a 2D (e.g. en face image, layer thickness map, etc.) or a down-sampled 3D OCT image can be used to estimate the corresponding VF (52 out of 54 values, excluding 2 blind spots). In VF forecasting, the input is made up of the current VF and the time difference (between the current and future VFs).

Results

In VF estimation with enface images, 2D ResNet and CoTrNet achieved the global mean absolute error (MAE) of 3.91 ± 0.24, and 3.52 ± 0.26 dBs, respectively. However, the overall performance was improved by using 3D OCT images. In Figure 1, MAE and its pointwise heatmap are reported for the compared methods. It shows that 3D ResNet's error was 3.39 ± 0.21 while CoTrNet's error was 3.10 ± 0.15. In VF forecasting, CoTrNet (MAE=2.10 ± 0.11) significantly outperformed the identity function (2.70 ± 0.15), recurrent neural network (RNN) (2.54 ± 0.21), and CascadeNet-5 (2.27 ± 0.13) methods. Our analysis showed that VF forecasting performance stayed stable until the time interval hit 4 years.

Conclusions

Our unified framework supported the use of 2D and 3D OCT, as well as VF, as inputs. The proposed model outperformed problem- and modality-specific methods for both VF estimation and forecasting by harnessing the power of local and global processing via the integration of convolutions and transformers in the network.

ANALYSIS OF POST-TRANSLATIONAL MODIFICATIONS ASSOCIATED WITH AGE AND INSOLUBILIZATION IN RHESUS MACAQUE LENSES

POSTERBOARD#: A0265

Abstract Number: 5035 - A0265

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Purpose

The accumulation of damaging posttranslational modifications (PTMs) in lens proteins with age has been hypothesized as a primary cause of protein aggregation in age-related cataract. Non-human primates (NHP) provide a powerful model for studying human aging and disease but lens studies in this model have been relatively rare. Several advances in proteomic technologies allow simultaneous measurement of many PTMs in biological samples without the need for enrichment; providing greater breadth and depth of analyses than has previously been possible. We have leveraged these new technologies to analyze the lens cores of young (4 years old) and aged (15-16 years old) rhesus macaques from the free ranging Cayo Santiago population using data-dependent bottom-up proteomics (DDA) to determine which PTMs accumulate with age and which are preferentially found in the water insoluble fraction.

Methods

Lens cores were prepared using a microtrephine to isolate them from frozen lenses. Cores were then homogenized in lysis buffer and proteins were separated into water-soluble and water-insoluble fractions using aqueous buffer and centrifugation. The water-insoluble fraction was solubilized using SDS. Proteins were processed using S-trap columns (ProtiFi) to purify proteins, remove SDS, reduce and alkylate cysteines, and digest with trypsin. Peptide digests were analyzed using high-resolution, label-free DDA proteomics with a Q-Exactive HF Orbitrap mass spectrometer (Thermo Scientific). Open modification searches were performed using MSFragger and the FragPipe pipeline to identify possible PTMs in a less-biased manner.

Results

We observed PTMs from over 350 proteins including lens crystallins, structural proteins like beaded filaments, and many metabolic enzymes involved in glycolysis. The number of modified peptides assigned to samples by age or solubility were compared to find PTMs with statistically significant count differences. Several PTMs were associated with loss of solubility: deamidation, oxidation, and carbon adducts. Deamidation and carbamylation were found to increase with age.

Conclusions

The palette of observed NHP proteins and their PTMs were similar to those found in human lens studies. These PTMs, particularly deamidation, are known to increase with age in human lenses and destabilize proteins, leading to loss of lens function.

ACCURACY AND READABILITY OF AFTER VISIT SUMMARIES FOR RETINAL CONDITIONS GENERATED BY A LARGE LANGUAGE MODEL

POSTERBOARD#: B0411

Abstract Number: 822 - B0411

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Purpose

After-visit summaries (AVS), can strengthen doctor-patient communication and improve health outcomes. AVS may not routinely be provided at every clinical visit, potentially due to the extra time required to create additional documentation. Recent legislation mandates patient access to clinical notes, however these are written at a more sophisticated reading level or may contain abbreviations or jargon, all of which limits patient understanding.

ChatGPT, an artificial intelligence (AI) model can appropriately answer questions concerning retinal disease. The purpose of this study is to determine whether ChatGPT-4, the most updated version of the model, can generate accurate, readable AVS for common retinal conditions.

Methods

One to three conditions among the following disease categories were selected by an experienced, fellowship-trained, retina specialist with the intention of capturing a set of conditions which may be routinely encountered by an adult retina specialist: “vascular,” “macular,” “peripheral,” “inflammatory or infectious,” “neoplastic,” “toxic,” “surgical.”

Two clinical notes written between 2020 and 2023 were randomly obtained for each condition and were graded by three practicing ophthalmologists, with senior author adjudication, by the following criteria: Accurately describes 1. diagnosis, 2. clinical visit, and 3. follow up plan. Inaccurate responses were further categorized as “Incorrect,” “Omission,” or “Hallucination.” Reading level of the responses was assessed using the Flesch-Kincaid readability test.

Results

38 AVS describing 19 retinal conditions written by 12 physicians were generated. The mean (standard deviation) word count of the notes was 242 (53) (range: 119 to 361). Descriptions of the diagnosis, clinical visit, and follow up were accurate for 30 (79%), 20 (53%), and 26 (68%) of the AVS. Incorrect information was most common (5 [13%], 12 [32%], and 7 [18%], respectively) whereas hallucination was noted in 6 (16%) notes. There was no difference in accuracy as a function of note word count or author. Flesch-Kincaid scores demonstrated patients would require between 3.4 and 12.5 years of education to understand the responses.

Conclusions

AI could be used to create clinical summaries, which may improve doctor-patient communication and health outcomes. Further work is necessary to ensure output is readable and completely accurate.

ANTI-VEGF THERAPY FOR STAGES 3 AND STAGE 4 PROLIFERATIVE SICKLE CELL RETINOPATHY RESULTS IN IMPROVED ANATOMIC AND VISUAL OUTCOMES

POSTERBOARD#: B0067

Abstract Number: 1724 - B0067

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Purpose

To investigate the potential utility of intravitreal anti-VEGF therapy for stage 3 or 4 proliferative sickle cell retinopathy (PSR)

Methods

We surveyed the Anti-VEGF versus Laser (ALPS) Group (23 retinal specialists) about experience using anti-VEGF agents in treatment of PSR. Six reported using anti-VEGF treatment for stage 3 and 4 PSR. IRB approval was obtained for a retrospective review of anti-VEGF therapy for PSR. De-identified data collected included baseline demographics (age, sickle cell subtype), ocular history, PSR stage, anti-VEGF therapy parameters, visual and anatomic outcomes (seafan activity and fibrosis, vitreous hemorrhage (VH), development of new seafans or VH) as well as complications (endophthalmitis, retinal tears, tractional (TRD) or rhegmatogenous detachment (RRD)). Only previously non-published cases were included in this series.

Results

There were 38 PSR eyes (US and Nigeria) treated with intravitreal anti-VEGF injections. Five eyes were excluded (4 eyes with diabetic retinopathy and 1 eye with choroidal neovascularization), leaving 33 PSR eyes in 31 patients (22 SC, 6 SS, 1 SThal, 2 unknown); 15 eyes were stage 3 and 18 stage 4 PSR. 10/33 eyes had prior laser photocoagulation for PSR. Anti-VEGF drugs included bevacizumab (24), aflibercept (6) and ranibizumab (3). Treatment regimens included anti-VEGF alone in 13 eyes and anti-VEGF followed by laser photocoagulation (combination) in 20 eyes. Follow-up ranged from 1 to 36 months (4 eyes had only 1 month follow-up). For anti-VEGF alone eyes, seafan regression to inactivity occurred in 9/13 (69%) at both month 1 and last follow-up (3 of 4 persistent seafans were in eyes with 1 month follow-up). For eyes with follow-up > 1 month, at last follow-up, seafans were inactive in 7/8 (87.5%) for anti-VEGF only and 17/20 (85%) for combination eyes (P= NS). For stage 4 eyes, 1-month after anti-VEGF, VA improved > 3 lines in 12/18 eyes, remained stable in 5/18 eyes (all 20/20 or 20/25 at baseline) and worsened in 1/18 eye. For stage 4 eyes with baseline VA 20/40 or worse, 12/13 (92%) improved > 3 lines by month 1 post-anti-VEGF. No cases of endophthalmitis or RRD occurred.

Conclusions

Within one month of treatment, anti-VEGF therapy of PSR eyes resulted in high rates of seafan regression, significant clearing of vitreous hemorrhage, and stable or improved VA in a large majority.

APPLICATIONS OF MULTIMODAL GENERATIVE AI IN A REAL-WORLD RETINA CLINIC SETTING

POSTERBOARD#: A0201

Abstract Number: 2347 - A0201

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Purpose
To assess the precision and accuracy of Chat Generative Pre-trained Transformer-4 with vision (GPT-4 Turbo with vision, GPT-4V, OpenAI) in diagnosing common vitreoretinal diseases in a real-world ophthalmology setting.

Methods
A retrospective chart review was conducted on patients diagnosed with the fifteen most common vitreoretinal diseases at Bascom Palmer Eye Clinic from January 2010 to March 2023. Representative patient cases were created using clinical scenarios and retinal images from their initial visits. The model's accuracy in generating diagnoses and corresponding International Classification of Diseases (ICD-10) codes was assessed using open-ended questions (OEQ) and multiple-choice questions (MCQ). The images were divided into two groups, A and B, based on the availability of adequate clinical information. Group A comprised simple cases, while Group B consisted of challenging cases for diagnosis. The accuracy of responses was independently assessed by three retina specialists.

Results
A total of 256 eyes from 143 patients, along with their clinical histories and images, were analyzed using the GPT-4V platform. Diagnostic responses were accurate in 13.7% (OEQ) and 31.3% (MCQ) ($p < 0.001$). For ICD-10 responses, accuracy was 5.5% (OEQ) and 31.3% (MCQ) ($p < 0.001$). Notable correct diagnoses included posterior vitreous detachment (PVD, OEQ=100%, MCQ=100%), non-exudative age-related macular degeneration (NEAMD, OEQ=55%, MCQ=65%), and retinal detachment (RD, OEQ=29.4%, MCQ=64.7%). In ICD-10 responses, NEAMD (55%), central retinal vein occlusion (6.3%), and macular holes (6%) were the most accurately diagnosed conditions for OEQ, while PVD (100%), NEAMD (65%), and RD (64.7%) topped the list for MCQ. Subgroup analyses showed no statistically significant differences between groups A and B for diagnostic and corresponding ICD-10 responses with both OEQ and MCQ ($p \geq 0.399$).

Conclusions
The AI-based ChatGPT-4V model holds promise in improving efficiency in clinical care and medical record-keeping. While it performs well with standardized multiple-choice questions, its effectiveness decreases in free-response scenarios, primarily due to the complexities and variability inherent in real medical cases, particularly in retina clinics. This underscores a significant limitation of the tool in providing advice on ocular health matters.

ASSESSMENT OF ANTI-CATARACT PROPERTIES OF FLAVONOIDS USING AN IN VITRO MODEL OF UV-INDUCED PHOTOOXIDATION AND PROTEIN AGGREGATION

POSTERBOARD#: A0266

Abstract Number: 5036 - A0266

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DisclosureBlock: Rilee Bahner, None; Hailee Gosart, None; Kiernan McDonald, None; Billy Hayden, None; Rachel Munds, None; Arturo Barron-Arrambide, None; Michael Montague, None; Melween I. Martinez, None; Gadi Wollstein, None; John Danias, None; James Higham, None; Amanda Melin, None; Nicole Hughes, None; Jeremy A. Whitson, None;

Purpose

We sought to develop a benchtop assay to measure the UV-induced modification and aggregation of lens proteins as a model of age-related cataract formation and to test the efficacy of flavonoid compounds in reducing UV-induced damage to the lens. Many flavonoids have photoprotective properties, are present in common foods, are orally bioavailable, and cross the blood-eye-barrier, giving them a strong potential role in defense against age-related cataract formation.

Methods

Lens homogenates obtained from the free ranging Cayo Santiago population of rhesus macaques were used in this study. Both young (~4 years old) and aged (~16 years old) lenses were used to ensure that this assay properly models age-related changes. Homogenates were made from frozen lens fragments in a buffer of Tris-HCl, NaCl, and EDTA at pH 6.7 to approximate the physiological conditions within the lens. Various concentrations of hydrogen peroxide were added and homogenates were incubated within a UV Stratalinker 1800 for 16 hours to induce photooxidation. Light scattering was measured as absorbance/turbidity within a standard plate reader at 300 nm to assess protein aggregation. Quercetin, apigen, daidzein, and flavone were selected as flavonoids to test in this model as all occur naturally in edible plants.

Results

Old lens samples were found to have approximately twice the absorbance of young samples prior to UV incubation, indicating the higher levels of aggregation present within aged lenses at baseline. Higher protein and hydrogen peroxide content resulted in greater turbidity in a dose-dependant manner. Analysis of the efficacy of each flavonoid is ongoing.

Conclusions

We have demonstrated a simple and rapid method to model cataractogenesis in the lab and to test photoprotective compounds for potential anti-cataract properties in vitro.

ARE TREATMENT PATTERNS FOR ENDOPHTHALMITIS AFTER CATARACT SURGERY FOLLOWING THE EVS TRIAL RECOMMENDATIONS?: AN IRIS® REGISTRY (INTELLIGENT RESEARCH IN SIGHT) ANALYSIS

POSTERBOARD#: A0316

Abstract Number: 2424 - A0316

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Purpose

To describe if treatment patterns for endophthalmitis after cataract surgery in the IRIS® Registry are in line with evidence-based guidelines established by the 1995 Early Vitrectomy (VIT) Treatment Study (EVS) which showed that patients who present with light perception vision (LP) have better visual outcomes with immediate VIT compared to those with better vision.

Methods

Using the American Academy of Ophthalmology IRIS Registry, patients undergoing cataract surgery between 2014 and 2022 (CPT codes), presenting with endophthalmitis (ICD 10 code) within 42 days post-cataract surgery, and having a record of being treated with VIT or vitreous tap with antibiotic injection (TAP) on the same or following day of endophthalmitis diagnosis were identified. Cofactors assessed included age, sex, race, ethnicity, geographic region, insurance status, and visual acuity on the day of endophthalmitis diagnosis were summarized and compared between patients treated with VIT or TAP.

Results

Of the 2,425 patients who met the inclusion criteria, 14% (345) underwent VIT and 86% (2,080) underwent TAP. 80% of patients (1946) presented with endophthalmitis within 14 days from cataract surgery (median = 6 days). Notably, 66% (173/263) of the patients presenting with LP vision underwent TAP instead of VIT (Fig. 1). In a multivariable logistic regression model, receiving VIT instead of TAP was positively associated with poor vision at endophthalmitis presentation (LP – OR, 5.3 [CI: 2.9-10.5]; CF,HM – OR 1.8 [CI: 1.0-3.6]) vs. [20/20-20/40] vision; Asian vs. White race (OR, 2.6 [CI: 1.2-5.1]); Hispanic vs. Non-Hispanic ethnicity (OR, 1.9 [CI, 1.0-3.2]); living in the West (OR, 1.5 [CI, 1.1-2.2]) and Midwest (OR- 1.4 [CI, 1.0-2.0]) (vs. South). The remaining covariates (age, sex, and insurance coverage) were not significantly associated with increased risk of VIT ($p > 0.05$).

Conclusions

This IRIS Registry analysis revealed differences between the EVS randomized controlled clinical trial recommendations and current real-world treatment patterns for endophthalmitis post-cataract surgery. Further studies are needed to identify the reasons for these differences.

ASSOCIATIONS BETWEEN VISUAL CORTEX METABOLISM AND VISUAL FIELD LOSS PATTERNS IN GLAUCOMA

POSTERBOARD#: B0455

Abstract Number: 4792 - B0455

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Purpose

Recent magnetic resonance spectroscopy (MRS) studies in glaucoma patients and experimental glaucoma suggest that brain metabolite levels are associated with glaucomatous neurodegeneration. However, it remains unclear how these brain metabolites influence visual field (VF) function. This study examined the associations between metabolic profiles in the visual cortex and VF loss patterns in glaucoma.

Methods

Twenty early glaucoma, 28 advanced glaucoma, and 19 healthy subjects underwent 3-Tesla proton MRS of the visual cortex using a 2.2×2.2×2.2 cm^3 voxel centered at the calcarine sulcus. Gamma-aminobutyric acid (GABA), glutamate (Glu), and choline (Cho) levels were quantified from the spectra using LCModel and compared between groups using ANOVA and post-hoc Tukey's tests. Partial correlation analyses were performed to associate metabolite levels with total deviations of 24-2 VF tests. The resulting VF models were aligned with 16 predefined archetypal (AT) patterns of VF loss (PMID: 25505132) using multivariate linear regression to characterize VF loss regions.

Results

Clinical ophthalmic measurements were significantly different between subject groups, whereas age and sex were not (Fig. 1). Lower GABA, Glu, and Cho levels were found in both early and advanced glaucoma patients compared to healthy subjects (Fig. 2). In archetypal analyses, GABA, Glu and Cho were positively associated with the normal VF archetype (AT1) in both eyes. Decreasing GABA was associated with worse VF loss in the superonasal step area (AT3), whereas decreasing Glu was associated with worse VF loss in the inferonasal step (AT5) and inferior altitudinal (AT13) areas in the left eye. Decreasing Cho was also associated with worse VF loss in the inferonasal (AT10) and inferior altitudinal (AT13) areas in the left eye, as well as worse VF loss in the inferonasal (AT10) and nasal (AT15) areas in the right eye.

Conclusions

GABA, Glu, and Cho levels were lower in both early and advanced glaucoma patients. These neurometabolites also appeared to associate with complementary regional patterns of VF loss in glaucoma, with GABA affecting the superonasal areas more, and Glu and Cho affecting the inferior areas more. These spectral biomarkers may help determine the glaucoma pathogenesis and plasticity in the brain with relevance to regional VF loss in both eyes.

AUTOMATED MOTION ARTIFACT DETECTION IN EN FACE OCT IMAGES USING DEEP LEARNING ALGORITHM

POSTERBOARD#: A0273

Abstract Number: 2381 - A0273

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Purpose

Motion artifacts from eye movements affects the assessment of clinical optical coherence tomography (OCT) images, though they are qualified for the manufacturer defined signal quality measurements. Many motion correction post processing methods are reported but none of them are widely accessible. Clinicians may overlook motion artifacts in OCT image interpretation, resulting in inaccurate assessments. This study aimed to develop an automated system detecting motion artifacts to notify users of their presence and locations.

Methods

A total of 4488 3D OCT scans (Cirrus HD-OCT, 200x200 ONH scan, Zeiss, Dublin, CA), qualifying the manufacturer's signal quality index criteria, were enrolled from a longitudinal glaucoma study dataset. En face images were generated by summing OCT signal values along the z-axis for each x and y-axis position. 3515 were used for model development, while 973 were reserved for external validation. The YOLOv5l, a deep learning detection algorithm with CSPDarknet, Path Aggregation Network, and Yolo layer, was trained using manually labeled bounding boxes around affected retinal blood vessels as ground truth. The dataset for model development was split into 80% for training, 10% for validation, and 10% for testing. For clinical applications, the trained model was applied to identify motion artifacts. The assessment of the model's bounding box-level performance involved measuring the distance between centroids to the edge of the model output and comparing it to half the size of the ground truth box for overlap. The image-level performance was determined by detecting any motion corresponding to the ground truth within a given image.

Results

At the bounding box level, a precision of 0.78 and a recall of 0.73 were attained. At the image level, the model achieved an AUC of 0.94 on the external test set. Upon visual inspection, many false positive cases in the model predictions were, in part, attributed to human errors during the manual annotation step. After revising ground truth data by detecting small motion artifacts on images previously not detected as motion artifacts, without referring to the model outcome, the AUC improved to 0.97 for the external test set.

Conclusions

Our motion artifacts detection model successfully detected motion artifacts with their locations. This system may be useful to screen OCT images for motion artifacts, especially for curating large datasets.

BARRIERS TO AUTOMATED VISUAL FIELD PERIMETRY DATA EXTRACTION, HARMONIZATION, AND REPRESENTATION IN OMOP

POSTERBOARD#: B0456

Abstract Number: 4793 - B0456

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Purpose

Preserving the visual field (VF) is the endpoint of glaucoma care. Perimetry data are not typically represented in existing “big data” resources, hindering our ability to study functional progression. We analyzed different methods for extracting and representing perimetry data elements to determine existing barriers.

Methods

Glaucoma specialists from multiple institutions and their informatics teams attempted to extract bulk data from their perimeter devices. A list of all extraction methods and resulting output files was created and compared among the institutions. Data elements were extracted from materials published by the vendors, VF reports, and public data repositories. The extracted data elements from different vendors were compared to evaluate interoperability and searched against existing concepts within the Observational Medical Outcomes Partnership (OMOP) Common Data Model (CDM) and standard vocabularies using the Athena tool.

Results

The bulk data extraction from Zeiss Humphrey Field Analyzer (HFA) and Haag-Streit Octopus (OPS) perimeters lacked standardization and was not specified in the user manuals. Extraction from the devices yielded reports or raw test data in image information object definition (IOD), comma-separated values (CSV), DICOM files in encapsulated or raw, and Extensible Mark-up Language (XML) formats. Zeiss provided an ophthalmic visual field (OPV)-specific DICOM conformance document, while Haag-Streit has not implemented OPV DICOM standard for their perimeters. Fifty-seven and 46 data elements were identified for HFA and OPS, respectively. These elements were categorized into eye-level, cluster-level, and point-level concepts. OMOP CDM contained 19.3% (N=11/57) and 13 % (N=6/46) of the data elements for HFA and OPS, respectively (Table 1). Notably, the CDM included VF interpretation concepts (e.g., paracentral scotoma of the right eye).

Conclusions

Barriers hindering the representation of perimetry data include the lack of a standardized method for bulk data export, limited accessibility to advanced data export tools, and limited concept coverage within the OMOP CDM. Addressing these challenges is crucial for achieving data harmonization, promoting interoperability, and empowering future multicenter clinical research.

BINOCULAR VISUAL FIELD LOSS PATTERNS IN GLAUCOMA AND THEIR ASSOCIATIONS WITH DEMOGRAPHIC GROUPS

POSTERBOARD#: B0470

Abstract Number: 4807 - B0470

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Purpose

To quantify the binocular visual field (VF) loss patterns with archetypal (AT) analysis and their associations with different demographic groups.

Methods

Two datasets were used in this study: (1) the Glaucoma Research Network (GRN) dataset excluding the Massachusetts Eye and Ear (MEE) partition for the archetypal model training, and (2) the MEE dataset for demographic correlation analysis. The whole study was restricted to the most recent VF measurements from each subject and binocular VFs were constructed by the integrated visual field method, which was taking the higher sensitivity at each test location. We first applied archetypal analysis to cluster 24-2 binocular VFs into archetypal patterns. The total number of patterns was determined by the Bayes factor. Pearson's correlations analyzed the associations between binocular VF patterns and demographic groups adjusted for age effects, and the coefficients were set to 0 if p-values corrected by multiple comparisons ≥ 0.05.

Results

77,270 glaucoma patients with last-visit binocular VFs in GRN were used to train the archetypal model. It contains 17 parent patterns with 35,700 VFs as the largest group (Group 1) and 113 VFs as the smallest group (Group 15). Figure 1 shows all 17 binocular VF loss patterns including 3 pairs of real patient VFs of each binocular archetypal pattern. 45,254 MEE patients were used for demographic character analysis. Older age (Figure 2) was particularly associated with binocular patterns of superior altitudinal loss (AT 14; R: 0.1), inferior altitudinal loss (AT 13; R: 0.13), peripheral loss (AT 5; R: 0.12), unilateral diffused loss (ATs 4 and 7; Rs: 0.13 and 0.11), and superior paracentral loss (AT 17; R: 0.09). Compared with Whites and Asians, Blacks were more likely to have binocular patterns of total loss (AT 12; Rs: 0.1 and 0.08) and peripheral loss (AT 5; Rs: 0.07 and 0.08). Blacks were also more likely to have a superior altitudinal loss (AT 14; R: 0.06) than Whites. P values were significant for all mentioned correlations.

Conclusions

Blacks are more likely to have binocular patterns of total loss and peripheral loss compared with Whites and Asians. The quantifications of binocular VF loss patterns by archetypal analysis may help better understand glaucoma's impact on patients' quality of life.

BIOMARKER-BASED STRESS MEASURES AS RISK FACTORS AND MEDIATORS OF DIABETIC RETINOPATHY RACIAL DISPARITIES

POSTERBOARD#: B0139

Abstract Number: 1796 - B0139

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Purpose

The “weathering hypothesis” proposes that physiologically harmful stress from racism or poverty may partially explain racial health disparities. This cross-sectional study analyzes whether diabetic retinopathy (DR) disease risk and racial disparities are associated with three biomarker-based measures of weathering.

Methods

The study included participants from the 2005-2008 National Health and Nutrition Examination Survey (NHANES) aged ≥ 40 years who received fundus photography graded for DR and had complete biomarker data used to calculate weathering measures (e.g. albumin, CRP, HDL). Weathering measures included homeostatic dysregulation (HD), phenotypic age advancement (standardized difference between phenotypic and chronological ages), and allostatic load score (ALS, “high” if ≥3). Separate survey-weighted, multivariable logistic regression models were used to analyze associations of weathering measures with DR risk, while causal mediation analysis was used to examine if weathering measures mediated racial disparities. Covariates included age, sex, race/ethnicity, income-to-poverty ratio, and self-reported history of diabetes.

Results

Of 4,985 participants who met eligibility criteria, 611 (12.3%) were graded as having DR. Compared to White participants, Black participants had higher mean values of HD (difference:0.41 units, 95% CI: 0.29-0.52), unstandardized phenotypic age advancement (difference:2.43 years, 95% CI: 1.78-3.07), and ALS (difference:0.42 points, 95% CI: 0.28-0.55). In multivariable regression models, Black race was positively associated with higher odds of DR compared to White race (OR:1.50, 95% CI: 1.13-1.99, p=0.01). HD was associated with higher odds of DR (OR:1.42 per 1SD increase, 95% CI: 1.25-1.61, p<0.001). Standardized phenotypic age advancement was also associated with higher odds of DR (OR:1.20 per 1SD increase, 95% CI: 1.06-1.35, p<0.01). High ALS was not associated with DR (p=0.86). Causal mediation analysis estimated that HD mediated 19.3% (95% CI: 7.4%-68.2%, p<0.01) of the Black-White racial disparity in DR. Phenotypic age advancement (p=0.41) and high allostatic load score (p=0.86) did not appear to mediate racial disparity in DR.

Conclusions

Several weathering measures were associated with DR risk. HD partially accounted for Black and White disparity in the incidence of DR.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.

Racial differences in the diabetic eye disease called diabetic retinopathy are well documented, with Black individuals more likely to have this disease than White individuals. One theory used to help explain racial health differences is that long-term stress can lead to damaged body function and disease. This stress may come from social causes like racism and poverty. This study studied racial differences in diabetic retinopathy using several measures of stress that other researchers have previously linked to other health conditions. This study found that several measures of stress are linked to a higher risk of diabetic retinopathy. One measure of stress called “homeostatic dysregulation” helped to explain about 20% of the Black-white racial difference in diabetic retinopathy. To our knowledge, this is the first study to use these techniques to study racial differences in diabetic retinopathy. If confirmed by larger studies, these results may have consequences for public health or medical practice. Stress measures may be used for tracking risk of diabetic retinopathy across the population, or for deciding who may benefit from earlier screening. These measures could also be used to track the effects of stress-reducing treatments on risk of diabetic retinopathy.

BIOMECHANICAL ASSESSMENTS OF HIGH-FLUENCE CORNEAL CROSSLINKING WITH SUPPLEMENTAL OXYGEN USING OPTICAL COHERENCE ELASTOGRAPHY IN EX VIVO RABBIT EYES

POSTERBOARD#: B0483

Abstract Number: 2049 - B0483

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Purpose

The biomechanical impacts of supplemental oxygen and epithelial presence during high-fluence UVA corneal crosslinking were investigated using Optical Coherence Elastography (OCE).

Methods

A total of 80 fresh New Zealand White rabbit eyes received in pairs were stabilized to room temperature and 15 mmHg intraocular pressure (IOP), and treated with Ultraviolet A (UVA) crosslinking KXL iLink system. Eyes were separated into three treatment groups. All groups received a fluence of 10 J/cm^2 at an irradiance of 30 mW/cm^2 with 1s:1s pulsing for 11 minutes 6 seconds. Eyes in Groups 2 and 3, with the epithelium intact, received trans-epithelial (epi-on) riboflavin solutions. The epithelium was removed for eyes in Group 1 which received a 10-minute soak of a riboflavin solution. Eyes were placed in chambers to prevent dehydration during IOP stabilization and treatment time. Eyes in Group 3 received supplemental oxygen maintained at a >90% level. Eyes in Group 1 and 2 received air supply at the same flow rate as supplemental oxygen rate for Group 3. An in-house built OCE was used to scan eyes twice immediately before and after UVA treatment to obtain average shear moduli, which were later used in paired and unpaired t-test analyses. The repeatability of scans provided a means to exclude eyes that were not stabilized. The order of eyes receiving treatment, the chambers used for treatment, and the order of running different arms were randomized.

Results

A significant change in shear modulus pre/post UVA treatment was observed in all groups. The increase in Group 3 (31%) was found to be significantly higher than both Group 1 (17%) and 2 (18%) ($p<<0.0001$). No significant difference was found between changes in shear moduli in Groups 1 and 2 ($p=0.6$).

Conclusions

The oxygen enriched epi-on procedure significantly outperformed both epi-off and epi-on high-fluence procedures without supplemental oxygen. Adding supplemental oxygen to the epi-on procedure resulted in a significant boost in the induced biomechanical changes, around a 100% extra increase in shear modulus, compared to other procedures without supplemental oxygen. Furthermore, the presence of the epithelium did not adversely affect crosslinking efficacy for the normoxic procedures.

CHARACTERIZING PATIENTS WITH A HISTORY OF DIABETIC RETINOPATHY: A SURVEY STUDY

POSTERBOARD#: B0124

Abstract Number: 1781 - B0124

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Purpose

The purpose of this study is to evaluate sociodemographic characteristics and overall health burden of patients with a known history of diabetic retinopathy.

Methods

This is a survey study conducted on patients with diabetic retinopathy at the Retina Service of Wills Eye Hospital, Philadelphia, PA. All subjects were asked to participate in a survey of 30 questions related to their demographics, their diabetes diagnosis and management, and their ability to access to healthcare-related resources. Inclusion criteria included patients with a history of diabetic retinopathy. Exclusion criteria included inability to understand or respond to the survey questions. Outcome measures included sociodemographic characteristics, health information, and financial baseline characteristics of involved participants.

Results

A total of 240 patients answered the survey. Average age was 58.9 (SD ±11.2) years. Median age of diagnosis was 37 (IQR 26 – 46) years. When evaluating household income, 18.0% of patients had a total annual household income of <$25,000, and 38.1% of patients had a total household income of <$50,000. There were 22 (9.2%) of patients that considered their diabetes as mild, 102 (42.5%) as moderate, 79 (32.9%) as severe, 23 (9.6%) as very severe. There were 13 (5.4%) patients that were not sure about the severity of their diabetes. There were 21 (8.8%) patients that did not know the severity of their diabetic retinopathy. There were 25 (10.4%) patients undergoing dialysis for end-stage renal disease. There were 69 (28.7%) patients that did not know how many intravitreal injections they received for their diabetic retinopathy.

Conclusions

Patients with diabetic retinopathy may have several socioeconomic and health burdens which may prevent them from receiving appropriate care. Additionally, some patients may have a poor understanding of their disease.

COMPARATIVE DYNAMIC PATTERN ANALYSIS OF THE LENS INJURY RESPONSE TO IDENTIFY MOLECULAR TRANSITIONS GOVERNING WOUND HEALING VERSUS FIBROSIS OUTCOMES

PAPER PRESENTATION

Abstract Number: 4283

AuthorBlock: ***Catherine Lalman[1,3]***, *Morgan D. Basta[2]*, ***Rajanikanth Vadigepalli[3]*, *Janice L. Walker[3,4]***
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Purpose
The lens fibrotic disease, posterior capsule opacification (PCO), is a pathological response to cataract surgery. PCO is characterized by the emergence of alpha smooth muscle actin-expressing myofibroblasts, pathologically linked to the excessive production of extracellular matrix that accumulates and ultimately results in a loss of vision. It is unclear what factors divert an injury response to cataract surgery wounding toward fibrosis.

Methods
Using an ex vivo post-cataract surgery model, we performed RNAseq analysis and a computational pattern analysis approach to identify and compare differential gene expression patterns between the normal wound healing response and the development of fibrosis. RNAseq analysis was performed on an ex vivo post-cataract surgery chicken model from the time of injury through day 1 (D1), D2 and D3. By day 3, wound healing is completed across the endogenous lens basement membrane, and myofibroblasts emerge as part of the fibrotic response within a distinct pro-fibrotic microenvironment. We used comparative pattern analysis (COMPACT), a data analysis approach that exhaustively enumerates the possible dynamic patterns of gene expression changes over time and compares the abundance of these patterns across conditions.

Results
COMPACT analysis allowed gene expression dynamics to be visualized temporally, revealing subtle and dominant patterns of genes, including differentially expressed genes that were uniquely upregulated or downregulated with fibrosis compared to wound healing and vice versa. We focused on a pair of patterns that represented an early divergence of gene regulation between wound healing and fibrosis that then persisted into 3 days. Progression of wound healing involved the persistent upregulation of genes linked to the regulation of WNT signaling, Rho GTPase family function, cytoskeleton, lipid signaling, and cell adhesion. Transition to a fibrotic phenotype involved persistent upregulation of genes associated with regulating signal transduction, including distinct phosphatase and serine/threonine kinases, as well as the contractility of cells.

Conclusions
Our results are starting to map the molecular transitions that govern wound healing versus the fibrotic response to lens injury.

DEMOGRAPHIC AND RESEARCH CHARACTERISTICS OF MATCHED INTERNATIONAL MEDICAL GRADUATES (IMGS) OPHTHALMOLOGY RESIDENCY: A BIBLIOMETRIC STUDY

POSTERBOARD#: B0675

Abstract Number: 4223 - B0675

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Purpose

Ophthalmology residency selection continues to be a competitive process. It is widely understood that international medical graduates (IMGs) have an even more difficult match process. IMGs applying to ophthalmology often complete several years of post-doctoral research fellowships to build their research profiles while working with US-based mentors who may provide insight into their character and work ethic through letter of recommendations, a crucial aspect of the ophthalmology residency application process. The data is sparse and outdated regarding information on IMGs matching and, to our knowledge, no published data exists for pinpointing research fellowships that may result in successful matches.

Methods Data was queried from the anonymous, publicly available, crowd-sourced OphthoMatch 2021-2021 and 2022-2023 spreadsheets. We searched and collected various characteristics of matched IMG individuals, including programs they matched to and country/medical school of origin. A bibliometric search on PubMed was conducted to gather matched IMG author affiliations as well as total number of PubMed-indexed articles for each applicant by January 1st of the year they matched (I.e. our cutoff for an applicant who applied during the 2022-2023 cycle was January 1st, 2023). Author affiliations were used as a marker of possible post-doctoral research fellowships that applicants completed.

Results

11 and 12 IMG candidates were reported to match during the 2022 and 2023 match cycles per OphthoMatch spreadsheet, respectively. The most represented countries of origin of matched IMGs included: Iran (6), India (4), Lebanon (3), Venezuela (3).

The most commonly presumed research fellowship institutions represented were Massachusetts Eye and Ear (3), Bascom Palmer (2), Wills Eye Hospital (2), Duke (2), New York Eye and Ear (2) and UCSD (2). Of the 23 total matched IMGs, 4 matched to the institution of their presumed research fellowship. The average number of PubMed indexed articles of all applicants by January 1st of their match year was 19.1.

Conclusions

This study provides some introductory and much-needed data for IMGs applying to ophthalmology, including possible top research fellowships to consider as well as an average number of publications of matched candidates. Data collection continues to provide a greater, more accurate representation of a successful IMG applicant.

DOES MELANOMA TUMOR SIZE MATTER IN LONG TERM PATIENT OUTCOMES: A SIMPLIFIED APPROACH

POSTERBOARD#: A0102

Abstract Number: 2248 - A0102

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DisclosureBlock: Rolika Bansal, None; Carol Shields, None;

Purpose

To estimate metastasis free survival of patients with uveal melanoma on the basis of tumor thickness classified as small (0.0-3.0mm), medium (3.1-8.0mm) and large (>8.1mm).

Methods

Retrospective study of 8034 cases over 35 years at a single ocular oncology referral centre evaluated for the primary endpoint of cumulative incidence of metastasis using non conditional and conditional outcomes at 3-years, 5-years, and 10-years. Cox proportional risk regression analysis was performed.

Results

The mean thickness of small tumors was 2.5 mm, medium tumors 5.0 mm, and large tumors 10.2 mm. A comparison (small vs. medium vs. large melanoma) revealed small tumors more likely to be detected in younger patients ($p < 0.001$) and females ($p < 0.001$). Large tumors were more likely to have Bruch's membrane rupture and extraocular extension ($p < 0.001$). By comparison, 25-year non-conditional metastasis was (5% vs. 12% vs. 21%), and for those who survived five years without metastasis, the 25-year incidence of metastasis was (6% vs. 118% vs. 20%). For patients who maintained 3-year/5-year/10-year metastasis free survival, HR large vs medium were (2.22p <0.0001)/ 2.22 (p <0.0001)/ 2.52(p <0.0001), and HR medium vs small were (2.19p <0.0001)/ 2.24, p <0.0001/ 2.24, p <0.0001, respectively.

Conclusions

A comparison of uveal Melanoma metastasis, classified on the basis of small, medium and large thickness, revealed small melanomas were more likely to be detected in younger individuals and females. Whereas, larger melanomas were more likely to present with risk-factors, had poorer prognosis and were more likely to develop metastasis over time.

DUAL-LEVEL PATTERN TREE FOR VISUAL FIELD CHARACTERIZATION IN GLAUCOMA IMPROVES PREDICTING PROGRESSION AND POLYGENIC RISK SCORE

PAPER PRESENTATION

Abstract Number: 6477

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Purpose

To develop a dual-level pattern tree that more adequately represents visual field loss subtypes in glaucoma, which may better forecast progression and correlate with genetic variations.

Methods

Three datasets were used in this study: (1) the Glaucoma Research Network (GRN) dataset excluding the Massachusetts Eye and Ear (MEE) partition for the dual-level pattern tree model training, (2) the MEE longitudinal dataset for progression forecasting, and (3) the Nurses' Health Studies and Health Professionals Follow-up Study datasets for polygenic risk score (PRS) analyses. We first applied archetypal analysis to cluster 24-2 VFs into parent patterns and their own child patterns. The Cox regression model forecasted the VF progression with four widely used progression definitions: slope of MD, MD-Fast, VFI, and TD pointwise. Pearson's correlations analyzed relationships between VF patterns and PRS.

Results

182,548 VFs from 103,856 glaucoma patients in GRN were used to train the dual-level archetypal model. It contains 17 parent patterns with 118,059 VFs as the largest group (Parent 1) and 1,161 VFs as the smallest group (Parent 11). The second level contains a total of 169 child patterns (child pattern numbers under each parent pattern: 9.9 ± 1.6). Figure 1 shows all parent patterns and their child patterns. 119,856 VFs from 8,442 MEE patients were used for Cox progression prediction. Figure 2(A) shows parent-child patterns are consistently if modestly superior to parent patterns only for progression forecasting measured by the average area under the curve (average AUC): MD (0.62 vs 0.60), MD-Fast (0.79 vs 0.75), VFI (0.67 vs 0.64) and TD Pointwise (0.71 vs 0.69) with all $p < 0.001$. PRS relationship analysis with 732 VFs shows the child patterns are generally more strongly associated with PRS than parent patterns, as shown in Figure 2(B), in which the P3-C7 pattern (Child Pattern 7 under Parent Pattern 3) ($R = 0.35$; $p = 0.003$) shows a higher correlation than P3 ($R = 0.15$, $p = 0.213$) and the P7-C3 pattern ($R = 0.57$; $p = 0.03$) shows a higher correlation than P7 ($R = 0.33$, $p = 0.24$).

Conclusions

The dual-level pattern characterization for VFs predicts VF progression better and shows a stronger association with PRS which may facilitate a better understanding of glaucoma subtypes related to different progression trajectories and genomic variants.

EARLY INFLAMMATORY RESPONSE IN THE EYE FOLLOWING INDUCTION OF AUTOIMMUNE UVEITIS.

POSTERBOARD#: A0156

Abstract Number: 2997 - A0156

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Purpose

The immune-privileged status of the eye results from the need to maintain its vasculature outside of the central visual axis, presenting challenges to the recruitment of immune cells in response to injury or pathogenesis. Tissue resident immune cells play a key role in this process as the sentinels of danger. Their activation can lead to induction of an inflammatory response and the subsequent recruitment of immune cells with immunomodulatory functions to maintain/restore homeostasis. In the Experimental Autoimmune Uveitis (EAU) mouse model the peak of disease occurs at day 14 post-induction, by which time immunomodulatory cells are recruited to the lens capsule surface. Here, we investigated the spatial and temporal activation of resident immune cells in the eye following induction of EAU.

Methods

EAU was induced in C57BL/6 mice by immunization with a peptide encoding a uveitogenic epitope of the interphotoreceptor retinoid-binding protein (hIRBPP651-670). At days 3, 8, 11, and 14 post-induction of EAU, whole eyes were fixed and prepared for cryosectioning. 30µm sections were prepared and immunolabeled for molecules such as MHCII, whose expression is characteristic of activated Antigen Presenting Cells (APCs). Sections were co-labeled with fluorescent-tagged phalloidin to detect F-actin, which delineates the cytoarchitecture of eye tissues, and with DAPI to detect nuclei. Images were acquired by confocal microscopy and were analyzed using Imaris software.

Results

MHCII-positive cells with properties of professional antigen presenting cells were detected in different regions of the eye, including the retina and cornea, as early as 3 days post-induction of EAU. Activation of the resident immune cells of the lens occurred later, and was temporally linked to the recruitment of immunomodulatory cells to the surface of the lens capsule.

Conclusions

Resident immune cells were rapidly activated in different ocular tissues following the induction of EAU. Their activation could play a role both in inducing the inflammatory response and in recruiting regulatory immune cells that could modulate EAU inflammation.

ENDOPHTHALMITIS FOLLOWING PARS PLANA VITRECTOMY: CLINICAL FEATURES, VISUAL OUTCOMES, AND RISK FACTORS

POSTERBOARD#: B0362

Abstract Number: 773 - B0362

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Purpose

A retrospective review to describe the incidence, visual outcomes, and risk factors for endophthalmitis following pars plan vitrectomy (PPV) at two retina institutions.

Methods

All cases of suspected endophthalmitis following pars plana vitrectomy between 3/1/2015 and 10/31/2022 at Austin Retina Associates and between 5/1/2015 and 10/31/2017 at Wills Eye Hospital were identified with billing data. Medical records were then reviewed to capture patient demographics, visual outcomes, and surgical characteristics.

Results

Results: A total of 20,107 pars plana vitrectomies were included. Suspected endophthalmitis occurred after 27 cases and culture-positive endophthalmitis occurred after 10 cases giving incidence rates of 0.13% and 0.05%, respectively. The mean age of our cohort was 68.9 years old with a mean time to presentation of 13.7 days. At 3 months post-infection, visual acuity returned to within 2 lines of baseline acuity in 32% of patients and 52% of patients had vision of 20/200 or worse. The placement of a scleral buckle at the time of PPV (n=5,645) was associated with a significant reduction in the risk of suspected endophthalmitis (p=0.006) and culture-positive endophthalmitis (p=0.05). The use of gas tamponade was significantly associated with reduced risk of suspected endophthalmitis (p=0.003), but not culture-positive endophthalmitis (p=0.39). No association was found between suspected endophthalmitis and vitrectomy gauge (23g vs. 25g; p=0.13).

Conclusions

Endophthalmitis following PPV remains uncommon but visual outcomes may be poor with only one third of patient returning to their baseline acuity. The use of gas tamponade and the addition of a scleral buckle were associated with a decreased risk of infection.

FACTORS ASSOCIATED WITH BETTER VISUAL OUTCOMES AFTER REPAIR OF RECURRENT RHEGMATOGENOUS RETINAL DETACHMENT WITHOUT PROLIFERATIVE VITREORETINOPATHY

ON-DEMAND

Abstract Number: OD75

AuthorBlock: ***Kristine Wang[1], Michael Nguyen[1], Bita Momenaei[2], Taku Wakabayashi[2], Hana A. Mansour[2], Jason Hsu[2]***

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Purpose

To identify factors associated with better visual outcomes in eyes undergoing pars plana vitrectomy (PPV) with or without scleral buckle (SB) for recurrent rhegmatogenous retinal detachment (RRD) without proliferative vitreoretinopathy (PVR) grade C or worse.

Methods

A single-center, retrospective chart review of eyes that had a primary RRD repaired by PPV ± SB then redetached within 1 year and underwent repeat PPV ± SB from January 2015 to December 2022. Eyes with PVR grade C or worse at the time of primary or recurrent RRD; silicone oil (SO) tamponade or ERM peel during primary RRD repair; SO tamponade during recurrent RRD repair that was not removed within 1 year; more than one recurrent RRD; less than 6 months follow-up after recurrent RRD repair; or prior PPV, SB, or pneumatic retinopexy were excluded.

Results

A total of 95 eyes of 95 patients were included with 58 (61.1%) being male. The mean (SD) age was 62.3 (8.9) years. The mean (SD) follow-up duration after recurrent RRD repair was 35.6 (22.4) months. At the time of primary RRD and recurrent RRD, 52 (54.7%) eyes and 48 (50.5%) eyes were macula-off, respectively. The mean (SD) logMAR visual acuity (VA) [Snellen] was 0.94 (0.94) [20/174] at the time of primary RRD and 0.77 (0.75) [20/118] at the time of recurrent RRD (p=0.06). The mean (SD) logMAR VA [Snellen] significantly improved from the time of primary RRD to 0.60 (0.62) [20/83] at 6 months (p=0.001) and to 0.39 (0.51) [20/49] at final visit (p<0.001). Better final VA was significantly associated with better preoperative VA at the time of primary and recurrent RRD (both p<0.001), macula-on recurrent RRD (p=0.001), lesser extent of primary RRD (p=0.008), lesser extent of recurrent RRD (p=0.025), and gas tamponade instead of SO at the time of recurrent RRD repair (p=0.005) in the univariate analysis, and with better preoperative VA at the time of primary RRD in the multivariate analysis (p=0.023).

Conclusions

In recurrent RRD without PVR grade C or worse treated with PPV ± SB, better final visual outcomes were associated with better preoperative VA at the time of primary RD repair.

FOXO FUNCTION IN LENS CELL DIFFERENTIATION

PAPER PRESENTATION

Abstract Number: 3280
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DisclosureBlock: Rifah Gheyas, None; A Sue Menko, None;

Purpose

FOXOs, a family of transcription factors sharing a conserved forkhead DNA-binding domain, are known to be regulated by PI3K/Akt signaling. Akt phosphorylation of FOXOs at three conserved sites is associated with their cytoplasmic localization and their dephosphorylation with retention in the nucleus where they bind to chromatin to regulate transcription. We examined how Akt inhibition impacts FOXO localization in different regions of the lens and differentiation initiation, and the potential function of FOXO1 in formation of the lens Organelle Free Zone.

Methods

At E12, prior to formation of the OFZ, embryonic chick lenses were exposed in organ culture to the PI3K/Akt-specific inhibitor MK-2206 for 24 hrs with vehicle DMSO as control. Lenses were microdissected into differentiation-state specific regions and cytoplasmic, nucleoplasmic, and chromatin fractions isolated for immunoblot analysis or fixed, cryoprotected and 25mm cryosections prepared for immunolocalization studies using antibodies to FOXO1, FOXO4, and their transcriptional target the cell cycle inhibitor p27. For inhibitor studies E12 chick lenses were exposed in organ culture to the inhibitor of FOXO1 transcriptional activity AS1842856 or its vehicle DMSO for 24 hrs. Lenses were either microdissected for immunoblot analysis or cryosectioned for immunolocalization analysis using antibodies to molecular intermediates in autophagy like Beclin, and molecular indicators associated with chromatin cleavage that could be regulated by the FOXOs.

Results

FOXO1 and FOXO4 association with chromatin increased in response to inhibition of the PI3K/Akt signaling axis in lens epithelial, cortical fiber and nuclear fiber cells. This outcome was directly correlated with increased expression of the FOXO1/4 transcriptional target p27, its premature expression in lens epithelial cells and more widespread expression across the lens fiber cell region. Inhibition of FOXO1 transcriptional activity suppresses expression of beclin1, an initiator of autophagy, in cortical fiber cells. Inhibiting FOXO1 transcriptional activity also suppressed cleavage of the caspase-3 target PARP1 and blocked DNA cleavage in central fiber cell nuclei, shown by immunolabeling for pH2AX.

Conclusions

The inhibition of PI3K/Akt induced FOXO1/4 chromatin association and the early induction of withdrawal of lens cells from the cell cycle. FOXO1 plays a role in autophagy induction in lens fiber cells and chromatin cleavage.

FREQUENCY OF ANTI-VEGF INJECTIONS BEFORE AND AFTER PARS PLANA VITRECTOMY IN EYES WITH NEOVASCULAR AGE-RELATED MACULAR DEGENERATION

POSTERBOARD#: B0284

Abstract Number: 221 - B0284

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Purpose

It has been theorized that removal of the vitreous affects the pharmacokinetic properties of intravitreal anti-VEGF therapy. This retrospective cohort study assessed the frequency of anti-VEGF administration before and after pars plana vitrectomy (PPV) in eyes with neovascular age-related macular degeneration (nAMD).

Methods

The study included 18 eyes with nAMD being treated with anti-VEGF injections that underwent PPV. Indications for PPV were recorded. At the five visits before (Pre-5, Pre-4, Pre-3, Pre-2, and Pre-1) and after PPV (Post-1, Post-2, Post-3, Post-4, Post-5, and final), functional and anatomic (optical coherence tomography) outcomes were assessed. The interval between visits was recorded. Statistical analyses included paired t-test, McNemar's test, and generalized estimating equations.

Results

The most common indications for PPV included 5 (28%) exudative/hemorrhagic retinal detachments (RD), 5 (28%) dislocated lens/retained lens fragments, and 3 (17%) rhegmatogenous RDs. In the visits preceding vitrectomy, there were average intervals of 50.7 (±24.0), 55.8 (±26.2), 58.9 (±28.5), and 58.9 (±35.5) days between the visits [Pre-5 to Pre-4], [Pre-4 to Pre-3], [Pre-3 to Pre-2], and [Pre-2 to Pre-1], respectively. After vitrectomy, the intervals between visits were 39.8 (±13.3), 46.7 (±24.0), 40.8 (±18.2), and 42.6 (±18.4) days between the [Post-1 to Post 2], [Post-2 to Post-3], [Post-3 to Post-4] and [Post-4 to Post-5] visits, respectively. When comparing the intervals between visits before vitrectomy to those after vitrectomy, there was a significant difference, p=0.03. Average LogMAR vision was 0.56 (± 0.60), 0.59 (±0.60), 0.62 (± 0.67), and 0.73 (± 0.72) at the Pre-5, Pre-4, Pre-3, and Pre-2, visits, respectively. There was no significant difference in vision from that of the Pre-1 visit [1.24 (±0.85)] when compared to the vision of the Post-1 visit [0.99 (± 0.66)], p-value= 0.29. In the subsequent Post-2, Post-3, and Post-4 visits, the average LogMAR vision was 0.88 (±0.67), 0.86 (±0.65), and 0.94 (±0.73), respectively.

Conclusions

A shortening of treatment intervals was observed after PPV in eyes receiving anti-VEGF injections for nAMD. After PPV, close monitoring of anti-VEGF treatment response is prudent given the potential pharmacokinetic effects of post-vitrectomy physiology.

GOOGLE SEARCH TRENDS TO ASSESS PUBLIC INTEREST AND CONCERN ABOUT SYFOVRE FOR THE TREATMENT OF GEOGRAPHIC ATROPHY

POSTERBOARD#: A0149

Abstract Number: 4430 - A0149

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DisclosureBlock: Hana A. Mansour, None; Ajay Kuriyan, Code C (Consultant/Contractor) Alimera Sciences, Allergan, Bausch + Lomb, Eyepoint Pharmaceuticals, Optos, Novartis, Genentech/Roche, Recens Medical, Spark Therapeutics, Code F (Financial Support) Adverum, Annexon, Alcon Laboratories, Genentech/Roche

Purpose

To assess global trends in interest surrounding the newly Food and Drug Administration-approved treatment for geographic atrophy Syfovre, (pegcetacoplan), (Apellis Pharmaceuticals Inc., Waltham, MA, USA), and related searches.

Methods

We utilized Google Trends, (Google LLC, California, USA), which provides real-time data on the relative search volume (RSV) for specified terms, in order to gauge the public interest in “Syfovre” worldwide, with a particular focus on the United States. Our analysis covered the period from October 16, 2022, to October 8, 2023. The primary outcome measures included changes in the RSVs for terms such as “Syfovre”, “pegcetacoplan”, “geographic atrophy” and related popular queries like “Syfovre side effects”.

Results

Following the positive outcomes of clinical trials involving pegcetacoplan for the treatment of geographic atrophy, the Food and Drug Administration granted approval to Syfovre on February 18, 2023. Subsequently, notable spikes in RSVs for 'Syfovre' were observed, (Figure 1), in mid-to-late February 2023, as well as in March and April 2023, coinciding with the drug's introduction to the market. Of the various Syfovre side effects, retinal vasculitis garnered the most significant attention, with a sharp rise in RSV in mid-July 2023, following several reports of this specific adverse event. Geographic variation was evident, with the highest RSVs for 'Syfovre' originating from users on the East Coast in Connecticut (RSV = 100), followed by Massachusetts (RSV = 93), and New Jersey (RSV = 89).

Conclusions

Google Trends proves to be a useful tool for gaining insight into public interest in Syfovre as a treatment for geographic atrophy. Concerns among the public regarding potential side effects necessitate further real-world investigations to examine the causal relationship between Syfovre and retinal vasculitis especially, with the goal of finding prevention strategies.

GROWTH RATES OF GEOGRAPHIC ATROPHY IN EYES WITH ADVANCED DRY AGE-RELATED MACULAR DEGENERATION COMPARED TO MACULAR ATROPHY IN FELLOW EYES TREATED FOR NEOVASCULAR AGE-RELATED MACULAR DEGENERATION

ON-DEMAND

Abstract Number: OD70

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Purpose

To study the natural history and anatomic characteristics of geographic atrophy (GA) in eyes with advanced dry age-related macular degeneration (dAMD) compared to macular atrophy in fellow eyes treated for neovascular AMD (nAMD) with anti-vascular endothelial growth factor (VEGF) injections.

Methods

This is a single center, retrospective chart review of patients with dAMD in one eye and nAMD in the fellow eye. Data were recorded at two time points (#1 and #2) one year apart. Two independent graders reviewed the images to measure atrophy size and grade it based on the Consensus on Atrophy Meeting group criteria. The change in atrophy was calculated as the difference in atrophy size between the two time points. A square root transformation (SQRT) was also performed to report the change in atrophy size.

Results

208 eyes of 104 patients were included in this study: 104 eyes had dAMD and 104 fellow eyes had nAMD. Mean (SD) age was 87.5 (6.3) years and 68.3% (71 of 104) were females. Mean (SD) atrophy size was 14.05 (9.96) mm^2 in dAMD eyes and 14.14 (9.26) mm^2 in nAMD eyes (p= 0.95) at time point #1, and 16.92 (10.83) mm^2 in dAMD eyes and 17.35 (11.03) mm^2 in nAMD eyes (p= 0.78) at time point #2. Mean (SD) atrophy growth rate was 3.08 (2.52) mm^2/year in the nAMD eyes and 2.77 (1.88) mm^2/year in the dAMD eyes (p= 0.32). Using the SQRT, the growth rates were 0.40 (0.24) mm/year in nAMD and 0.38 (0.22) mm/year in dAMD (p= 0.55).

Conclusions

GA in eyes with dAMD and macular atrophy in fellow eyes with nAMD exhibit similar growth rates, suggesting a high degree of concordance. This suggests a rationale for considering complement inhibition in eyes with nAMD and macular atrophy.

HIGH-RISK HISTOPATHOLOGICAL FEATURES OF RETINOBLASTOMA: A GLOBAL STUDY OF 1426 PATIENTS FROM 5 CONTINENTS

PAPER PRESENTATION

Abstract Number: 3272

AuthorBlock: *Swathi Kaliki[1], Tatiana Ushakova[2], Alia Ahmad[3], Yacoub A. Yousef[4], Soma Roy[5], Devjyoti Tripathy[6], Juan Garcia Leon[7], Jesse L. Berry[8], Shahar Frenkel[9],* ***Carol Shields[10]****, Anasua Kapoor[11], M Ashwin Reddy[12], Hans E. Grossniklaus[13], John D. McKenzie[14], Ido Didi Fabian[15], Rosdali Yesenia Diaz Coronado[7]*

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Purpose

To evaluate the high-risk histopathological features (HRHF) following primary enucleation of eyes with retinoblastoma (RB) and assess the patient outcomes across continents

Methods

Retrospective study of 1426 patients from 5 continents during the study period of 2011 to 2020

Results

Of the 1426 primarily enucleated RB eyes, 923 (65%) were from Asia, 27 (2%) from Australia, 120 (8%) from Europe, 162 (11%) from North America, and 194 (14%) from South America. Based on International Classification of Intraocular Retinoblastoma, the eyes belonged to group C (n=2, <1%), D (n=264, 19%), or E (n=1046, 73%). Based on continent (Asia vs Australia vs Europe vs North America vs South America), the histopathology features included massive choroidal invasion (31% vs 7% vs 13% vs 19% vs 27%, p=0.001), post-laminar optic nerve invasion (27% vs 0% vs 16% vs 21% vs 19%, p=0.0006), scleral infiltration (5% vs 0% vs 4% vs 2% vs 7%, p=0.13), and microscopic extrascleral infiltration (4% vs 0% vs <1% vs <1% vs 4%, p=0.68). Adjuvant chemotherapy with/without orbital radiotherapy was given in 761 (53%) patients. Based on Kaplan-Meier estimates in different continents (Asia vs Australia vs Europe vs North America vs South America), the 6 year risk of orbital tumor recurrence was 5% vs 2% vs 0% vs 0% vs 12% (p<0.001), systemic metastasis was 8% vs 5% vs 2% vs 0% vs 13% (p=0.001), and death was 10% vs 3% vs 2% vs 0% vs 11% (p<0.001).

Conclusions

There is a wide variation in the infiltrative histopathology features of RB across continents resulting in variable outcomes. South America and Asia had higher risk of orbital tumor recurrence, systemic metastasis and death compared to Australia, Europe, and North America.

HOW FAR IN THE FUTURE CAN A DEEP LEARNING MODEL FORECAST POINTWISE VISUAL FIELD (VF) DATA BASED SOLELY ON ONE VF DATA INPUT

PAPER PRESENTATION

Abstract Number: 373

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Purpose

Accurate assessment of disease progression is essential for glaucoma mangement. The purpose of this study was to investigate how far in the future a deep learning model can forecast pointwise visual field (VF, Humphrey, 24-2 SITA Standard, Zeiss, Dublin, CA) data within the expected variability range based on one VF input.

Methods

We collected a series of VF test results in our longitudinal glaucoma cohort for each subject. A newly developed deep learning model architecture, CoTrNet, which combines convolution and transformer, was used to forecast pointwise VF sensitivities at variable future time points based on a single baseline VF data. Total number of 8390 VF series of 1423 subjects, where various intervals between VF tests were counted as individual series, were used for training, validation, and testing of the model. The time interval between the baseline and the forecasting future time point was concatenated with the baseline VF to form the input to the model. The mean absolute error (MAE) was used for both training and evaluation. As a comparison against the conventional architectures, CascadeNet-5 (convolutional neural network (CNN) architecture) and recurrent neural network (RNN, long short term memory (LSTM) architecture) were also trained. CascadeNet-5 took data from one VF data as input just like our CoTrNet, while RNN took data from 2 consecutive baseline VF data as input. For all 3 models, the dataset was split to perform 10-fold cross-validation without patient overlap.

Results

Mean age of the subjects was 66.1 ± 12.0 yeas. Average baseline VF mean deviation (MD) of the cohort was -5.6 ± 7.4 dB (median -2.74, ranged from -34.0 to 5.8 dB). Figure shows performances of the 3 deep learning models as a function of time for forecasting. CoTrNet showed the lowest MAE until it hit 4 years, all within the expected variability range (< 2.75 dB), when both CoTrNet and CascadeNet-5 showed a sudden rise in MAE, most likely due to small test samples.

Conclusions

The newly developed CoTrNet model achieved stable forecasting performance up to 3.5 years, and it outperformed the other tested models. CoTrNet may provide a way to predict future glaucoma progression at the first visit, meaning that only one VF test is required.

INCIDENCE OF MANAGEMENT CHANGES ON POSTOPERATIVE DAY ONE AFTER EPIRETINAL MEMBRANE PEEL

POSTERBOARD#: B0579

Abstract Number: 918 - B0579

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Purpose

Vitrectomy for epiretinal membrane (ERM) traditionally has required patients to return to the clinic on postoperative day 1 (POD1), week 1 (POW1), month 1 (POM1), and month 3 (POM3). Recent advancements in diagnostic and surgical techniques for vitrectomy and ERM peel have improved surgical efficiency and resulted in a lower rate of procedure-related complications. Therefore, this study aims to investigate the complications associated with ERM peels to determine the necessity of mandating patients to return for POD1 visits.

Methods

All eyes with a diagnosis of ERM that underwent ERM peel with or without internal limiting membrane (ILM) peel, from January 2015 to January 2023, and completed POD1 through POM3 visits, were included. Baseline characteristics, surgical outcomes, and complications were assessed. Main outcome measures included postoperative complications assessed at each visit, including ocular hypertension or hypotension (intraocular pressure, (IOP), greater than 24 mmHg or less than 6 mmHg), retinal detachment or tear, vitreous hemorrhage (VH), hyphema, endophthalmitis, and the need for changes in management.

Results

A total of 339 eyes of 339 patients were examined. Of the complications investigated, 3 eyes (0.9%) developed an IOP exceeding 30 mmHg at POD1. IOP-lowering drops were prescribed for 2 of them. At POD1, 15 eyes (4.4%) had an IOP less than 6 mmHg, with 14 resolving spontaneously by POW1. Additionally, at POD1, a hyphema was noted in 1 eye, corneal abrasion in 1 eye, and VH in 3 eyes. No non-standard steroids or non-standard antibiotics were required at POD1. 4 patients (1.2%) necessitated a change in follow-up interval due to complications at POD1: 1 due to corneal abrasion, 1 for symptomatic acute endophthalmitis, and 2 for ocular hypotension, all requiring additional intervention.

Conclusions

Management changes on POD1 after ERM peel occurred in 1.2% of cases, all of which caused patient symptoms. Flexibility regarding the features of the POD1 encounter, such as an IOP check with an ophthalmic technician or non-retinal eye care, accompanied by a provider phone call to inquire about symptoms, may be reasonable in certain circumstances.

INTERNATIONAL RETINOBLASTOMA LIQUID BIOPSY CONSORTIUM (IRB-LBC): A MULTI-CENTER, MULTI-NATIONAL COLLABORATIVE STUDY ON AQUEOUS HUMOR AS A LIQUID BIOPSY TOOL FOR RETINOBLASTOMA

POSTERBOARD#: A0002

Abstract Number: 464 - A0002

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Purpose

Retinoblastoma (RB) is a rare pediatric ocular cancer that cannot be biopsied without risk of extraocular tumor spread. Our novel research has shown that aqueous humor (AH) biopsy is a safe, valid method for acquiring molecular and genomic tumor information in the absence of tissue. We created an international consortium to examine the diagnostic and prognostic value of AH for RB.

Methods

Children's Hospital Los Angeles (CHLA) is the lead institution, recruiting investigators with active RB programs. Researchers obtain local IRB approval for the collection of AH, blood, tumor and clinical data, and recruit their own patients. Samples are maintained on site per protocol, with AH stored at -80C. After a Materials Transfer Agreement, 23 sites ship RB biospecimens to CHLA for DNA extraction and sequencing, while 7 sites process their own samples and share genomic data.

Results

There are 30 centers involved. Started by CHLA in May of 2019, this project recruited 7 US sites and 1 Canadian hospital. Eight additional US centers, 6 international centers (IND, São Paulo + Goiânia, BRA, MX, ISR, NZL/AUS) and the broad European RB Group recently joined. The CHLA biorepository has 691 samples from 125 patients, including 35 from multisite studies. Our first multisite publication detailed nucleic acid concentrations in RB AH samples (Oph. Science, 2023) and was recognized as the 'Best Paper Presentation' for ocular oncology at the AAO 2023 conference. We also reported on MYCN amplification in RB AH Genomic data from 263 samples sequenced at CHLA was released to the NIH Database of Genotypes and Phenotypes (https://www.ncbi.nlm.nih.gov/gap/) in 2023 and is now publicly available.

Conclusions

Our multisite, international research collaboration provides a mechanism to capture data on more RB patients under varied treatment protocols. Future research will examine the impact of treatment stratification on AH biomarkers, assess the clinical utility of AH as a companion diagnostic, and AH biomarkers to stratify prospective clinical trials. This project has been essential for advancing innovative and translational research for RB.

IN VIVO LONGITUDINAL BIOMECHANICAL CHANGES OF THE LAMINA CRIBROSA UNDER CHRONIC ELEVATED INTRAOCULAR PRESSURE

POSTERBOARD#: A0428

Abstract Number: 2504 - A0428

AuthorBlock: ***Gabriela Cavagnoli Schwantes[1]***, *Leon Kamen[2]*, ***Ronald Zambrano[1]***, *Timothy K. Chung[3]*, *John Danias[4]*, *Jonathan Pieter Vande Geest[3,5]*, ***Gadi Wollstein[1,6]***

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Purpose

The lamina cribrosa (LC) is a porous structure within the optic nerve head (ONH) and alterations in it have been previously linked to glaucoma. The purpose of this study is to determine the in vivo longitudinal biomechanical changes that occur in the LC in the presence of chronic ocular hypertension.

Methods

Laser photocoagulation of the trabecular meshwork was performed in one eye of each of 3 healthy adult rhesus macaques to induce chronic IOP elevation. The animals were followed longitudinally using OCT (Bioptigen Envisu; Leica, Chicago, IL) scanning of the ONH at the inherent IOP level and at 15mmHg, achieved through anterior chamber cannulation (Figure 1A). A non-rigid Thirion's demon algorithm was used to compute the 3D displacement field of each LC at the varying IOP levels (Figure 1B). A 3D Gaussian low-pass filter was applied to the displacement field to minimize the effect of the noise and estimation error on the strain calculation. 3D Green-Lagrange strains were calculated from the displacement field from which the right Cauchy stretch tensor was computed. Maximum principal values (MP) of the right Cauchy stretch tensor were subsequently calculated.

Results

Peak IOP in the experimental eyes ranged between 31-38mmHg among the 3 animals and 16-17mmHg in the control eyes. Distribution of MP level per pixel within the lamina demonstrated an overall similar strain pattern at baseline across all eyes with inter-eye and inter-subject variability (Figure 2, top 2 rows). All 3 animals presented dynamic changes in strain over time when subjected to chronic IOP elevation. The experimental eyes of Animal #1 and Animal #2 became more flexible (peak distribution shifted to the right and peak height decreased), while in Animal #3 it became less deformable.

Conclusions

The in vivo biomechanical response of the LC changes over time when subjected to chronic IOP elevation. Future studies will determine the association between the varying patterns of change and the rate of retinal ganglion cell axonal damage.

LENADOGENE NOLPARVOVEC GENE THERAPY FOR LEBER HEREDITARY OPTIC NEUROPATHY IN THE REAL-LIFE SETTING

PAPER PRESENTATION

Abstract Number: 419

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Purpose

Through early access programs (EAP), patients with Leber hereditary optic neuropathy (LHON) can benefit from lenadogene nolparvovec, a yet unapproved gene therapy for LHON due to the m.11778G>A *ND4* mutation.

Methods

Lenadogene nolparvovec was provided based on unsolicited requests and its use was authorized by local regulations. Patients received lenadogene nolparvovec in 4 countries (France, Italy, UK and US) as a unilateral or bilateral intravitreal injection at a dose of $9x10^{10}$ viral genomes/eye.

Results

A total of 63 *ND4*-LHON patients received lenadogene nolparvovec in EAP, mainly in France (35 [55.6%]) and the US (18 [28.6%]). Overall, 42 (66.7%) patients received a bilateral injection; all but one received both injections on the same day. At the time of the first injection of lenadogene nolparvovec, patients were on average (SD) 33.7 (16.6) years old, with 6 (9.5%) children aged <15 years. The mean (SD) duration of disease at the first injection was 11.4 (9.6) months. Most (81.0%) patients were treated with idebenone therapy at the time of or after the gene therapy injection. BCVA values at 1 year were obtained from 50 patients; the mean (SD) change in BCVA from nadir to 1 year was -0.43 (0.54) LogMAR (+22 ETDRS letters equivalent). An improvement of at least 0.3 LogMAR from nadir was observed in 63.0% patients. During the same timeframe, 28 untreated *ND4*-LHON patients, with comparable profiles, were prospectively followed and showed an absence of visual recovery at the last available observation (mean follow-up: 13.3 months post vision loss), with a mean (SD) BCVA of +1.90 (0.60) LogMAR and a change from nadir of -0.09 LogMAR (+4 ETDRS letters), contrasting with the benefit observed in *ND4*-LHON patients treated with lenadogene nolparvovec. The safety of lenadogene nolparvovec in EAP was comparable to those of the 189 patients from clinical studies, with an intraocular inflammation rate of 51.4% and no difference in the incidence of intraocular inflammation between patients treated bilaterally and unilaterally.

Conclusions

Preliminary analyses show that injection of lenadogene nolparvovec in the real-life setting was associated with a clinically significant improvement in visual acuity from nadir and a favorable safety profile similar to that observed in the clinical studies.

LONGITUDINAL CHANGES IN RNFL AND GCIPL THICKNESSES IN RHESUS MACAQUES WITH CHRONIC OCULAR HYPERTENSION

POSTERBOARD#: B0959

Abstract Number: 6760 - B0959

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DisclosureBlock: Leon Kamen, None; Gabriela Schwantes, None; Palaiologos Alexopoulos, None; Arturo Barron Arrambide, None; Ronald Zambrano, None; Ezekiel Ede, None; TingFang Lee, None; John Danias, None; Gadi Wollstein, None;

Purpose
Retinal nerve fiber layer (RNFL) and ganglion cell-inner plexiform layer (GCIPL) thicknesses are primary structural biomarkers used in clinical management of glaucoma for diagnosis and longitudinal monitoring. In this study we compare the thickness change of RNFL and GCIPL in a rhesus macaque model with laser-induced chronic ocular hypertension as the eyes transition from health to early structural changes.

Methods
Laser photocoagulation of the trabecular meshwork was employed to induce chronic IOP elevation in one eye of each of three adult rhesus macaques. The RNFL and GCIPL thicknesses were longitudinally measured using spectral-domain OCT (Bioptigen Envisu; Leica, Chicago, IL). Images were obtained both at intrinsic IOP levels and at 15 mmHg which was achieved through anterior chamber cannulation. The Iowa Segmentation software (Retinal Image Analysis Lab, Iowa Institute for Biomedical Imaging, Iowa City, IA) was used to analyze the scans. Linear mixed effect models were used to determine differences in the rate of change. To standardize the difference in RNFL and GCIPL dynamic range measurements, percent change from baseline was also compared.

Results
Peak IOP range during the follow up period was 31-34mmHg in the experimental eyes of the 3 animals and 16-17mmHg in the control eyes. Significant rate of RNFL thickness change was detected in naïve ($p=0.001$) and fixed IOP ($p=0.001$) settings in the experimental eye and non-significant for GCIPL thickness measurements ($p=0.339$, 0.358, respectively; Figure, Table). The overall rate of change was faster in the experimental eye then the control eye for RNFL ($p<0.001$, 0.047 for naïve and fixed IOP) but not for GCIPL ($p=0.932$, 0.451). The overall rate of change by percent (all eyes) was faster for RNFL compared with GCIPL under both naïve ($p<0.001$) and fixed IOP ($p=0.017$) conditions. The rate of change for either the RNFL or the GCIPL was independent of the IOP value at the time of image acquisition ($p=0.465$, 0.663, respectively).

Conclusions
Moderately high IOP at the time of image acquisition does not affect RNFL or GCIPL thickness measurements. RNFL thickness decline more rapidly than GCIPL thickness at early stages of experimental glaucoma, even when accounting for the different dynamic range of the parameters, making it a better indicator of disease change at this stage of the disease.

LONG TERM OUTCOMES OF YAMANE TECHNIQUE COMBINED WITH PARS PLANA VITRECTOMY IN VARIOUS INDICATIONS: A RETROSPECTIVE STUDY

POSTERBOARD#: B0139

Abstract Number: 4020 - B0139

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Purpose
No previous studies have reported long-term visual outcomes and complication rates of Yamane technique fixation combined with Pars Plana Vitrectomy. This retrospective study aimed to describe the long-term clinical outcomes of the Yamane transconjunctival sutureless intrascleral intraocular lens (SIS IOL) fixation technique combined with pars plana vitrectomy (PPV) in patients with aphakia, IOL dislocation, IOL opacification, and lens luxation.

Methods
A retrospective analysis was conducted at a Private Hospital in Brazil. Demographic data, preoperative and postoperative best-corrected visual acuity (BCVA), indications for surgery, pre-existing ophthalmologic comorbidities, follow-up length, necessity for surgical reintervention, and postoperative complications were recorded.As preoperative and postoperative visual acuity did not follow a normal distribution, the Wilcoxon signed-rank test was used for statistical analysis.

The study enrolled 50 patients with various surgical indications: aphakia (9), IOL dislocation (33), IOL opacification (4), and lens luxation (4). Participants, mean age 68.78 ± 15.02 years (range: 14–96), underwent an average follow-up of 11.08 ± 9.99 months (range: 0.39–36.39). BCVA significantly improved from 0.667 ± 0.486 logMAR to 0.523 ± 0.456 logMAR (p=0.0182). Surgical reintervention was needed in 18%, with 8% within three months. Seventeen complications occurred: corneal edema (20%), vitreous hemorrhage (6%), cystoid macular edema plus vitreous hemorrhage (2%), IOL luxation (4%), and IOL luxation plus vitreous hemorrhage in one patient.

The Yamane SIS IOL fixation technique in conjunction with PPV proved to be an effective and dependable surgical approach for complicated cases necessitating additional interventions, as demonstrated by the long-term follow-up results.

LONG-TERM VISUAL FIELD PROGRESSION IN PATIENTS WITH OPTIC DISC DRUSEN WITH OR WITHOUT GLAUCOMA

POSTERBOARD#: A0471

Abstract Number: 2547 - A0471

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Purpose

To study visual field (VF) deterioration in patients with optic disc drusen (ODD) with or without glaucoma and identify possible factors associated with faster rates of VF progression.

Methods

Single-center, retrospective, comparative study including patients with a diagnosis of ODD, with > 2 reliable standard automated perimetry (SAP) tests obtained either by Humphrey or Octopus, and > 12 ≥months of follow-up. Rates of change in SAP mean deviation (MD) were obtained by linear mixed model regression and categorized as slow (<0.5 dB/year) or moderate/fast (>0.5 dB/year). Characteristics at baseline including demographics, glaucoma diagnosis, comorbid conditions, intraocular pressure (IOP), use of pressure-lowering medications, retinal nerve fiber layer (RNFL) thickness, and past ocular surgery were compared between groups, as well as IOP and use of medications during follow-up.

Results

82 eyes of 45 patients were included with a mean age of 56.6 ± 16.0 years and mean follow-up time of 53.7 ± 40.0 months (range 13.0-181.0 months). 65 eyes were classified as slow and 17 eyes were classified as moderate/fast. Glaucoma was diagnosed in 33/65 eyes (50.8%) in the slow group and 8/17 eyes (47.1%) in the moderate/fast group, with no significant difference. No significant differences in demographics, medical and surgical history, or mean IOP existed at baseline between groups. Patients in the moderate/fast group were on more glaucoma medications (1.29 vs. 0.40, P=0.003) and had a lower RNFL thickness (65.7 μm vs. 80.2 μm, P=0.032) at baseline compared to the slow group.

Conclusions

The moderate/fast progression group had lower RNFL thickness and more glaucoma medications at baseline compared to the slow group, regardless of glaucoma diagnosis. Notably, some eyes with ODD exhibited significant VF progression even without glaucoma, despite similar baseline IOP. These results suggest the importance of close monitoring for ODD patients and potential treatment consideration for those with significant RNFL thinning, even with normal IOP. Our findings emphasize the inherent challenge in distinguishing glaucoma and ODD, as evidenced by the similar distribution observed in both the slow and moderate/fast progression groups.

LONGITUDINAL BCVA ANALYSIS OF LOW- OR HIGH-DOSE MCO-010 MUTATION AGNOSTIC OPTOGENETIC THERAPY FOR RETINITIS PIGMENTOSA: 12-MONTH RESULTS FROM A PHASE 2B/3 RANDOMIZED, SHAM-CONTROLLED, PATIENT- AND ASSESSOR-MASKED CLINICAL TRIAL (RESTORE)

PAPER PRESENTATION

Abstract Number: 2137
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Purpose
MCO-010 is a gene mutation agnostic optogenetic therapy being evaluated in an ongoing Phase 2b/3 RESTORE clinical trial in individuals with advanced retinitis pigmentosa (RP). We performed an analysis of 52-week longitudinal data to evaluate the efficacy of a single administration of 2 different doses of MCO-010 therapy vs sham. MCO-010 is an AAV2-delivered multi-characteristic opsin (MCO) transgene administered by intravitreal injection. MCO-010 transduces bipolar cells to express a photosensitive opsin protein, restoring light sensitivity to the retina in patients with permanent photoreceptor loss.
Methods
Subjects had an advanced RP clinical diagnosis and a baseline visual acuity worse than 1.9 logMAR in the study eye and no better than 1.6 logMAR in the fellow eye. Subjects received a single dose of 0.9E11 gc/eye (low-dose; n = 9) or 1.2E11 gc/eye (high-dose; n = 9) MCO-010, or sham (n = 9), in the study eye at day 0. Visual acuity was assessed systematically until week 52 by best-corrected visual acuity (BCVA) using Freiburg visual acuity. Data were analyzed comparing the low- or high-dose MCO-010–treated individuals vs sham using a mixed-effects model for repeated measures with treatment, visit, and treatment-by-visit interaction as factors in the model, using the baseline score as a covariate.
Results
MCO-010 patients had mean baseline BCVA scores of 2.207 ± 0.105 and 2.250 ± 0.00 logMAR (low- and high-dose, respectively), and the sham patients had a mean baseline BCVA of 2.172 ± 0.1342 logMAR. The following BCVA results are reported from weeks 16, 24, 36, and 52. Compared to sham, low-dose MCO-010 patients had a mean improvement of 0.171, 0.207, 0.438, and 0.337 logMAR (P = 0.2242, 0.1424, 0.0021, and 0.0164, respectively). High-dose MCO-010 patients had a mean improvement of 0.077, 0.220, 0.228, and 0.301 logMAR (vs sham; P = 0.6016, 0.1277, 0.1091, and 0.0355, respectively). MCO-010 was well tolerated with no serious adverse effects observed through week 52.
Conclusions
RESTORE data demonstrate MCO-010–treated patients improved in BCVA compared to sham-treated patients in both dose groups, where statistically significant improvements in visual acuity was reported at week 36 and was maintained through the 52-week study.

MULTI-OMICS OF RETINAS FROM FREE-RANGING PRIMATES WITH NATURALLY OCCURRING THIN RETINAL NERVE FIBER LAYER

Posterboard#: A0517

Abstract Number: 656 - A0517

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Purpose

The interaction of environmental and genetic elements is implicated in glaucoma, but elucidating the important risk factors is difficult due to poor understanding of associations between clinical and molecular features. Our purpose is to determine tissue-level multi-omic associations with naturally occurring thin retinal nerve fiber layer (RNFL), a commonly used indicator of glaucomatous phenotype, in a population of free-ranging primates living in a naturalistic environment.

Methods

We studied clinical and ‘omic profiles of free-ranging adult rhesus macaques removed from the Cayo Santiago colony for population management. From 89 animals, we selected 18 (9M and 9F) with thin RNFLs (65.3-81.4 mm) and 18 (9M, 9F) with average (84.6 – 103.2 mm) RNFLs, assessed by OCT under anaesthetic. We were provided with eye tissues from the same animals and generated total RNA transcriptomes from retinal biopsies and untargeted global aqueous metabolomic profiles using the remaining retinal tissues. DESEQ2 was used to identify differentially expressed genes, which were piped into the Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway enrichment analysis to discover related pathways. The integration of gene expression and metabolomic data were conducted using mixomic.

Results

14 genes were differentially expressed in animals with thin versus average RNFL thickness. Among these, SFRP2, which is important for retinal development and myogenesis, and MIR7173, which affects the stability and translation of mRNAs, were among the most strongly differentially expressed. KEGG analysis highlighted 17 pathways that were enriched, including those linked with type I diabetes and cellular senescence. Considering metabolites, individuals with thin RNFLs had relatively less sorbitol and a higher abundance of six metabolites, including carnosine, methylmalonate, and retinal. Heatmaps of transcriptomic versus metabolomic profiles revealed a greater number of multiomic correlations, especially positive correlations, among eyes with thinner RNFLs.

Conclusions

The ‘omic profiles and multiomic interactions differ between free-ranging macaques with thin vs average RNFLs. These data improve our understanding of the biology of glaucomatous phenotypes and may help reveal the pathophysiology of glaucoma.

NORMATIVE VARIABILITY IN RETINAL NERVE FIBER LAYER THICKNESS: DOES IT MATTER WHERE THE PEAKS ARE?

POSTERBOARD#: B0558

Abstract Number: 5957 - B0558

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Purpose

Retinal nerve fiber layer thickness (RNFLT) is an important biomarker for glaucoma, but it has a wide normative range affecting its sensitivity and specificity for abnormality detection. Many think that the inter-individual peak location variability causes this wide normative range. The purpose of this study was 1) to assess the effect of RNFLT peak normalization on normative variability and 2) to seek a structural representation of the RNFLT peaks, using retinal blood vessels (BVs) information.

Methods

163 optical coherence tomography scans (Cirrus HD-OCT, 200x200 optic nerve head (ONH) scans, Zeiss, Dublin, CA) from 101 normal individuals were used. For each scan, a circumpapillary RNFLT profile at 1.7 mm radius circle around the ONH was obtained. Fovea-ONH axis (FOA) was calculated from corresponding scanning laser ophthalmoscope (SLO) images. Supra-temporal (ST) and infra-temporal (IT) RNFLT peaks from each profile were aligned to respective average peak locations. Normative ranges were calculated by averaging individual profiles before and after peak normalization. Mean BVs location (based on segmented vessels in ST and IT regions separately) and location of major BV arcades (manually annotated) were obtained at the 1.7 mm radius and correlated with the corresponding RNFLT peaks. All methods were also performed after alignment of FOA with the horizontal axis (HA).

Results

RNFLT peak normalization leads to localized reduction in variability around the peak locations, especially in the ST region (clock hour (CH) 11, $p<0.05$, Levene's test) (Figure 1). Aligning FOA to HA prior to peak normalization further reduces variability in CHs 10, 11 and 12 ($p<0.05$). Of the two BV related measures, mean BVs locations in the ST and IT regions were better correlated ($r = -0.51$ and -0.61, respectively, $p <0.05$) with the respective RNFLT peak locations compared to the superior and inferior BV arcade locations ($r = 0.03$ and 0.15, respectively) (Figure2). Aligning FOA to HA prior to peak normalization did not improve correlations between BV measures and RNFLT peak locations.

Conclusions

RNFLT peak normalization has region specific effects on reducing variability in the normative range, with greater reduction in the superior compared to inferior hemifield. Mean BV location in each hemifield may be of utility in RNFLT peak normalization compared to the BV arcade locations.

NOVEL OCT CHINREST ATTACHMENT IMPROVES PATIENT COMFORT

POSTERBOARD#: B0508

Abstract Number: 5907 - B0508

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Purpose

Subjects scanned with ocular imaging devices often experience inconvenience due to the limited capability to accommodate their specific face structure. In this study, we examined the comfort level of subjects undergoing ocular imaging using a newly designed chin rest, which was constructed for improved comfort and stability.

Methods

The tested chinrest was designed as an add-on to existing slit-lamp configurations of various OCT devices with the following capabilities (Figure 1): changing the extension to accommodate for varying chin sizes, rotation in the z-plane (towards the subject), and translational motion in the x and y planes via the existing imaging devices. Healthy individuals and subjects with a multitude of eye diseases were recruited for the study. All subjects had macular and optic disc cube scans (Cirrus HD-OCT; Zeiss, Dublin, CA) acquired with the existing and novel chinrest in a randomized order. A comfort related questionnaire was administered to the participants post imaging session. Proportional and paired t-tests were performed to determine which device provided a more comfortable imaging experience for the subject.

Results

Eighteen subjects were scanned with both chinrests in the same session. 78% of the subjects (N = 14) reported that the novel device is more comfortable than the conventional chin rest ($p = 0.03$). Specifically, the comfort level rating for the novel device was 1.39 points higher than that of the conventional device on a scale of 1-5 ($p = 0.001$).

Conclusions

This pilot trial successfully demonstrates that our new chinrest attachment was able to acquire images while significantly improving the subject's comfort during the imaging session. Future studies will examine the effects on motion artifacts and measurement reproducibility.

OCU400 NUCLEAR HORMONE RECEPTOR-BASED GENE MODIFIER THERAPY: SAFETY AND EFFICACY FROM PHASE 1/2 CLINICAL TRIAL FOR RETINITIS PIGMENTOSA ASSOCIATED WITH NR2E3 AND RHO MUTATIONS

PAPER PRESENTATION

Abstract Number: 406

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Purpose

Preclinical data indicates Nuclear Hormone Receptor-based gene modification therapy regulates transcriptional networks and delivery of *NR2E3* improves retinal structure, function and restores retinal homeostasis in retinitis pigmentosa (RP). We report the safety and efficacy of OCU400 gene modifier therapy from the phase 1/2 clinical trial for *NR2E3* and *RHO* associated RP (NCT05203939).

Methods

The multicenter phase 1/2 open-label trial was a 3+3 dose escalation and dose expansion study. Participants included adults with autosomal recessive *NR2E3* (AR-*NR2E3*), autosomal dominant *NR2E3* (AD-*NR2E3*), or autosomal dominant *RHO* RP (AD-*RHO*). Sentinel subjects had a best-corrected visual acuity (BCVA) ≤20/160 or visual field (VF) <20° III4e isopter while subjects had BCVA ≤20/50 or VF <20° III4e isopter in the study eye. Unilateral subretinal injection of OCU400 (AAV5-h*NR2E3*) with low ($5.0x10^9$ vg), medium ($1.0x10^{10}$ vg), or high ($5.0x10^{10}$ vg) doses were given to the worse eye. Primary safety endpoints included study-related adverse effects (AEs); secondary safety endpoints included immune and biochemical changes. Efficacy endpoints included BCVA, low-luminance visual acuity (LLVA), and multi-luminance mobility testing (MLMT).

Results

18 subjects were dosed and data from subjects who completed 6-months post dosing are reported. Most AE's were related to the surgery and resolved within weeks. One AESI involving inflammation associated with OCU400 occurred in the medium dose cohort, with full recovery. In the high dose cohorts, one serious adverse event (SAE) of BCVA loss associated with persistent postoperative foveal detachment occurred without recovery; another SAE of BCVA loss related to surgery improved with sequelae. 10 subjects showed Improved BCVA, LLVA, and MLMT Lux Level scores in the treated eyes relative to the untreated eyes. 86% (6/7) of *RHO* subjects experienced stabilization or improved MLMT scores, including a subset of subjects (2/7) that demonstrated a 3-luminance level improvement. AD-*NR2E3*subjects had no improvement in all three parameters.

Conclusions

OCU400 demonstrated relative safety in low and medium doses and showed potential efficacy for AR-*NR2E3* and AD-*RHO* cases but not for AD-*NR2E3* cases. Further efficacy testing of this therapy is warranted.

OUTCOMES AND COMPLICATIONS OF VITRECTOMY AND INTRAOCULAR LENS IMPLANTATION IN EYES WITH RETAINED LENS FRAGMENTS

POSTERBOARD#: B0115

Abstract Number: 3996 - B0115

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Purpose

To investigate visual and anatomic outcomes, complications, and factors associated with outcomes after pars plana vitrectomy (PPV) and intraocular lens (IOL) implantation for retained lens fragments.

Methods

This is a retrospective study of all patients with a diagnosis of retained lens fragments who underwent PPV, pars plana lensectomy (PPL), and secondary IOL implantation by a vitreoretinal surgeon from January 2015 to December 2022. Eyes with less than 3 months of follow-up were excluded. Primary outcome measures included visual outcomes and rate of ocular complications during the follow-up period.

Results

We analyzed 66 eyes from 66 patients that were followed for a mean (standard deviation, SD) of 25.7 (23.7) months after cataract surgery. The interval between cataract surgery to PPV was 25 (86) days. 44 eyes (81.8%) underwent IOL implantation at the time of PPV and PPL and 12 (18.2%) eyes underwent IOL implantation during a second surgery with a mean interval of 166.1 (187) days between surgeries. In total, scleral fixated IOL (SFIOL) with Yamane technique was used in 9 (13.6) eyes, scleral sutured IOL (SSIOL) using Gortex sutures was used in 56 (84.8%) eyes, and an IOL was placed in sulcus in 1 (1.5%) eye. In the study, 13.6% of eyes experienced retinal tear, 7.6% had retinal detachment, 3% developed choroidal detachment, and 1.5% developed endophthalmitis. Ocular hypertension affected 28.8% of eyes, while hypotony occurred in 10.6%. Additionally, postoperative cystoid macular edema (CME) was detected in 34.8% of eyes. The mean (SD) logMAR visual acuity at baseline was 2.1 (0.38) [Snellen equivalent: 20/2517], which improved significantly to 0.7 (0.75) [Snellen equivalent: 20/100], at the final visit at the retina clinic ($P<0.001$). When comparing eyes receiving SFIOL and SSIOL, there was no significant difference in final visual outcomes or rate of ocular complications. Similarly, visual outcomes and ocular complications showed no significant differences when comparing patients who received an IOL at the time of PPV and PPL versus those who received it at a later date.

Conclusions

The technique or timing of secondary IOL implantation does not affect the visual outcomes or rate of complications in eyes with retained lens fragments.

OUTCOMES OF EYES WITH RETINOSCHISIS-RELATED RETINAL DETACHMENT

POSTERBOARD#: B0583

Abstract Number: 922 - B0583

AuthorBlock: ***Bita Momenaei[1], Asad Farooq Durrani[1], Kristine Wang[1], Jason Hsu[1]***

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Purpose

To investigate visual and anatomic outcomes in patients who have undergone primary interventions for schisis-detachment.

Methods

A retrospective review was conducted on eyes that underwent a procedure for schisis-related retinal detachment (RD) between January 2015 and November 2022. Eyes with X-linked retinoschisis, isolated macular schisis, RD unrelated to schisis, and <6 months of follow-up were excluded. Primary outcome measures were the incidence of redetachment following the initial intervention, as well as visual and anatomic outcomes at 6 months and the final visit.

Results

After reviewing 174 eyes, 67 eyes of 67 patients met the inclusion criteria. The mean (standard deviation, SD) follow-up duration was 38.3 (24.3) months. Macular involvement was observed in 27 eyes (40.3%), and proliferative vitreoretinopathy (PVR) was present in 8 eyes (11.9%) at the time of primary RD. The initial repair methods included laser retinopexy in 23 eyes (34.3%), vitrectomy in 23 eyes (34.3%), combined vitrectomy and buckle in 13 eyes (19.4%), and buckle alone in 8 eyes (11.9%). The initial procedure failed in 7 eyes (30.4%) that underwent laser and 9 eyes (20.5%) that underwent surgery (P=0.381) after a median time (interquartile range, IQR) of 70 days (14-623) and 65 days (29-187), respectively. Single surgery anatomic success (SSAS) for RD repair was achieved in 81.8% of eyes (36/44) at 3 months. The anatomic success rate for reattachment was 91.3% at 6 month and 95.7% at the final visit in the laser group, and 97.7% at 6 months and at the final visit in the surgical group, with 8 eyes and 5 eyes remaining silicone oil-filled at these visits. The mean (SD) logarithm of the minimal angle of resolution (logMAR) visual acuity at the 6 month and final visit was 0.52 (0.55, Snellen equivalent: 20/66) and 0.37 (0.54, 20/47), showing no significant change compared to vision at the time of RD diagnosis (0.46 (0.66), 20/58) (P=0.844 and 0.276).

Conclusions

The treatment of schisis-detachment appears to lead to generally acceptable anatomical outcomes with preservation of vision. However, the relatively high redetachment rate suggests that these types of RDs may be more difficult to treat than non-schisis related rhegmatogenous RDs.

OUTCOMES OF VITREORETINAL SURGERY FOR RETINAL DETACHMENT ASSOCIATED WITH RETINAL HEMANGIOBLASTOMA IN VON HIPPEL-LINDAU DISEASE

POSTERBOARD#: B0550

Abstract Number: 889 - B0550

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Purpose

Von Hippel-Lindau (VHL) disease is an autosomal dominant genetic disorder caused by mutations in the tumor suppressor gene VHL and is characterized by retinal hemangioblastomas (RH) and other tumors. Pars plana vitrectomy (PPV) has been used to treat patients with multiple, large RHs and associated retinal detachment (RD). However, the recurrence of RHs after surgery is relatively common and the visual and anatomic outcomes in the long-term have not been well investigated. This case series aims to analyze the clinical characteristics, management, and long-term outcomes of eyes with RH and RD.

Methods

A retrospective chart review was conducted on all patients with a diagnosis of VHL from the Retina Service, Wills Eye Hospital, who had RD requiring vitreoretinal surgery between the year 2014 to 2022. Baseline demographic variables, RH characteristics and associated features, procedures performed, baseline, pre-operative, and final visual acuities, and complications were recorded.

Results

A total of 3 out of 225 VHL patients met inclusion criteria. Of the three cases, the mean patient age at initial evaluation was 21.33 ± 12.10 (range 12-35). All patients were female. The mean presenting logMAR vision was 0 (20/20) for patient 1, 1.30 (20/400) for patient 2, and 0 (20/20) for patient 3. The median interval from date first seen to RD was 6.58 years. Pre-operative logMAR vision was 1 (20/200), 2 (CF), and 0.10 (20/25) for patients 1, 2, 3, respectively. Median follow-up duration after RD repair was 11 months. Patient 1 exhibited traction RD-rhegmatogenous RD (TRD-RRD); patient 2 exhibited TRD-exudative RD (ERD); and patient 3 exhibited TRD. Initially, patients 1 and 3 received scleral buckle repair and patient 2 received PPV with air-fluid tamponade. Two out of 3 (patients 1 and 2) required additional repairs with PPV and silicone oil injection due to retinal re-detachment. Within the first 6 post-operative months, proliferative vitreoretinopathy was noted in patient 1. Silicone oil was removed from both patients, and at the most recent and final visit, the retina remained attached in all three patients. The final logMAR vision was 1.30 (20/400) for patient 1, 3 (NLP) for patient 2, and 0.18 (20/30) for patient 3.

Conclusions

Patients with VHL disease can present with complex RD and require multiple vitreoretinal surgeries with guarded long-term visual outcomes.

OUTER RETINA INVOLVEMENT IN MILD COGNITIVE IMPAIRMENT ALZHEIMER'S DEMENTIA

POSTERBOARD#: B0609

Abstract Number: 5506 - B0609

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Purpose

OCT has been suggested as a non-invasive tool to help identify visual biomarkers in Alzheimer's disease (AD) and mild cognitive impairment (MCI). This cross-sectional study investigated the involvement of the various inner and outer retinal layers in individuals with AD, MCI and normal cognition.

Methods

Subjects 60 years and older with a diagnosis of normal cognition, mild AD or MCI, according to the National Institute on Aging (NIA) and the Alzheimer's Association (AA) criteria, were enrolled in the study. All subjects had Humphrey visual field (VF) 24-2 (Zeiss, Dublin, CA) testing, spectral-domain OCT (Cirrus HD-OCT; Zeiss) optic nerve head (ONH) and macula cube scans. Segmentation of the macula scans was performed using the Iowa Reference Algorithms (version 3.8.0; Retinal Image Analysis Lab, Iowa Institute for Biomedical Imaging, Iowa City, IA). This software automatically segments 11 retinal surfaces from the internal limiting membrane to the RPE. A trained grader masked to the participant characteristics reviewed all segmented volume scans for accurate segmentation and foveal centration and manually corrected them, when needed. Linear mixed-effects model was used to compare the means of the 3 groups while adjusting for age and accounting for inter-eye correlation.

Results

59 eyes (30 subjects) qualified for the study. VF mean deviation (MD) and visual field index (VFI) were significantly reduced in mild AD and MCI compared to those with normal cognition (Table 1). No significant difference was detected between the groups for circumpapillary RNFL thickness or ONH parameters. However, average inner segment and outer segment photoreceptor junction (IS/OS) was significantly thicker in mild AD and MCI compared to normal cognition while average outer photoreceptor (OPR) was reduced in the same groups with a larger difference between the control group and the AD group than between the control group and the MCI group (Table 2).

Conclusions

Previous studies reported that the inner retinal layers are affected in AD. In our study, IS/OS and OPR thickness measurements were shown to be affected in the disease. This has not been previously reported when less detailed analysis of the outer retina was conducted. The underlying mechanism remains unclear but might be related to selective accumulation of amyloid β plaques in the retina.

PFKFB1 IS A NOVEL CANDIDATE GENE IDENTIFIED IN A FAMILY WITH A COMPLEX RETINAL DISORDER

PAPER PRESENTATION

Abstract Number: 1522

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Purpose

Pigmented paravenous retinochoroidal atrophy (PPRCA) is a rare disorder characterized by pigment accumulation in a venous distribution. A few cases have been reported with genetic variants, but most cases remain unexplained. Here we describe a family including three brothers with PPRCA-like retinal findings, partial posterior vitreous detachment, and varying degrees of vision loss; asymptomatic mother with mild overlapping retinal abnormalities; and unaffected father. We hypothesize that a genetic variant is causing the phenotype.

Methods

Exome sequencing was performed on all five family members. Familial analysis was performed, and variants were annotated and evaluated for pathogenicity. Candidate genes were evaluated in zebrafish for expression and function during embryonic development using RNAScope *in situ* and CRISPR-Cas9-mediated gene editing. Zebrafish embryos and adults were evaluated by gross examination under a microscope and histological studies.

Results

We identified a predicted loss of function variant in *PFKFB1* (NM_002625.4:c.318-2A>G) that is hemizygous in the brothers, heterozygous in the mother, and not present in the father. The variant is ultra-rare (1/1073580 in gnomADv4 with 0 hemizygotes) and predicted to be deleterious by in silico programs with a CADD score of 33 and splicing disruption leading to frameshift predicted by Splice AI and Pangolin. *PFKFB1* encodes a bifunctional enzyme known to regulate glycolysis, notably important in retinal tissues. Analysis of the zebrafish genome identified a single ortholog, *pfkfb1*, with 80% identity at the protein level. Expression studies revealed a dynamic expression pattern including strong presence in various ocular structures. We generated a zebrafish line, c.173_177del, with a predicted frameshift, similar to the expected effect of the human variant. No gross ocular phenotype was observed in the *pfkfb1* homozygous or heterozygous zebrafish larvae at 1-7 dpf (n=100) or at adult stages (6mpf, n=9). Further characterization through histology of the retina is underway.

Conclusions

Exome sequencing identified a strong candidate variant in *PFKFB1* in a family with a complex retinal disorder. This is further supported by the dynamic expression of *pfkfb1* in the developing eye of zebrafish, necessitating further studies into the effects of *pfkfb1* deficiency on retinal development and function in vertebrates.

PHOTOBIOMODULATION USING THE VALEDA MULTIWAVELENGTH LIGHT DELIVERY SYSTEM DEMONSTRATES SIGNIFICANT REDUCTION IN RISK FOR VISION LOSS AND ONSET OF GEOGRAPHIC ATROPHY IN DRY AGE-RELATED MACULAR DEGENERATION

Abstract Number: 379

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Purpose

The LIGHTSITE III study evaluated multiwavelength photobiomodulation (PBM) treatment using the LumiThera Valeda® Light Delivery System in dry age-related macular degeneration (AMD).

Methods

LIGHTSITE III was a prospective, double-masked, randomized, sham-controlled, parallel group, multi-center study to assess the safety and efficacy of PBM in dry AMD. PBM therapy consists of low-level light exposure to selected tissues resulting in positive effects on mitochondrial output and improvement in cellular activity. Subjects were treated with six series of multi-wavelength PBM (590, 660 and 850 nm) or active Sham treatment (Tx) (3x per week/3-5 weeks) delivered every 4 months over a 24-month period. A cox proportional hazards model was performed to evaluate the time to event hazard ratio of 1) vision loss (defined as >5 letter loss in BCVA) and 2) onset of geographic atrophy (GA). Data was analyzed at 24 months.

Results

100 subjects (148 eyes) with dry AMD were randomized. The majority of subjects had a mean age of 75.4 years (SD 7.1) and a mean time since diagnosis of 4.9 yrs. The LIGHTSITE III study results demonstrated a sustained improvement in BCVA with a primary endpoint BCVA benefit at both 13 and 24 months in the PBM vs Sham Tx group. The patients in the sham tx group showed greater vision loss over two years and progressed into later stage disease with 18% of sham eyes losing >5 letters in BCVA and 24% progressing to new onset GA. In the current analysis, the hazard ratio for BCVA with a >5 letter loss was 0.47, ($p < 0.02$) which indicated a statistically significant 53% reduction in onset of vision loss of >5 letters for PBM vs Sham Tx. The hazard ratio for onset of new GA was 0.27, ($p < 0.006$) indicating a statistically significant risk reduction of 73% to progress to new GA for PBM vs Sham Tx.

Conclusions

LIGHTSITE III provides the largest randomized controlled trial in dry AMD showing improved clinical and anatomical outcomes following PBM treatment. PBM therapy may offer a new treatment strategy with a unique mitochondrial mechanism and modality for patients with dry AMD to maintain retinal health and slow AMD disease progression.

PORT DELIVERY SYSTEM WITH RANIBIZUMAB (PDS) IN DIABETIC MACULAR EDEMA (DME): ADDITIONAL PRIMARY ANALYSIS RESULTS OF THE PHASE 3 PAGODA TRIAL

POSTERBOARD#: B0143

Abstract Number: 6233 - B0143

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Purpose

The PDS is an innovative drug delivery system that includes a refillable ocular implant for continuous delivery of a customized formulation of ranibizumab. The Pagoda trial assesses the efficacy, safety, and pharmacokinetics of the PDS with fixed 100 mg/mL refill-exchanges every 24 weeks (Q24W) compared with intravitreal ranibizumab 0.5 mg injections every 4 weeks (RBZ Q4W) in patients with center-involved DME.

Methods

Pagoda (NCT04108156) is an ongoing phase 3, multicenter, randomized, visual assessor–masked, active comparator clinical trial. Patients were randomized 3:2 to PDS Q24W or RBZ Q4W. PDS Q24W patients were assessed for supplemental intravitreal ranibizumab 0.5 mg treatment at the 2 visits before each refill-exchange. Primary endpoint was change in BCVA score (Early Treatment Diabetic Retinopathy Study letters) from baseline averaged over weeks (W) 60 and 64 (noninferiority margin –4.5 letters). Additional efficacy endpoints included assessment of treatment preference for PDS vs intravitreal injections in PDS Q24W patients using the PDS Patient Preference Questionnaire at W64; and evaluation of the proportion of patients with absence of intraretinal fluid (IRF) and subretinal fluid (SRF) over time.

Results

634 eyes were randomized (PDS Q24W, n=381; RBZ Q4W, n=253). Pagoda met its primary endpoint with PDS Q24W noninferior to RBZ Q4W for BCVA change from baseline averaged over W60/W64 (mean change, letters [95% CI]: PDS Q24W, 9.6 [8.7, 1.5]; RBZ Q4W, 9.4 [8.3, 10.5]; difference [95% CI] 0.2 [–1.2, 1.6]). CST reductions through W64 were comparable between arms. Through 2 refill-exchange intervals, 95.9% and 97.4% of PDS patients assessed did not receive supplemental treatment, respectively. Overall, 80% (241/301) of PDS Q24W patients indicated preference for PDS treatment at W64, with fewer treatments cited as the main reason (Fig 1). Absence of IRF and SRF in the central 1 mm subfield was comparable between arms at W64. PDS was generally well tolerated. No endophthalmitis cases were reported in the PDS arm after implantation through W64.

Conclusions

Pagoda met its primary endpoint – PDS Q24W demonstrated noninferior vision outcomes to RBZ Q4W at W60/64. PDS Q24W resulted in vision and anatomic outcomes comparable to RBZ Q4W with 80% of patients preferring PDS treatment.

PORT DELIVERY SYSTEM WITH RANIBIZUMAB (PDS) MET PRIMARY ENDPOINT AND KEY SECONDARY OUTCOMES WITH > 75% OF PATIENTS PREFERRING PDS TREATMENT IN PHASE 3 PAVILION TRIAL FOR DIABETIC RETINOPATHY (DR)

PAPER PRESENTATION

Abstract Number: 4884

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Purpose

The PDS is an innovative drug delivery system for continuous delivery of a customized formulation of ranibizumab. Pavilion is the first trial to evaluate the efficacy, safety, and pharmacokinetics of PDS 100 mg/mL with fixed refill-exchanges every 36 weeks (Q36W) in patients with DR without center-involved diabetic macular edema (CI-DME).

Methods

Pavilion (NCT04503551) is an ongoing phase 3, multicenter, randomized, visual assessor–masked trial. Patients were randomized (5:3) to receive PDS Q36W or control (clinical monitoring plus supplemental intravitreal ranibizumab 0.5 mg as required), respectively. Patients could receive supplemental intravitreal ranibizumab 0.5 mg at each study visit (control) or any non–refill-exchange visit (PDS Q36W). Primary endpoint: proportion of patients with a ≥2-step ETDRS-DRSS improvement from baseline at week (W) 52. Additional efficacy endpoints: rate of patients developing CI-DME; and assessment of treatment preference for PDS vs intravitreal injections in PDS Q36W patients using the PDS Patient Preference Questionnaire at W52.

Results

174 patients were randomized (PDS Q36W, n=106; control, n=68). Pavilion met its primary endpoint in superiority of PDS Q36W; a significantly greater proportion of patients achieved a ≥2-step ETDRS-DRSS improvement from baseline with PDS Q36W (80.1%) vs control (9.0%) at W52 (difference=71.1%; 95% CI, 61.0–81.2; P=<0.0001). The rate of patients developing CI-DME was significantly lower with PDS Q36W (7.1%) vs control (47.0%) at W52 (hazard ratio=0.1; 95% CI, = 0.1–0.3; P=<0.0001). Through W52, no PDS Q36W patients received supplemental treatment compared with 39.7% of patients in the control arm. Overall, 76.6% (72/94) of PDS Q36W patients indicated a preference for PDS treatment at W52, with fewer treatments cited as the main reason (Fig 1). PDS was generally well tolerated. No events of endophthalmitis or implant dislocation were reported in the PDS arm through W52.

Conclusions

Pavilion met its primary endpoint; PDS Q36W demonstrated superior disease outcomes vs the control arm. More than 75% of patients preferred PDS treatment over intravitreal injections. No new safety signals were observed. PDS has the potential to provide clinical benefits without the need for frequent intravitreal injections in patients with DR.

POSSIBLE TREATMENT APPROACH FOR RETINITIS PIGMENTOSA BY TARGETING INHIBITION OF PTEN IN THE PI3K-AKT SIGNALING PATHWAY

POSTERBOARD#: A0365

Abstract Number: 3101 - A0365

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Purpose

Our hypothesis posits that targeting phosphatase and tensin homolog deleted on chromosome 10 (PTEN) within the Akt pathway holds the potential for treating retinitis pigmentosa (RP). This comprehensive review analyzes murine models using Bisperoxovanadium (bpV) and Rasagiline to investigate the shared apoptotic pathway in rod photoreceptors implicated in RP and retinal detachment (RD).

Methods

This literature review utilized keywords to retrieve articles from PubMed. Articles in English between 2000 and 2023 were considered, resulting in the initial selection of 28 articles. Following exclusion criteria related to date range and thematic focus, 14 studies were included. This review covers biochemical pathways and drugs targeting enzymes in murine models. Excessive dosage implications are uncertain due to the lack of established medication dosages.

Results

Research investigations involving Rasagiline, a pharmaceutical agent recognized for inducing the overexpression of the Bcl-2 protein, a downstream factor in the PI3K-Akt signaling pathway reveal that mice with the rd10 genotype for RP, demonstrated significant improvements in both visual acuity and the electrical responses of photoreceptors to light stimuli after 30 days of treatment. Furthermore, the drug demonstrated efficacy in attenuating photoreceptor degeneration, with a decrease in the pro-apoptotic factor Bax and an increase in the antiapoptotic factor Bcl-2.

In another experimental investigation, Mao et al. focused on using bpV, a PTEN inhibitor in the PI3K/Akt pathway for RD. It was determined that animals treated with the drug displayed diminished photoreceptor apoptosis and preserved retinal thickness post-retinal detachment compared to the control group. Additionally, the treatment resulted in increased levels of p-Akt, PDK-1, p-BAD, and Bcl-2, and decreased levels of cytochrome c and cleaved caspase-3 (Figure 1).

Conclusions

The inhibition of PTEN leads to elevated levels of p-Akt enzyme, facilitates Bcl-2 overexpression, and diminishes pro-apoptotic factors such as cytochrome c and cleaved caspase-3 after RD. The recognition of shared molecular pathways leading to photoreceptor death implicated in both RP and RD establishes a unifying rationale for our proposed treatment approach of targeting PTEN to protect rod photoreceptors in both diseases.

POSTOPERATIVE RHEGMATOGENOUS RETINAL DETACHMENT FOLLOWING VITRECTOMY AND SUBRETINAL TISSUE PLASMINOGEN ACTIVATOR FOR SUBMACULAR HEMORRHAGE

POSTERBOARD#: B0588

Abstract Number: 927 - B0588

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Purpose

To investigate the outcomes of rhegmatogenous retinal detachment (RRD) occurring after pars plana vitrectomy (PPV) and subretinal tissue plasminogen activator (tPA) for submacular hemorrhage (SMH).

Methods

A single center, retrospective chart review of patients who underwent PPV/subretinal tPA for SMH between April 2014 and September 2023 was performed. Patients with <3 months follow-up were excluded. In cases where bilateral surgery was performed, only one eye was randomly selected for inclusion. The visual and anatomic outcomes of eyes that developed RRD following PPV/subretinal tPA were collected.

Results

Out of 167 eyes that underwent PPV/subretinal tPA for SMH, 15 (9%) eyes developed RRD, with macular involvement in 12 (80%) and proliferative vitreoretinopathy (PVR) in 9 eyes (60%). The mean follow-up for all patients was 43.9 months, and the median follow-up time for RRD cases was 32 months. The median (interquartile range, IQR) time from PPV/subretinal tPA until RRD diagnosis was 41 (22-81) days. Of these cases, 12 were treated with PPV, 1 with scleral buckle, while 2 were observed due to poor visual prognosis. Single-surgery anatomic success was achieved in 14 eyes (93.3%) at three months after the first RRD repair and 11 eyes (73.3%) at the final visit. The final anatomic success rate for reattachment was 86.7% (13 eyes) with 7 (46.7%) remaining silicone oil (SO)-filled. Retinal reattachment without SO at the final visit was achieved in 6 eyes (40%). Three eyes (20%) developed recurrent RRD and underwent additional repair during the follow-up period. The median (IQR) logarithm of the minimal angle of resolution (logMAR) [Snellen] visual acuity (VA) at the preoperative visit following SMH was 2 (2-2.3) [20/2000] and increased to 2.3 (2.2-2.7) [20/3991] at the time of RRD diagnosis (P=0.01). The median (IQR) logMAR VA [Snellen] at the final visit was 2.3 (2-2.7) [20/3991] with no significant change compared to VA at the date of RRD diagnosis (P=0.15).

Conclusions

Postoperative RRD occurred in 9% of eyes after PPV/subretinal tPA for SMH and was associated with a high rate of PVR and suboptimal visual outcomes.

PREDICTION OF LATE STAGE AMD BASED ON DEEP LEARNING MODELS USING MULTIMODAL AREDS DATA

ON-DEMAND

Abstract Number: OD50

AuthorBlock: ***Qiang Zhang[1]***, *Qi Yan[2], Yifan Peng[3], Mingquan Lin[3],* ***Joel S. Schuman[1], Julia A. Haller[1],*** *Emily Y. Chew[4]*

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Purpose

Purposes: Age-related macular degeneration (AMD) is a principal cause of blindness influenced by both genetic and environmental factors. AMD severity is primarily measured through color fundus photographs. Recently, machine learning techniques utilizing these images have emerged for AMD prediction. In our previous research, using both genetic and image data, we successfully predicted AMD progression. In this study, we expanded our methodology by incorporating more predictors, such as age, smoking status, education, medical history (including cataract surgery, laser photocoagulation, visual acuity, diabetes, and hypertension), and AMD treatment.

Methods

Methods: We employed a modified deep convolutional neural network (CNN) to predict the progression to late AMD using 31,262 fundus images, 52 AMD-related genetic markers[CE([1] e, and 9 demographic/clinical variables. This data was sourced from 1,351 subjects [CE([2] in the Age-Related Eye Disease Study (AREDS) observed over 12 years.

Results

Results: Our findings indicated that the combination of fundus images with demographic/clinical and genetic data predicted late AMD progression with an average area under the curve (AUC) of 0.9 (95%CI: 0.88-0.91). In comparison, integrating only fundus images with genotypes resulted in an AUC of 0.85 (95%CI: 0.83-0.86), and using solely fundus images yielded an AUC of 0.81 (95%CI: 0.80-0.83).

Conclusions

Conclusion: Inclusion of clinical data in deep learning models significantly enhances late stage AMD prediction accuracy.

PROPOSED MECHANISM OF SEA FAN NEOVASCULARIZATION USING A COMPUTATIONAL MODEL OF DIFFUSION LIMITED AGGREGATION

POSTERBOARD#: B0082

Abstract Number: 1739 - B0082

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Purpose

Sea fan neovascularization (SFNV) is a well recognized complication of sickle cell retinopathy as well as other vascular insults. Despite the broad clinical awareness of this striking entity, there is no unifying mechanism to explain its unique morphology.

Methods

We hypothesized that vascular endothelial growth factor (VEGF) patterns of diffusion can sufficiently explain SFNV, and we developed a computational model with Python 3.10 using a modified Diffusion Limited Aggregation (DLA) scheme, a fractal generative process based on particles undergoing random walks clustering to form networks. We varied the topography of the originating source of diffusible particles and compared the results to fluorescein angiography images from eyes with and without SFNV.

Results

One patient with proliferative sickle cell retinopathy (SCR) and two patients with proliferative diabetic retinopathy (PDR) were included. One patient with PDR had a large, confluent area of ischemia and the other had multifocal areas of ischemia. The model demonstrated that structures similar in appearance to NV can be simulated using DLA, and SFNV specifically may result from a unidirectional source of diffusible VEGF, which is more likely to occur with confluent areas of nonperfusion. This mechanism would be independent of the underlying disease.

Conclusions

The pattern of retinal neovascularization may depend on the topography of retinal ischemia.

PROSPECTIVE MULTICENTER OBSERVATIONAL STUDY TO ASSESS THE BURDEN OF HERPES ZOSTER OPHTHALMICUS: BASELINE RESULTS

POSTERBOARD#: B0190

Abstract Number: 1847 - B0190

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Purpose

This longitudinal cohort study aimed to describe symptoms, healthcare utilization, and quality of life (QoL) burden among patients with herpes zoster ophthalmicus (HZO).

Methods

Patients ≥18 years old with active HZO, English/Spanish speaking, willing and able to respond to study assessments, and not enrolled in a concurrent interventional HZO trial were recruited after evaluation for initial or recurrent HZO episode by 6 US ophthalmologic practices in 2019-23. Data were collected via 1) clinical assessment form completed by the practice and 2) baseline patient questionnaires (at study enrollment) on symptoms, healthcare utilization, and patient-reported outcomes (National Eye Institute 25-item Visual Function Questionnaire [NEI-VFQ-25] for vision-related QoL, eight-item Patient Health Questionnaire [PHQ-8] for depressive symptoms, Zoster Brief Pain Inventory [ZBPI] for pain, and Work Productivity and Activity Impairment – Specific Health Problem questionnaire [WPAI-SHP]). Descriptive statistics are reported.

Results

Clinical information was completed for 113 patients (mean age: 64 years). Herpes zoster iridocyclitis (20%), keratitis (15%), and conjunctivitis (4%) were the most common HZO diagnoses. Baseline survey was completed by 103 patients (67% white; 59% female; 73 initial and 30 recurrent HZO episodes; Table 1). The most common patient-reported symptoms were sensitivity to light (64%), dryness (58%), and ptosis (56%) (Table 2). In the 3 months prior to enrollment, emergency room (ER) or urgent care was sought by 31% of patients, with shingles or eye problems reported as the major reasons for the visit. Mean NEI-VFQ-25 score (standard deviation [SD]) was 82 (16), while mean PHQ-8 and ZBPI scores (SD) were 5 (5) and 1 (2), reflecting mild depression and mild pain, respectively (Table 2). Mean work productivity loss (SD) was 17% (24%) (Table 2).

Conclusions

HZO causes a significant burden on adults, with some common and impactful patient symptoms often requiring ER or urgent care use. QoL and work productivity decrements are similar to other major ocular diseases. These findings highlight the imperative need for preventive measures for herpes zoster.

RATES OF FAILURE OF CORNEAL CROSSLINKING FOR KERATOCONUS IN THE UNITED STATES

POSTERBOARD#: A0243

Abstract Number: 4569 - A0243

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Purpose

Keratoconus is a progressively ectatic corneal disease that leads to bilateral corneal stromal thinning and conical corneal bulging. Previous multi-center clinical trials have demonstrated the effectiveness of corneal crosslinking (CXL) in treating progressive keratoconus. However, previous cohort studies and case series have reported a wide range of CXL failure rates that range from 0-23%. This study aims to characterize rates of corneal crosslinking (CXL) failure in patients with keratoconus using a large insurance claims database.

Methods

A retrospective claims-based analysis was conducted of patients in IBM® MarketScan®, a nationally representative sample of commercial insurance beneficiaries, who underwent corneal crosslinking (CXL) from 2007-2022. We excluded patients who had enrollment beginning less than one year before initial CXL and patients who had undergone previous penetrating keratoplasty [PK] or deep anterior lamellar keratoplasty [DALK]. The primary study outcome was time to treatment failure repeat CXL, penetrating keratoplasty [PK], or deep anterior lamellar keratoplasty [DALK]) identified by Current Procedural Terminology (CPT-4) codes.

Results

Between 2007 and 2022, 3107 eyes from 2356 patients with keratoconus underwent CXL. The mean age was 31.8 ± 11.3 years. 1590 of 2356 (67.5%) were male. The mean enrollment length was 4.6 ± 3.8 years. 37 (1.2%) of eyes from 35 patients experience treatment failure. Of these 31 of 37 (83.7%) underwent a repeat CXL, with the remainder undergoing PK or DALK. The mean time to a repeat CXL, DALK, or PK was 182 ± 258 days. CXL failure was more likely to occur in patients with allergic or atopic disease (56.8% vs 40.0%, p =0.03). There was no difference in failure rates by pediatric status (18.9% vs 12.9%, p = 0.28), sleep apnea (21.6% vs 14.8%, p < 0.25), or gender (40.5% vs 33.2% female, p = 0.34).

Conclusions

Approximately 1 in 80 eyes with keratoconus that underwent CXL required a repeat CXL, PK, or DALK. Allergy and atopic disease were associated with a higher treatment failure rate.

REGIONAL DIFFERENCES IN OPTICAL COHERENCE TOMOGRAPHY (OCT) OPTIC NERVE HEAD AND MACULA PARAMETERS FOR DETECTING GLAUCOMA IN EYES WITH AND WITHOUT HIGH AXIAL MYOPIA

POSTERBOARD#: A0467

Abstract Number: 2543 - A0467

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Purpose

To identify regional differences in structural optic nerve head (ONH) and macula OCT parameters to improve discrimination between myopia and glaucoma in eyes with high axial myopia.

Methods

885 eyes of 514 glaucoma patients and 767 eyes of 401 healthy subjects were stratified into 3 axial myopia groups: no myopia (n=368 glaucoma eyes and 411 healthy eyes), mild myopia (24mm < axial length [AL] < 26mm, n=393 glaucoma eyes and 271 healthy eyes), and high myopia (AL > 26 mm, n=124 glaucoma eyes and 85 healthy eyes). Linear mixed models were used to compare eye characteristics between groups, and age-, visual field mean deviation- and image quality score-adjusted area under the receiver operating characteristic curves (AUC) were used to evaluate the diagnostic accuracies of thickness parameters in 6 ONH sectors and 8 macula sectors.

Results

The distribution of the ONH thickness parameters (peripapillary RNFL [pRNFL], Bruch's membrane opening minimum rim width [BMO-MRW]) and macula thickness parameters (ganglion cell inner plexiform layer [GCIPL] and macular RNFL [mRNFL]) varied by myopia status as shown in Figure 1 (healthy eyes) and Figure 2 (glaucoma eyes).

For ONH parameters the diagnostic accuracy was highest for global (AUC=0.95) and inferotemporal (AUC=0.91) pRNFL for high myopes and global BMO-MRW for non-myopes (AUC=1.0) and mild myopes (AUC=0.97).

The diagnostic accuracy of sectoral macula GCIPL was higher (AUC 0.79-0.92) than sectoral mRNFLT (AUC 0.52-0.89) in high myopes.

Conclusions

The diagnostic accuracy of ONH-derived pRNFL and macula-derived GCIPL for detecting glaucoma was high for high axial myopic eyes and can be used for glaucoma management in high myopes.

REPRODUCIBILITY OF SCLERAL VASCULATURE MEASUREMENTS WITH ANTERIOR SEGMENT OCT ANGIOGRAPHY IN POAG

POSTERBOARD#: A0344

Abstract Number: 3429 - A0344

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Purpose

The anterior segment (AS) fluid dynamics is established as a primary site for impairment and a target for treatment in glaucoma. In vivo, non-invasive visualization and quantification of scleral vessels (SV) might provide important clinical insight for glaucoma management. This study aims to assess the reproducibility of SV measurements using AS-OCT angiography (OCTA) in subjects with primary open angle glaucoma (POAG).

Methods

Subjects with POAG underwent a comprehensive clinical examination, visual field (VF) testing and imaging with PlexElite SS-OCT (Zeiss, Dublin, CA). Images were acquired using the Anterior Segment scanning protocol and a prototype anterior segment attachment developed by the manufacturer. Multiple OCTA scans were acquired at 200 kHz in a 6mm x 6mm x 6 mm (500x500x3072 voxels) region with 2 repetitions for capturing blood flow motion contrast. Scans were centered on the corneal limbus, nasally and temporally. Enface projection images were denoised and contrast enhanced to improve vessel visualization. A region of interest (ROI) spanning a circumferential arch length of 3mm with a diameter of 1.6mm was set at the bottom of Schlemm's canal (SC). Additional Frangi, skeleton and perfusion filters were applied for quantifying the SV from the OCTA scan (Figure). Intraclass correlation coefficient (ICC) and within subject coefficient of variance (WSCoV) were performed to assess reproducibility of the SV measurements.

Results

Twenty eyes (20 subjects) qualified for the study according to the motion and imaging artifacts criteria. Subjects were age 66.6 ± 11.1 yrs (Mean ± SD), with IOP=13 ± 3.8 mmHg, VF mean deviation (MD) -9.0 ± 9.5 dB, and average RNFL thickness of 73 ± 11.7 µm. OCTA vessel parameters were compiled from nasal and temporal scans. ICC for OCTA measurements were within moderate to good reliability range (Table). Likewise, WSCoV exhibited good reproducibility.

Conclusions

SV-AS-OCTA measurements acquired in the vicinity of the SC are reproducible in POAG eyes. The role of SV-AS-OCTA measurements in glaucoma management merits further investigation.

RETINAL DETACHMENT AFTER COMMOTIO RETINAE: PREVALENCE AND CLINICAL CHARACTERISTICS

POSTERBOARD#: A0050

Abstract Number: 2891 - A0050

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Purpose
We aim to describe the rate and clinical characteristics of rhegmatogenous retinal detachments occurring following commotio retinae in the setting of ocular trauma.

Methods
A single center, retrospective chart review of all patients who presented with commotio retinae between January 2015, and June 2022. Those who had a ruptured globe, prior retinal detachment (RD) or who concomitantly presented with a RD, and those with history of vitreoretinal surgery were excluded.

Results
380 eyes of 380 patients were diagnosed with commotio retinae after blunt trauma and met inclusion criteria. 262 (68.9%) were male and mean (SD) age was 31.78 (18.98) years, [range 4 to 82 years]. Mean (SD) follow up duration was 409 (590) days.

During follow-up, 15 (3.95%) patients developed a RD post-commotio. RD developed 36±68 days post-commotio [range 1 to 237 days]. Mean (SD) log MAR visual acuity (VA) [Snellen] at initial presentation to the emergency room was worse in eyes that subsequently developed RD 0.93 (0.84) [20/170] compared to eyes that did not develop RD 0.44 (0.64) [20/55] (p= 0.013).

PVD and VH were found in 2 (13.3%) and 9 (60%) eyes who developed RD respectively, compared to 74 (20.3%) and 110 (30.2%) of non-RD eyes (p= 0.443 and p= 0.028) respectively. 15 (100%) were macula-sparing, 9 (60%) were from retinal dialyses, and the average number of retinal breaks was 1.75, and average extent of RD was 2.78 clock hours.

Ten (66.7%) were focal and treated with demarcation laser photocoagulation and needed no further treatment. Two (13.3%) underwent vitrectomy with silicone oil tamponade: One patient’s retina remained attached under oil, while the second had a shallow RD under oil. One patient had a subclinical RD and was closely observed. One (6.7%) was lost to follow-up and another (6.7%) sought care elsewhere.

Conclusions
Most cases of commotio retinae are self-limited and do not result in long-term complications. However, 4% of patients in our cohort developed subsequent retinal detachment. Patients should be followed closely and counseled accordingly.

SAFETY AND LONGEVITY OF IOP CONTROL AFTER BIMATOPROST IMPLANT ADMINISTRATION

POSTERBOARD#: B0272

Abstract Number: 1909 - B0272

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Purpose

Phase 3b study interim analysis to evaluate safety and duration of intraocular pressure (IOP)-lowering effect after single administration of the intracameral 10-µg bimatoprost implant in patients with open-angle glaucoma (OAG) or ocular hypertension (OHT).

Methods

Ongoing (enrollment completed), open-label, multicenter study (NCT03850782) evaluating outcomes of up to 3 as-needed administrations of bimatoprost implant in patients with OAG or OHT inadequately managed with topical IOP-lowering medication for reasons other than efficacy. Rescue treatment (IOP-lowering medication or procedure) is allowed if the eye does not meet retreatment criteria. Primary endpoint is time to rescue/retreatment after the initial implant administration in the study eye analyzed by Kaplan-Meier method. Safety measures include treatment-emergent adverse events (TEAEs) and reading center evaluation of corneal endothelial cell density (CECD). This interim analysis used data collected through January 13, 2023 for the initial (day 1) implant administration only.

Results

A total of 423 patients received a 10-µg bimatoprost implant in the study eye on day 1; 211 (49.9%) had completed ≥12 months of follow-up at the data cutoff. Median time (95% CI) from the first implant administration to requiring either a 2nd implant administration or rescue treatment was 379 (362, 512) days; cumulative probability of not requiring a 2nd administration or rescue treatment by day 360 was 56.5% (Fig 1). Baseline mean (SE) IOP (mmHg) was 25.6 (0.15); mean (SE) reduction from baseline IOP in eyes without rescue or retreatment was 8.1 (0.20) at week 12, 7.3 (0.24) at week 24, and 6.3 (0.34) at month 12 (Fig 2). The most common ocular TEAEs in study eyes after single implant administration were conjunctival hyperemia (12.8%; usually temporally associated with the administration procedure) and increased IOP (8.5%). Mean (SE) % change from baseline in CECD at 12 months after single implant administration was −3.5% (0.80%). The implant was no longer visible or ≤25% of initial size in 69.8% and 97.7% of study eyes at 12 and 24 months, respectively.

Conclusions

In this interim analysis based on available data, the IOP-lowering effect of the initial bimatoprost implant administration was well maintained for >1 y in the majority of patients, with an acceptable safety profile.

SCREEN FAILURES IN CLINICAL TRIALS IN RETINA

POSTERBOARD#: A0361

Abstract Number: 5104 - A0361

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Purpose

Disparities in clinical trials are a major problem due to significant underrepresentation of certain gender, racial and ethnic groups. Several factors including stringent protocol criteria selection, recruitment methods, and regional site demographics hinder our understanding of retinal diseases. We performed a cross sectional study to describe differences in patient profiles and various causes of screen failures in clinical trials

Methods

Screening data of 87 trials from 6 centers were analyzed. Study characteristics (disease studied, phase of trial, route of drug administration) and patient demographics (age, gender, race, ethnicity, and employment status) were compared among different causes of screen failures. Screen failures were broadly classified into 4 categories: study criteria, patient related, physician related and miscellaneous. Pearson Chi-square test and ANOVA were used for statistical analysis.

Results

Among 87 trials and 962 patients, 464 (48.2%) were successfully randomized and 498 (51.8%) patients were classified as screen failures. Mean age (SD) was 76.5 (10.44) years and 59.5% were females. Trial disease states included Diabetic Macular Edema (DME, n=44), dry Age-related Macular Degeneration (AMD, n=18), wet AMD (n=18), Vascular occlusions (n=4), macular telangiectasia (n=2) and proliferative vitreoretinopathy related retinal detachments (n=1). Predominantly whites (93%) and unemployed/retired patients (66%) were screened. Of the 498 screen failures, most were due to study inclusion/exclusion criteria (n=400 [80%]) followed by patient related (n=35 [7%]), physician related (n=28 [5.6%]) and miscellaneous reasons (n=6 [1.2%]). Reason for screen failure was not available for 27 (5.4%) patients. Among 20 specific reasons for screen failure, common reasons were ocular/imaging findings (n=219 [44%]) and visual acuity (n=73 [14.6%]) not within the inclusion criteria, and patients excluded due to a systemic comorbidity (n=45 [9.2%]).

Conclusions

Whites and unemployed/retired patients predominantly participated in retinal clinical trials. Screen failures in retina trials are commonly due to ocular/imaging findings and visual acuity not within the inclusion criteria. Screen failures incur significant costs and time without contributing valuable data to the study. Better recruitment strategies from diverse backgrounds and careful consideration of study criteria can aid in decreasing the rate of screen failures.

SELF-SUPERVISED OCT DENOISING: STREAMLINED IMAGE ENHANCEMENT WITHOUT CLEAN TARGETS OR REPEATED SCANS

POSTERBOARD#: A0272

Abstract Number: 2380 - A0272

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Purpose

Optical Coherence Tomography (OCT) is essential in eye care but is limited by speckle noise, which obscures important details. Our study developed a self-supervised framework for OCT image denoising, improving clarity without needing repeated scans, clean references, or extensive preprocessing.

Methods

This research refines the self-supervised noise2noise framework (Lehtinen, ICML, 2018), traditionally reliant on multiple noisy instances of identical target images for denoising. Inspired by Gisbert's ARVO 2020 research, which employed template-based spatial alignment of repeated OCT scans, our study acknowledges the practical difficulty in acquiring such scans. Consequently, we exploit the structural similarity between adjacent B-scans in an OCT volume, considering them as separate noisy representations of the same underlying tissue structure.

A principal challenge in implementing noise2noise is image alignment, conventionally a time-intensive pre-processing stage. Our framework incorporates an image registration module (Balakrishnan, CVPR, 2018), enabling seamless end-to-end training. This integration not only streamlines the data preparation but also markedly reduces the time required for aligning B-scan slices.

For training and testing, our dataset comprises Cirrus HD-OCT ONH scans, with a voxel resolution of 200x1024x200 over dimensions of 6x2x6 mm^3. It includes 20 scans for training and 9 for testing, establishing a solid base for evaluating our denoising approach.

Results

We used synthetic data to mimic speckle noise, lacking clean reference images. Image quality was evaluated using Peak Signal-to-Noise Ratio (PSNR) and Structural Similarity Index Measure (SSIM). Higher PSNR reflects better image quality, while SSIM assesses visual aspects like luminance and contrast. Our approach achieved a PSNR of 25.0 and an SSIM of 0.390, exceeding BM3D (PSNR: 23.3, SSIM: 0.272) and Self Fuse (PSNR: 21.4, SSIM: 0.231). This indicates superior denoising, as also evident in Figure 1.

Conclusions

Our self-supervised denoising framework enables the training of a denoising network without the need for repeated scans, clean targets, or extensive preprocessing. It exhibits significant qualitative and quantitative improvements in OCT scan quality, underscoring its potential in enhancing ophthalmic diagnostics.

STRUCTURAL AND FUNCTIONAL DETERIORATION ALONG THE VISUAL PATHWAYS IN PATIENTS WITH GLAUCOMA OR NON-GLAUCOMATOUS OPTIC NEUROPATHIES

PAPER PRESENTATION

Abstract Number: 1454

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Purpose
Glaucoma is a neurodegenerative disease affecting both ocular and cerebral domains. However, it remains unclear if the brain changes are specific to glaucoma or are shared among optic neuropathies (ON). Here, we used the extensive UK Biobank (UKBB) datasets to examine the structural and functional brain changes in these patients.

Methods
We used the UKBB to select participants aged 40 to 80 years old with brain magnetic resonance imaging (MRI) scans and excluded those with diabetes-related eye diseases, trauma-induced vision loss, other serious eye conditions, as well as extrapyramidal disorders, or degenerative, demyelinating, and inflammatory diseases of the nervous system.
Glaucoma subjects were included based on ICD-10 or self-reported glaucoma diagnosis. Non-glaucomatous ON included optic neuritis or optic atrophy, while excluding glaucoma diagnosis. Healthy subjects had no ICD-10 or self-reported glaucoma, or non-glaucomatous ON diagnosis.
We used greedy matching in R Studio to address age and gender biases, resulting in 1,229 glaucoma, 432 non-glaucomatous ON, and 18,550 healthy subjects. T1-weighted structural MRI, diffusion-weighted MRI, task-evoked functional MRI, physiometabolic, and ophthalmic datasets were then obtained from UKBB.

Results
Both glaucoma and non-glaucomatous ON subjects exhibited thinner macular inner retinal layer (IRL) and reduced visual acuity (VA) compared to healthy subjects (Table 1). Glaucoma but not non-glaucomatous ON subjects also demonstrated lower diastolic blood pressure and lower platelet counts relative to healthy subjects.
In terms of brain changes (Table 2), glaucoma but not non-glaucomatous ON showed smaller lateral geniculate nuclei and visual cortex in lower-order (occipital pole) and higher-order (occipital fusiform, lateral occipital cortex) areas compared to healthy subjects. Furthermore, reduced fractional anisotropy was found in the posterior thalamic radiation of glaucoma subjects only. Task-based functional MRI also revealed significantly weaker face- and shape-related brain activation in glaucoma subjects only.

Conclusions
While both glaucoma and non-glaucomatous ON had thinner macular IRL and reduced VA, glaucoma but not non-glaucomatous ON may also impact the volumes of the posterior visual pathway, optic radiation microstructures, and higher-order brain activity, along with physiometabolic changes.

SURGICAL OUTCOMES OF PRIMARY NONCOMPLEX RHEGMATOGENOUS RETINAL DETACHMENT IN YOUNG ADULTS

PAPER PRESENTATION

Abstract Number: 6485

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Purpose

This study aims to describe anatomic and visual outcomes of young adults with uncomplicated primary RRD treated with scleral buckle (SB), pars plana vitrectomy (PPV), or both PPV/SB.

Methods

This is a multicenter, interventional cohort study. Patients aged 20-45 in the Primary Retinal Detachment Outcomes study were included, with a minimum requirement of 6 months follow-up. Patients with complex RRDs were excluded from this study. Primary outcomes were single surgery anatomic success (SSAS) and final visual acuity (VA). Multivariable cox proportional hazard models and multivariable logistic regression analysis were conducted for the two outcomes, redetachment rates and best available VA, which were assessed from 6 months to 2 years after surgery.

Results

One hundred sixty-five eyes met inclusion criteria, and median age was 37 years. SB was performed in 91 eyes (55%), PPV in 32 (19%), and PPV/SB in 42 (25%). SSAS rates were 79.3% for PPV alone, 83.7% for primary SB, and 92.7% for PPV/SB (ANOVA p = 0.25). When potential risk factors were adjusted for with a multivariable Cox proportional hazard regression model, eyes that underwent PPV were found to be more likely to result in redetachment compared to those who underwent PPV/SB (HR: 7.24, 95% CI: 1.25 – 42.1, p = 0.03), and eyes that underwent SB alone were not more likely to redetach than those that underwent PPV/SB (HR: 3.24, 95% CI: 0.63– 16.63, p = 0.16). When examining good vision (20/40 or better), eyes that underwent PPV/SB were less likely to result with good vision compared to eyes that underwent SB alone (OR: 0.26, 95% CI: 0.07 – 0.94, p = 0.04). Similarly, eyes that underwent PPV alone were less likely to obtain good vision compared to eyes that underwent SB alone (OR: 0.20, 95% CI: 0.05 – 0.81, p = 0.02).

Conclusions

For young adults in this study, primary SB had the best visual outcomes, and eyes that underwent PPV/SB were less likely to redetach compared to PPV alone.

SUSTAINABILITY IN EYE CARE: FACTORS INFLUENCING SOLID WASTE GENERATION AND OPPORTUNITIES FOR CO-BENEFITS

POSTERBOARD#: B0696

Abstract Number: 6374 - B0696

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Purpose

The growing concern over climate change has become a prominent topic in healthcare, particularly within eye care. It has been leading to shifts in weather changes causing an increased prevalence of ocular traumas, eye pathologies, and various diseases due to increased exposures to heat, UV radiation, and pollutants. Given the healthcare industry's contribution of 8.5% of the US's Greenhouse Gases (GHGs) every year, our focus is on the evaluation of the sustainability of cataract surgeries, the most common eye surgery in the world.

Methods

In this study, our team obtained a comprehensive set of data spanning numerous years of cataract surgeries across 2,095 patients. This data set encompassed details on costs of individual items, patient billings, surgeons, dates, times, and surgical venues. Data pertaining to concurrent procedures alongside cataract surgeries have been excluded from our analysis. Furthermore, our team manually collected data on the waste produced over 59 cataract surgeries performed by different surgeons over a 2-month period.

Results

Our findings unveiled significant disparities in waste production between different surgeons and surgical locations. These findings also highlighted statistically significant observations that indicate a correlation between extended operating room time and increased waste production ($p=0.00155$). Similarly, reduced expenditure on supplies is associated with a heightened waste generation. We also determined that the facility's mean expenditure per patient was $34,790.05, with a median and mode of $33,798.55 and $33,544.37, respectively.

Conclusions

These results indicate multiple factors correlating to variations in waste production underscoring the potential for a multitude of sustainability measures that we can implement into cataract surgeries. These measures could include the reuse of supplies, modifying the packaging of certain materials and educating providers and administrators. These initiatives have the potential to be advantageous for the future of our environment, improve patient outcomes, and financially benefit hospitals.

TEARS PROTEOMICS AS A SOURCE OF BIOMARKERS ASSOCIATED WITH INCREASED INTRAOCULAR PRESSURE

PAPER PRESENTATION

Abstract Number: 3313

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Purpose

Tear fluid forms the outermost layer of the ocular surface and its characteristics and protein composition have been connected to different ocular diseases. We assessed tear proteomic profiles of male and female free-ranging macaques *(Macaca mulatta)* differing in age and intraocular pressure (IOP).

Methods

We analyzed 31 individuals (17F, 14M) aged 0.6 to 25.2 years (mean 13.7±5.2) from the Cayo Santiago colony in Puerto Rico. Individuals went through a comprehensive eye examination including IOP assessment with a TonoVet tonometer (iCare, Vantaa, Finland). We used Schirmer Tear Test Strips to collect ca. 5 µL of tears from the inferior tear meniscus. Proteomic analysis was accomplished by liquid-chromatography and tandem mass spectrometry (LC-MS/MS). The identified proteins were compared across sex, age tertiles (younger: <12.4; mid-aged: ≥12.4 to <16.4; older: ≥16.4), and IOP (normal: <19mmHg; near-high: ≥19mmHg to <22mmHg; high: ≥22mmHg).

Results

Four proteins showed significant upregulation in high IOP versus normal IOP group: Glycerol-3-phosphate dehydrogenase (Coef.: 1.61), Pyrroline-5-carboxylate reductase (Coef.: 1.60), Macrophage migration inhibitory factor (Coef.: 1.88), and Coiled-coil domain containing 42 (Coef.: 4.91). Seven proteins showed significant upregulation in the high IOP versus near-high IOP: Glycerol-3-phosphate dehydrogenase (Coef.: 2.03), Pyrroline-5-carboxylate reductase (Coef.:2.34), Macrophage migration inhibitory factor (Coef.: 2.07), Actin beta (Coef.: 2.35), Apolipoprotein D (Coef.: 2.01), Proteasome subunit alpha type (Coef.:1.24), and Elongation factor 1-gamma (Coef.:1.04); while another 3 showed downregulation: Thioredoxin (Coef.: -2.19), Fatty acid binding protein 5 (Coef.: -1.92), and Anterior gradient 2 disulphide isomerase family (Coef.: -1.94). Most of the upregulated proteins are associated with cellular signaling, glycosylation, immune response, molecular transport, and lipid metabolism. Additionally, the results indicated 10 proteins upregulated and 7 proteins downregulated in older individuals versus younger and mid-aged, and 9 proteins downregulated in males versus females.

Conclusions

Tear proteomics enables non-invasive investigations of protein levels in tears. The identified candidate proteins may be potential biomarkers associated with elevated IOP and may lead to more insight in understanding mechanisms underlying the pathogenesis of this condition.

THE ASSOCIATION BETWEEN FOOD INSECURITY AND CHRONIC EYE DISEASE IN THE NATIONAL INSTITUTES OF HEALTH ALL OF US RESEARCH PROGRAM

POSTERBOARD#: A0318

Abstract Number: 2426 - A0318

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Purpose

Food insecurity has been identified as a potential risk factor for visual impairment; however, its association with specific eye diseases remains unknown. Using data from the National Institutes of Health All of Us Research Program, this cross-sectional study examined the association between food insecurity and chronic eye diseases including glaucoma, age-related macular degeneration (AMD), and diabetic retinopathy (DR).

Methods

The study population included all individuals in the All of Us Research Program who had Electronic Health Record data and who responded to survey questions regarding food insecurity. The primary outcomes were a diagnosis of glaucoma, age-related macular degeneration (AMD), diabetic retinopathy (DR), or any of the three diagnoses based on the International Classification of Diseases, 9th and 10th Revision codes. The exposure was the presence of food insecurity, which was dichotomized based on responses to two survey questions. Covariates included age, race and ethnicity, sex at birth, income, level of education, access to eye care in the past 12 months, smoking, hypertension, diabetes, and nutritional deficiency. Multivariable logistic regression was performed to examine the association between food insecurity and each eye disease, adjusting for all covariates.

Results

A total of 78,694 individuals were included in the study population. Of these, 9,732 (12.4%) reported food insecurity; 2,337 (3.0%) had glaucoma; 1,398 (1.8%) had AMD; and 1,127 (1.4%) had DR. Compared to those without food insecurity, individuals with food insecurity had higher odds of glaucoma (adjusted odds ratio [aOR]: 1.31, 95% confidence interval [CI]: 1.08-1.57, p = 0.004) or any eye disease (aOR: 1.15, 95% CI: 1.01-1.32, p = 0.046) but not AMD (aOR: 0.93, 95% CI: 0.68-1.23, p = 0.606) or DR (aOR: 1.17, 95% CI: 0.95-1.44, p = 0.141).

Conclusions

This study found a positive association between food insecurity and chronic eye disease, in line with prior studies linking food insecurity and visual impairment. Food insecurity may drive the development of eye disease through cycles of stress, dietary variation, and unstable access to health care. Further research should focus on understanding disease-specific mechanisms for these associations to better inform holistic strategies for the prevention of vision loss.

THE ROLE OF STEROIDS IN THE TREATMENT OF OCULAR HYPOTONY ASSOCIATED WITH PROLIFERATIVE VITREORETINOPATHY

ON-DEMAND

Abstract Number: OD80

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Purpose

To investigate the role of corticosteroids to treat ocular hypotony in patients with proliferative vitreoretinopathy (PVR) and to prevent long-term complications, including phthisis.

Methods

We performed a retrospective study of eyes with PVR that had at least two consecutive episodes of intraocular pressure (IOP) ≤ 6 mmHg and were treated with steroids during the hypotony period from January 2015 to December 2022. We excluded patients with <6 months of follow-up. Treatment failure was defined as IOP remaining ≤ 6 mmHg through the final visit, any need for surgery and silicone oil (SO) tamponade to raise IOP, any recurrence of hypotony, enucleation or evisceration, and development of phthisis or pre-phthisis.

Results

Out of 561 eyes with PVR and hypotony, 314 met our inclusion criteria. The mean (standard deviation, SD) duration of hypotony was 39 (70.5) weeks. During the initial period of hypotony, all eyes received topical steroids at a mean (SD) frequency of 4.2 (3.9) times per day with 15 (4.8%) receiving sub-tenon steroids, and 3 (1%) receiving intravitreal steroids. The mean (SD) duration of follow-up was 41.3 (27.8) months. The mean (SD) IOP at baseline was 4.8 (1.3) mmHg and increased to 7.7 (4) mmHg at 3 months ($p<0.001$), 9.1 (4.8) mmHg at 6 months ($p<0.001$), 9.4 (5.4) mmHg at 12 months ($p<0.001$), and 11.1 (5.5) mmHg at the final visit ($p<0.001$). At baseline, 155 eyes (49.4%) were filled with silicone oil, and by the final visit, this number had increased to 171 eyes (54.5%). The mean (SD) [Snellen] logMAR visual acuity (VA) was 2.12 (0.5) [20/2637] at baseline and 2.13 (0.68) [20/2698] at the final visit ($P=0.595$). Hypotony recurred in 186 eyes (59.2%). In total, 236 eyes (75.2%) met the criteria of treatment failure, of which 25 (8%) underwent PPV and SO tamponade, 7 (2.2%) underwent enucleation or evisceration, and 26 (8.2%) developed phthisis or pre-phthisis.

Conclusions

Despite 75.2% of eyes with hypotony secondary to PVR failing treatment with steroids, the IOP consistently and significantly increased at every visit throughout the follow-up period.

THE TOPOGRAPHICAL EFFECTS OF GEOGRAPHIC ATROPHY ON THE DEEPER CHOROIDAL VASCULATURE

POSTERBOARD#: B0112

Abstract Number: 5706 - B0112

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Purpose

The inner choroid (i.e., choriocapillaris) is known to be affected in eyes with geographic atrophy (GA) secondary to age-related degeneration (AMD). However, evaluations of the outer and larger choroidal vessels are rare. The aim of this study is to longitudinally quantitate regional changes in the larger choroidal vessels of patients with GA, using optical coherence tomography (OCT).

Methods

In this IRB-approved retrospective analysis, we collected data from 23 eyes with GA from 23 patients who had structural OCT images obtained with enhanced depth imaging (EDI). To investigate longitudinal changes in larger choroidal vessels, subjects had 3 OCT scans spaced 6 months apart from one another, spanning a cumulative period of 1 year. Using imageJ, quantitative analysis was performed in 3 regions: (i) GA region, (ii) 150-µm-wide ring around the GA, and (iii) GA-free region. In the GA region we chose all visible vessels (more than one) identifiable. Within the ring around the GA border, the first visible vessel moving from the GA region outward was selected and measured. In the GA-free region the first visible vessel from the external margin of the ring was identified and analyzed. Overall, 76 choroidal vessels were identified at baseline and traced through the follow-ups. For each vessel, the area and the horizontal and vertical diameters were measured at each visit (unit of measurement was μm^2 and µm, respectively). P values were obtained with the related-samples Friedman's Two-Way Analysis of Variance.

Results

Mean±SD age was 74.2±6.5 years. In the GA region, the vessel area had a significant reduction over time (4269.5±2675.7 at baseline, 3664.6±2165.4 at the 6-month visit, and 3346.9±2004.9 at the 12-month visit; $p<0.001$). Similarly, there was a notable longitudinal decrease observed in both the horizontal and vertical diameters ($p=0.003$ and $p=0.009$, respectively). By contrast, both the ring around the GA border and the GA-free region did not show significant changes in choroidal measurements over time.

Conclusions

Similar to the choriocapillaris, the outer and larger choroidal vessels appear to abruptly contract within the area of GA. This may suggest that these vessels are under a very tight paracrine control. Additional investigations are necessary to unravel the biological mechanisms governing the deeper vessels, potentially utilizing them as biomarkers and factors influencing the progression of GA.

THE VITREOUS PROTEOME AND ITS ASSOCIATION WITH INTRINSIC PROTEIN DISORDER

POSTERBOARD#: A0509

Abstract Number: 648 - A0509

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Purpose

Our objective was to analyze the human vitreous humor proteome, focusing on the identification characterization of intrinsically disordered proteins (IDPs). IDPs, known for lacking a stable three-dimensional structure, retain significant biological functionality. A key aspect of our study was to investigate the propensity of these IDPs for Liquid-Liquid Phase Separation (LLPS), a process critical in cellular organization and function. By exploring the relationship between IDPs and LLPS, we aim to deepen our understanding of their roles in the vitreous humor proteome, providing insights into the molecular behavior of this ocular fluid.

Methods

We examined a set of 1,240 vitreous proteins previously identified in published research. The amino acid sequences of the proteins were analyzed using various computational tools including the Phase Separation Predictor (PSPredictor) and the Predictor of Natural Disordered Regions Version 2 (PONDR).

Results

In our analysis using PONDR, we predicted 334 proteins (26.9%) as highly disordered, 852 proteins (68.8%) as moderate disorder or conformational flexibility, and only 54 proteins (4.3%) as highly structured and ordered. Additionally, our analysis predicts that 308 proteins (24.84%) are likely to undergo Liquid-Liquid Phase Separation (LLPS).

Conclusions

Our study suggests the presence of intrinsic disorder and LLPS propensities in the vitreous proteome. These findings highlight the complex molecular landscape of the vitreous but also suggest broader implications for its global structure. For instance, the phenomenon of vitreous syneresis, which involves a degree of phase separation, could potentially be linked to the dynamics of LLPS and intrinsic protein disorder. We speculate that alterations in ocular or systemic health might impact these properties, thereby affecting the overall structure and functionality of the vitreous.

TOPICAL 5-FLUOROURACIL 1% FOR OCULAR SURFACE SQUAMOUS NEOPLASIA: PRIMARY VERSUS SECONDARY TREATMENT

POSTERBOARD#: B0543

Abstract Number: 4091 - B0543

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Purpose

Ocular surface squamous neoplasia (OSSN) is a spectrum of malignancies that generally includes conjunctival intraepithelial neoplasia (CIN) and squamous cell carcinoma (SCC). OSSN can be treated with topical therapies including interferon α-2b (IFN), mitomycin-C (MMC), or 5-fluorouracil 1% (5FU). Recently, due to unavailability of IFN and MMC associated toxicity, therapy has shifted towards 5FU. Herein, we compare the use of 5FU 1% as a primary versus (vs.) secondary treatment regimen in eyes with moderate to extensive OSSN.

Methods

Retrospective cohort study of 73 consecutive patients with unilateral moderate to extensive OSSN treated with 5FU 1% (4 times daily for 2 weeks with an option for 2-weekly extension) at a single tertiary ocular oncology center from 2016 to 2023.

Results

In the 73 patients analyzed, a comparison (primary vs. secondary treatment) revealed no difference in mean tumor basal dimension (19.6 vs. 17.2 mm, p=0.46), thickness (3.7 vs. 3.4 mm, p=0.64), or tumor extent (4.4 vs. 4.5 clock hours, p=0.92). The primary treatment group showed greater complete tumor control (77% vs. 38%, p=0.04). Multivariable comparative analysis (primary vs. secondary treatment) showed primary treatment more likely to achieve complete tumor control (p=0.01). There was no difference in the complication rate from 5FU treatment between the groups. There was no difference in visual outcome, tumor-related metastasis (0%) or death (0%).

Conclusions

Topical 5FU 1% is efficacious and safe as a primary or secondary topical treatment modality for moderate to extensive OSSN. It is an efficient replacement of IFN and MMC, with excellent outcomes and often complete resolution in patients with moderate to extensive OSSN.

UNIFIED GROUP SEQUENTIAL DESIGNS FOR RANDOMIZED EYE TRIALS

POSTERBOARD#: A0325

Abstract Number: 2433 - A0325

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Purpose

Group sequential (GS) methods are the most commonly used tools for studies with interim monitoring plans, which control type I error rate, protect statistical power, and avoid false positive/negative findings. However, to the best of our knowledge, when both eyes (clustered) from at least some patients are included in an eye study, specific GS methods accounting for the inter-eye correlation do not exist. We develop statistical tools for the GS designs for randomized eye trials accommodating all possible design options with various types of endpoints.

Methods

We propose a unified GS design for vision research that accounts for the inter-eye correlations when both eyes of a patient are included in the study. The unified design accommodates all possible options, including the scenarios of only one eye eligible and/or both eyes on the same or different treatment arms. We investigate the design properties of the proposed GS methods and derive sample size/power calculation results and interim monitoring boundaries while accounting for the inter-eye correlation.

Results

Simulation studies demonstrate that the proposed methods perform well in practical settings. Using the Age-Related Eye Disease Study (AREDS) as an example, we calculate the sample sizes for comparing the change of IOP from baseline to year 5 in a future two-arm trial; see Figure 1, which shows that ignoring the inter-eye correlation may lead to incorrect sample size calculations. A demonstration of using the R package *iTrial* that implements the newly proposed methodology will be presented.

Conclusions

Our novel unified GS design accommodates all scenarios in eye trials and protects type I error rates and study power in the presence of inter-eye correlations. Successful implementation of the proposed methodology in randomized trials involving both eyes of a patient is important for evaluating new treatments. Proper study design and interim monitoring using these methods will help improve the study quality and achieve successful study conduct.

USING GOOGLE FORMS TO CREATE A HIPPA COMPLIANT DATABASE FOR RARE AND POORLY CODED DISEASES IN UVEITIS

ON-DEMAND

Abstract Number: OD45

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Purpose

The International Statistical Classification of Disease and Related Health Problems, tenth revision (ICD-10) coding in electronic health record (EHR) systems is unable to accurately characterize certain uveitis subtypes. We describe our experience with coding errors in our EHR system and using *Google Forms* to create a Health Insurance Portability and Accountability Act (HIPPA) compliant database to better characterize rare and poorly coded diseases in uveitis.

Methods

This is a pilot single-center retrospective, consecutive case series including patients diagnosed with uveitis to assess the frequency of inaccurate coding in our MDI (MDIntelleSys, Nextech Systems LLC) EHR using ICD-10 codes and the feasibility of using *Google Forms* to create an accurate HIPAA compliant database. MDI electronic medical records were reviewed to collect patient demographics and uveitis characteristics.

Results

The MDI charts of 100 consecutive patients beginning on September 7, 2015 and followed through March 24, 2023 were reviewed. Demographic information and uveitis characteristics were manually extracted to accurately classify various uveitis subtypes under the correct diagnosis using the organizational framework provided by *Google Forms*. The majority (64.0%) were female, aged 47.9 ± 18.1 years. Most patients were white (62.0%) and non-Hispanic (89.0%). The most common anatomic location of inflammation was anterior uveitis (52.0%), followed by panuveitis (15.0%), posterior uveitis (14.0%), scleritis (11.0%), intermediate uveitis (8.0%), and primary retinal vasculitis (1.0%). Most of the uveitis diagnoses in this study were non-infectious (94.0%). A majority of the uveitides were considered undifferentiated (52.0%), followed by HLA B27-associated (8.0%), sarcoidosis (8.0%), and birdshot chorioretinopathy (6.0%). Of the 22 total different etiologic diagnoses identified with extraction using *Google Forms*, 8 did not have an associated diagnosis or ICD-10 code in MDI (18 patients) and 2 etiologies (acute retinal necrosis and birdshot chorioretinopathy) were coded under the same diagnosis and ICD-10 code (disseminated chorioretinal inflammation, H30.13, 6 patients).

Conclusions

This pilot study successfully showed that *Google Forms* is a useful tool in the creation of an accurate HIPAA compliant database for uveitis, which may be inaccurately coded using our current EHR and international disease classifications.

VISUAL OUTCOMES IN EYES WITH NO LIGHT PERCEPTION PRIOR TO VITRECTOMY

POSTERBOARD#: A0159

Abstract Number: 4440 - A0159

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Purpose

Pars plana vitrectomy (PPV) is a frequently performed procedure utilized to address various vitreoretinal conditions such as rhegmatogenous retinal detachment (RRD), diabetic tractional retinal detachment (TRD), vitreous hemorrhage (VH), and choroidal detachment. Despite advancements in vitrectomy techniques, there is limited research on the visual prognosis for individuals with no light perception (NLP) vision before surgery. This study evaluates the visual outcomes of eyes with NLP vision during the pre-vitrectomy examination and identifies factors associated with post-surgical vision recovery.

Methods

A retrospective chart review of all patients scheduled for PPV with NLP vision at their preoperative visit from January 2015 to December 2023 was conducted. Demographic, preoperative, and postoperative data were collected. The main outcome measures were visual acuity (VA) at post-operative periods day 1, week 1, months 1, 3, 6, 12, final visit, date of first VA better than NLP post PPV, and date of best VA post PPV. VA was converted to logarithm of minimum angle of resolution (logMAR), and the Wilcoxon signed-rank test was used to analyze non-parametric data for paired samples to assess changes in VA.

Results

A total of 35 patients with NLP vision at baseline prior to surgery were included in the study. The median age was 60 (interquartile range = 34-79), median duration of follow-up (months) was 13 (interquartile range = 6-38), and 21 of the 35 subjects (60%) were male. The mean preoperative VA was 3±0. The mean best VA after surgery was 2.24±0.81. In this study, 26 of 35 eyes (74.3%) regained vision better than NLP. Of these 26 eyes that saw improvement, the mean best VA after surgery was 1.98±0.78. A statistically significant median VA from baseline to all post-operative periods was observed ($p \leq 0.001$). The median days to recovery of VA better than NLP post PPV was 1 (interquartile range = 1-7), and the median days to recovery of VA to the best value post PPV was 39 (interquartile range = 5.5-114.75). One eye with VH and TRD and PDR (94.1%) had the most improvement in VA post PPV. One eye with a retained lens fragment and TRD and one eye with VH and TRD saw no improvement in VA from baseline.

Conclusions

PPV may improve visual outcomes in patients with NLP vision at baseline, suggesting the potential benefits of vitrectomy in patients with severe visual impairment.

VISUAL FIELD LOSS IS ASSOCIATED WITH DECREASED BONE MINERAL DENSITY AMONG ADULTS IN THE UNITED STATES

POSTERBOARD#: A0418

Abstract Number: 4635 - A0418

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Purpose

Visual field loss (VFL) has been linked with decreased physical activity and increased falls. However, the association of VFL and bone density has not been well-characterized. We investigated bone mineral density and rates of osteoporosis among adults with VFL.

Methods

We analyzed the 2005-2008 National Health and Nutrition Examination Survey, a representative sample of US adults. VFL was assessed by the 2-2-1 algorithm based on frequency doubling technology. Osteoporosis was determined using previously validated thresholds of total femur, femoral neck, and trochanter bone mineral density (BMD) on DEXA scan. Multivariable regression models were adjusted for age, sex, race, insurance, and chronic comorbidities. Statistical analyses were performed using SAS version 9.4.

Results

Of the 4704 adults in the NHANES who underwent VF testing and DEXA scan, 66 (0.7%) had unilateral and 148 (2.2%) had bilateral VFL. Bilateral VFL was associated with decreased total femur (P=0.02) and trochanter BMD (P=0.02), and similar femoral neck BMD (P=0.19). Unilateral VFL was not associated with BMD (all P≥0.15).

Using validated BMD thresholds for osteoporosis, persons with bilateral VFL had higher rates of osteoporosis in the femur (adjusted OR [95% CI]: 2.46 [1.10-5.50], P=0.03) and trochanter (2.72 [1.19-6.23], P=0.02), and similar rates in the femoral neck (2.26 [0.90-5.66], P=0.08). Unilateral VFL was associated with greater odds of osteoporosis in the total femur (2.95 [1.40-6.18], P=0.006) and femoral neck (2.57 [1.04-6.37], P=0.04), and not in the trochanter (2.70 [0.78-9.34], P=0.11).

Conclusions

In this representative US cohort, adults with visual field loss had decreased bone mineral density and higher rates of osteoporosis. Patients with VFL may benefit from osteoporosis screening and multidisciplinary interventions to mitigate bone loss and fracture risk. Further studies are needed to investigate the underlying mechanisms and determine the optimal strategies to reduce osteoporosis among patients with VFL.

VISUAL STIMULATION-INDUCED CEREBROSPINAL FLUID DYNAMICS ARE IMPAIRED IN GLAUCOMA

POSTERBOARD#: B0001

Abstract Number: 1197 - B0001

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Purpose

Recent research indicates a potential connection between glaucoma, a neurodegenerative disease, and changes in cerebrospinal fluid (CSF) dynamics, which may be detected by visual stimulation. Here, we investigated the influence of visual stimulation on CSF dynamics in healthy older adults and glaucoma patients.

Methods

Eighteen early glaucoma patients [age: 66.00±1.89yrs (mean±S.E.M.)], twenty-four advanced glaucoma patients [66.63±1.36yrs] and twenty-three healthy controls [64.52±1.59yrs] underwent comprehensive ophthalmic evaluation including visual field perimetry and optical coherence tomography as well as anatomical and functional MRI (fMRI) (Fig.1A) at 3T. Patients were categorized as either early or advanced stage based on visual field mean deviation, using a cut-off threshold of -6.0 dB. During fMRI scans, a flickering checkerboard was presented on the entire screen (Fig.1B).

We extracted the blood-oxygenation-level-dependent (BOLD) signals from the visual cortex, and the fourth ventricle mask, which we delineated from the first slice of fMRI images. The BOLD signals derived from the fourth ventricle represent the incoming CSF flow, whereas those from the visual cortex reflect neural activity (Fig.1C).

Results

We observed that an increase in visual cortex BOLD is followed by a decrease in CSF inflow, and that a decrease in visual cortex BOLD is followed by an increase in CSF inflow with a time delay in healthy individuals (Fig.1D). However, this pattern was shown to be disrupted in glaucoma patients (Fig.1E,F).

We also examined the temporal relationship between visual cortex BOLD and CSF inflow using cross-correlation. In healthy individuals, the strongest coupling (in terms of absolute value of correlation coefficient) was observed at a lag of 1 second (Fig. 2A). Nevertheless, this coupling was weaker among early and advanced glaucoma patients. Furthermore, the strength of coupling was found to be associated with other ophthalmic parameters (Fig. 2B-G). Specifically, weaker coupling was related to worse visual field mean deviation, thinner peripapillary retinal nerve fiber layer thickness, thinner macular ganglion cell-inner plexiform layer thickness, and smaller neuroretinal rim area, as well as a higher cup-to-disc ratio, but not with intraocular pressure.

Conclusions

Our results suggest that the impact of visual stimulation on CSF inflow is gradually disrupted with increasing glaucoma severity.