ARVO International Chapter Affiliate

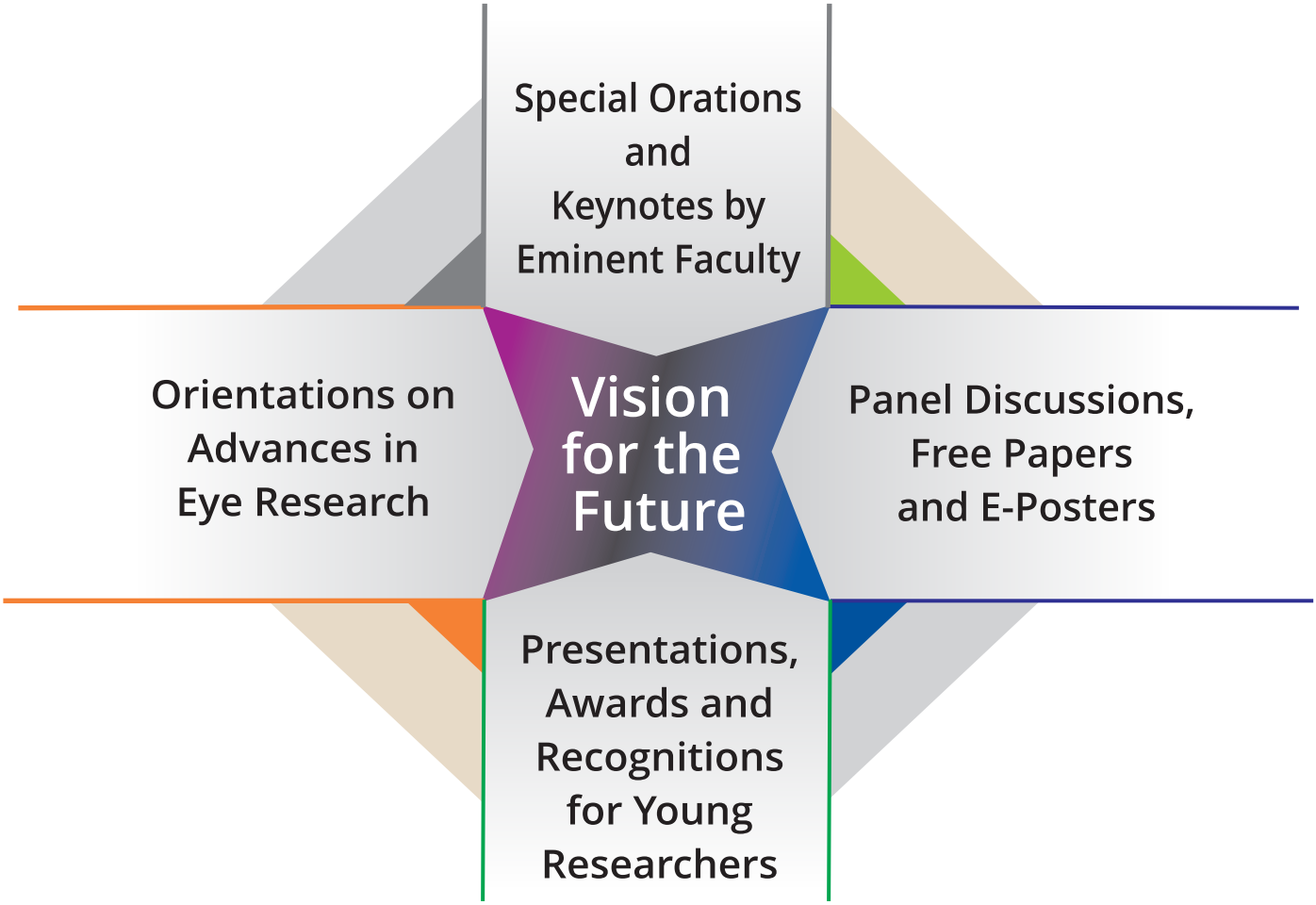
ARVO-INDIA

Indian Eye Research Group

28th Annual Meeting of the Indian Eye Research Group

Program Book

September 9-11, 2022



Organizers

Dr Sayan Basu

Dr Subhabrata Chakrabarti

Dr Sachin Shukla

Dr Tarandeep Kaur

Ms Priyasha Mishra

Mr Ashish Mishra

Ms Elena D Roopchandra

Ms Anjani

Mr Srinivas Ayyagari

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Pre-Conference Workshops

September 9, 2022

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Indian Eye Research Group

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Offline Workshops : September 9, 2022 (Friday)

Time	Title	Organizer
09.00 - 10.30	Molecular diagnostics	Sandor Specialty Diagnostics Pvt. Ltd.
10.30 - 10.45	**TEA/COFFEE BREAK**	
10.45 - 12.45	Single cell sequencing	10X Genomics
13.00 - 14.00	**LUNCH**	
14.00 - 15.00	Spatial transcriptomics and proteomics	Nanostring Technologies Inc.
15.00 - 15.30	**TEA/COFFEE BREAK**	
15.30 - 17.30	Cell therapy solutions for every step: from discovery to cure	Thermo Fisher Scientific

Online Workshops : September 9, 2022 (Friday)

Time	Title	Organizer
09.00 - 10.30	Regulatory framework and critical considerations for clinical translation of gene and cell therapies	Arkasubhra Ghosh Vineet Joshi
10.30 - 10.45	**TEA/COFFEE BREAK**	
10.45 - 12.45	Assessment of sensory and motor visual functions - a primer	Shrikant Bharadwaj Amithvikram Hathibelagal
13.00 - 14.00	**LUNCH**	
14.00 - 14.30	Technology video session	Johnson & Johnson
15.00 - 17.00	Animal models in eye research	Vivek Singh Kiran K. Bokara

Offline Workshops

Sandor
Speciality Diagnostics Pvt. Ltd.

We have more than 15 years of experience in specialized diagnostics. We are a proud pioneer in launching high value diagnostics services in india and heralding pioneering research in association with esteemed institutes .

Genomics (Diagnostics/Research)	Micro Array from both Illumina & Agilent| NGS from Illumina (NextSeq) | RT PCR | PCRs
Cell Imaging	Flow Cytometer- 2 laser (having 4 laser capability) (BD LSR II)
Others	Pre-Implantation Genetic Screening System | Bio Repository with five -800C. Freezers | Liquid N Storage facility | Cell Culture Facilities- 3 Covaris for DNA Fragmentation
Metabolomics	Varioskan for Enzyme Levels | Biorad IEF unit
Proteomics (Research)	Maldi TOF | LC MS Q-TOF | Triple Quadruple LC MS | HPLC UPLC Nano LC | AKTA Protein Purifier | GCMS
Biochemistry	NBS 49 disorders|Pterins Disorders| Glycine levels| VLCFA

91004 29144 www.sandordiagnostics.co.in diagnostics@sandor.co.in

Sandor family invites you to join us at the workshop on Sep 9th and conference on Sep10th - 11th at LVPEI, Hyderabad

Speakers:

Vineeta Singh
Vice President
Sandor Speciality Diagnostics, Hyderabad
Topic: Introduction to Sandor services : Diagnostics and Research,
Time : 9:00 - 9:15 AM, Duration : 15 mins

Niti Singh
Head - Institutional Research
Sandor Speciality Diagnostics, Hyderabad
Topic: Application of NGS & Microarray in Ophthalmology Research,
Time : 9:15 - 9:35 AM, Duration: 20 mins

Raju Rapaka
HOD - Proteomics
Sandor Speciality Diagnostics, Hyderabad
Topic: Protein and Metabolite Profiling by High Resolution Mass Spectroscopy (LC-QTOF),
Time : 9:35 - 9:55 AM, Duration : 20 mins

Akhilesh Narayan Pujar
Manager-Scientific Affairs
Sandor Speciality Diagnostics, Hyderabad
Topics: Importance of Genetic testing in Ocular Disorders,
Time : 9:55 - 10:15 AM, Duration: 20 mins

Question & Answer session
10:15 - 10:30 AM, Duration : 15 mins

www.sandordiagnostics.co.in

SINGLE CELL SEQUENCING

The vast complexities of biology require approaches to build a complete picture, starting from single cells to tissues and beyond. At 10x Genomics, we provide single cell and spatial solutions that enable researchers to drive the leading edge of what's possible. Resolve highly complex biological systems, while bringing into focus the details that matter most.

Join us for this workshop to learn how Chromium Single Cell solutions from 10x Genomics can help you push the boundaries of your research. Uncover molecular insights, dissect cell-type differences, investigate the adaptive immune system, detect novel subtypes and biomarkers, and map the epigenetic landscape cell by cell. Enabling deeper insight into cancer, immunology, neuroscience, and developmental biology, 10x Genomics gives researchers the ability to see biology at true resolution.

Date	Timings	Speaker	Title
9th Sep 2022	10:45 AM to 11:30 AM	Iovnne Peterman	10x Genomics Single Cell solutions overview presentation (online)
9th Sep 2022	11:30 AM to 12:00 PM	Nitya Nand Sharma and Avid Hussain	Chromium controller instrument Dry Demo
9th Sep 2022	12:00PM to 12:45PM	Nitya Nand Sharma	Software Demo- Single-cell Data analysis using loupe browser

Speakers:

Ivonne Petermann

Science and Technology Advisor, 10x Genomics

Ivonne has an extensive background in the life science business, supporting customers in various fields and driving their success. Ivonne graduated with a Ph.D. degree in Biology/Genetics at the University of Freiburg in Germany. She joins 10x Genomics as Science and Technology Advisor in Australia and looks forward to discussing your 10x Genomics single cell and spatial transcriptomics experimental plans.

Avid Hussain

Business Manager-India, 10x Genomics

Avid has an extensive background in the life science business, supporting customers in various fields and driving their success. Avid graduated with a Ph.D. degree in Microbial genomics at RGUHS in Bangalore. He joins 10x Genomics as Business Manager in India and looks forward to discussing your 10x Genomics single cell and spatial transcriptomics applications.

Nitya Nand Sharma

Sr. Product Manager, Premas Life Sciences Pvt Ltd

Nitya Nand Sharma, PhD (Biotechnology) is working as the Sr. Product Manager – Single Cell & Spatial Genomics with Premas Life Sciences Pvt. Having 18 years of experience in life sciences industry, Dr Sharma is proactively keen in consultative research solutions in single cell genomics and next generation sequencing, etc.

RNA BIOLOGY WITH ENZYME FREE TECHNOLOGY AND SPATIAL TRANSCRIPTOMICS AND PROTEOMICS OF COMPLEX TISSUES BY SPATIAL PROFILER SOLUTIONS

NanoString: The Leader in RNA Biology with Enzyme Free Technology

NanoString is a unique, established and very different technology from any other available today for studying RNA transcripts or selective proteins. It is essentially a single molecule counting system. It works by attaching molecular barcodes to target molecules of interest by nucleic acid base-pairing, a process that is simple, robust, and well understood. The molecular barcodes consist of a series of 6 fluorescent "spots", each of which can be one of 4 colours. The different combinations of ordered spot colours create different "barcodes" that uniquely identify each molecule in an experiment. In this way, several million molecules can be counted from a sample. Experimentally, you can use up to 800 different barcodes to detect and very precisely quantify target molecules, providing great scope for multiplexing. You can detect any number of targets up to the full 800-plex from a single sample, and without changing the effort required, the time taken or experimental protocol in any way.

Hallmarks of the Technology

1. Enzyme-free robustness
2. Digital precision

Spatial Transcriptomics and Proteomics of Complex Tissues by Spatial Profiler Solutions from NanoString

Traditional sequencing and other methods using dissociated samples can lose key spatial information present *in vivo*. To understand localized transcriptional and proteomics changes while maintaining information on tissue architecture intact, high-plexity spatial technologies are needed for genes and proteins profiling. By retaining the precise location of biological molecules within a tissue, spatial methods can further improve our understanding of mechanisms in disease and other research areas. The NanoString Spatial Profiler measures analytes (RNA or Proteins) within regions of interest defined by tissue morphology. The Spatial Profiler combines technology the best of spatial and molecular profiling, this unique combination of high-plex and high-throughput spatial profiling enables to assess the biological implications of the heterogeneity rapidly and quantitatively within FFPE, FF, organoids etc. samples.

Hallmarks of the Technology

1. Multiplex multi-omics on one tissue section in a single pass
2. Quantitation based on linear single molecule counting: up to 5.5 logs
3. Single-cell limit of detection
4. Non-destructive: sample completely intact after assay

Speaker:

Paras Yadav

Field Application Scientist, Nanostring Technologies Inc.

Paras Yadav has 13 years of experience in life science industry & obtained his Ph.D. degree in Molecular Biology in year 2009. He has developed expertise in wide range of molecular biology technology like Microarray, variety of NGS techniques and Spatial genomics technology for diverse range of applications like Gene Expression, genotyping and molecular cytogenetics etc.

CELL THERAPY SOLUTIONS FOR EVERY STEP– FROM DISCOVERY TO CURE

The use of chimeric antigen receptor (CAR) technology has contributed towards significant advances in the treatment of certain types of cancer. This technology harnesses the immune defenses (e.g., T cells) to specifically target a patient's cancerous cells with modified immune cells carrying a CAR "payload". As with many new technologies, rapid progress is being made that overcomes the barriers and hurdles associated with earlier generations of the CAR T cell technology.

In my presentation will discuss some of the more recent improvements to the development and manufacturing of CAR T cell therapies, including approaches to T cell isolation, engineering steps to produce CAR T cells, and strategies for the expansion of engineered cells for subsequent patient treatment. Presentation will also cover the overview Thermo Fisher Scientific CGT workflow solutions including the CTS Rotea system and Xenon electroporation system.

Speaker:

Prathap Naidu

Business Development Manager
Cell Biology & Synthetic Biology, South Asia

Ion Torrent Next Generation Sequencing - Technology and Application

Raju Yadav Perugu

Online Workshops

REGULATORY FRAMEWORK AND CRITICAL CONSIDERATIONS FOR CLINICAL TRANSLATION OF GENE AND CELL THERAPIES

Advanced Therapeutic Medicinal Products (ATMPs) represent the most cutting-edge treatment options, particularly for a variety of incurable and genetic conditions. These cell therapies, gene therapies or combinations thereof have begun to revolutionize medicine and delivery of therapy. Since such advances originate from cutting edge technologies developed in laboratories, it is often a challenge to translate them to viable clinically applicable products due to lack of awareness of the various regulatory requirements. As Indian medicine and science is rapidly advancing with the development of products in the cell and gene therapy space, it is important to understand and discuss the regulatory pathways for the same. Today, there are numerous stem cell based and gene therapy-based products already in trials or being developed for trials across a variety of diseases using many different vector types in India. Thus, the focus of this workshop is to raise awareness about the regulatory guidelines available, the relevant roadmaps for clinical translation, safety and production process considerations for ATMPs. The workshop is organized as follows:

Chair	Arkasubhra Ghosh *Director, GROW Research Laboratory, Narayana Nethralaya Foundation*
Co-Chair	Geeta Jotwani *Senior Director General, Indian Council of Medical Research*
Panelists	Vikram Matthews *Professor and Head, CMC Vellore*
	Sayan Basu *Network Director, LVPEI, Hyderabad*
	G. Kumaramanickavel *Research Director, NNF, Bangalore*
	Everette J. R. Nelson *Asso. Professor and HoD, VIT, Vellore*
	Mala Srivastava *Founder CEO, Nextvel LLP*

Program Schedule	
Vineet Joshi	Introduction to the panelists
Arkasubhra Ghosh	Introduction to ATMPs and the concept of translation
Geeta Jotwani	Regulatory framework for Stem Cell Therapy development
Varsha Dalal	Regulatory considerations for Gene Therapy
Sayan Basu	Clinical trial designs and regulatory path for ocular stem cell applications
Ruchita Selot	Clinical manufacturing considerations for Gene Therapy products
Panel discussion Moderators: E.J.R. Nelson Vineet Joshi	Regulatory framework, hurdles and tips for preparation of clinical applications

ASSESSMENT OF THE SENSORY AND MOTOR VISUAL FUNCTIONS- A PRIMER

Shrikant Bharadwaj	*Brien Holden Institute of Optometry and Vision Sciences, Prof. Brien Holden Eye Research Centre, L V Prasad Eye Institute, Hyderabad, India*
Amithavikram R Hathibelagal	
PremNandhini Satgunam	

Summary

This workshop will focus on techniques for measurement of sensory and motor visual functions, with a special focus on psychophysics (subjective perception of an objective stimulus), eye tracking and photorefraction. Sensory perception includes color vision, spatial and temporal vision, while motor visual functions include eye movements and accommodation. Various psychophysical techniques will be demonstrated for the measurement of visual functions in this online workshop, connecting these techniques to the examination methods employed in day-to-day clinical practice. The workshop will start with the fundamentals of each technique and will also highlight the recent technological advances in visual function measurements.

ANIMAL MODELS IN EYE RESEARCH

Dysfunction of the visual system can significantly reduce the quality of life. Inspite of high prevalence of ocular surface diseases, a limited information is available on the underlying pathological mechanisms causing these diseases, making in vitro analysis 'less translatable' to humans. Because experimental studies are limited in humans due to scarcity of sufficient tissues, developing animal models is very crucial in order to investigate the molecular mechanisms and to test new therapeutic interventions. Therefore, holding an educational session in this field of study will benefit researchers to understand the need of animal models in their research. This workshop is expected to bring together interested researchers and encourage them to design better animal models of disease and perform therapeutic research.

Scope of the session: This session covers the animal models used in ocular research and would discuss animal models and ethics, nanomedicine eye drops for corneal anti-angiogenesis treatment and animal model of Somitogenesis-independent tail regeneration. It will give the glimpse of various tools and animal models to answer unsolved questions and to understand the importance of pre-clinical study using animal models.

Time (24 hr, IST)	Speakers	Session Details
15:00 – 15:05	Minal Thacker *LV Prasad Eye Institute* Vijay Singh *LV Prasad Eye Institute*	Welcome & Introduction
15:05 – 15:30 (20 min Talk + 5min Discussion)	Ch. Mohan Rao *Centre for Cellular & Molecular Biology, India*	Animal models for Vision Research: Learning from experience
15:30 – 15:55 (20 min Talk + 5min Discussion)	Ratnakar Tripathi *University of Missouri, USA*	Investigating the Translational relevance of Various animal models: Overview and Ethics
15:55– 16:20 (20 min Talk + 5min Discussion)	Ching-Li Tseng *Taipei Medical University, Taiwan*	Nanomedicine as eye drops for corneal/choroidal anti-angiogenesis treatment: Therapeutic approach
16:20 – 16:50 (25 min Talk + 5min Discussion)	Prayag Murawala *MDI Biological Laboratory, USA*	Somitogenesis-independent tail regeneration in axolotl by tail-specific progenitors: Exploring new Horizon
16:50-17:00	Vivek Singh *LV Prasad Eye Institute* Kiran Kumar Bokara *Centre for Cellular & Molecular Biology, India* Minal Thacker *LV Prasad Eye Institute* Vijay Singh *LV Prasad Eye Institute*	Discussion & Closing Remarks

Program Schedule

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September 10, 2022 (Saturday)

SESSION	TIME	SPEAKER	TOPIC
Inauguration Moderator: *Sayan Basu*	09.00 - 09.07	Prashant Garg *L V Prasad Eye Institute, Hyderabad*	Welcome address
	09.07 - 09.14	Ronnie George *Sankara Nethralaya, Chennai*	Presidential address
	09.15 - 09.30	Gullapalli N. Rao *L V Prasad Eye Institute, Hyderabad*	Moving forward in eye research: An ARVO-India perspective
Session I Moderators: *N. Angayarkanni* *Inderjeet Kaur*	09.30 - 09.50	**KEYNOTE 1** Manish Jaiswal *Tata Institute of Fundamental Research, Hyderabad*	Novel insight into retinal degeneration caused by mitochondrial dysfunction using Drosophila
	09.50 - 10.05	**Special Talk 1** Sharada Ramsubramanyan *Sankara Nethralaya, Chennai*	The impact of molecular modifications in regulating cellular homeostasis and disease development: An ocular perspective
	10.05 - 10.15	**FP1** Anwar A. Palakkan *Aravind Medical Research Foundation, Madurai*	Generation of enriched population of retinal pigment epithelial cells from human induced pluripotent stem cells for retinal disease modelling
	10.15 - 10.25	**FP2** Ashu Shukla *Postgraduate Institute of Medical Education and Research, Chandigarh*	The fifth Fibronectin type III-like (Tn fnIII) domain of Tenascin-C (Tn fnIII 5) facilitates corneal wound healing
	10.25 - 10.35	**FP3** Anannya Tuli *All India Institute of Medical Sciences, New Delhi*	Evaluation of anti-angiogenic and anti-fibrotic potential of dipyridamole using cautery induced rat model
	10.35 - 10.45	**FP4** Divya Piddishetty *L V Prasad Eye Institute, Hyderabad*	Assessment of visual behaviour in retinal degeneration models of zebrafish: feed capture maze paradigms and optokinetic response device
	10.45 - 11.00	**Special Talk 2** Gowripriya Chidambaranathan *Aravind Medical Research Foundation, Madurai*	Biology of adult ocular stem cells and their role in regenerative medicine
BREAK	11.00 - 11.30	**Tea / Coffee**	
Session II Moderator: *Chitra Kannabiran*	11.30 - 1.45	**Special Talk 3** A. Vanniarajan *Aravind Medical Research Foundation, Madurai*	Epigenetic alterations in retinoblastoma
	11.45 - 12.05	**KEYNOTE 2** T. Velpandian *All India Institute of Medical Sciences, New Delhi*	Re-engineering ophthalmic therapeutics: Off-label to On-table

SESSION	TIME	SPEAKER	TOPIC
Session III Moderators: *T. Velpandian* *Sanhita Roy*	12.05 - 12.15	**FP5** Priyasha Mishra *LV Prasad Eye Institute, Hyderabad*	Inhibitory role of S100A12 against *Pseudomonas aeruginosa*
	12.15 - 12.25	**FP6** Subramanian R. Bharathidevi *Sankara Nethralaya, Chennai*	*In silico* design and development of mutated *PON2* by site directed mutagenesis and assessment of its function in *in vitro* cell model of HRECs upon CML treatment
	12.25 - 12.35	**FP7** Iswarya Radhakrishnan *Aravind Medical Research Foundation, Madurai*	Trabecular meshwork stem cell derived exosomes enhance TM cell survival and proliferation
	12.35 - 12.45	**FP8** Sushma Vishwakarma *LV Prasad Eye Institute, Hyderabad*	miRNA regulates potential genetic pathways involved in diabetic retinopathy: implications for an early disease diagnosis
	12.45 - 13.05	**KEYNOTE 3** Sushmita Kaushik *Postgraduate Institute of Medical Education and Research, Chandigarh*	Genetic aspects of congenital glaucoma: A clinician's tentative Journey
BREAK	13.05 - 14.00	**Lunch**	
Session IV E - Posters	14.00 - 15.00	**Poster Session - I**	
Session V Moderator: *D. Balasubramanian*	15.00 - 16.00	**BIRESWAR CHAKRABARTI ORATION** J. Mark Petrash *University of Colorado, CO, USA*	Pathogenesis and novel therapies for cataracts and lens disorders
BREAK	16.00 - 16.30	**Tea / Coffee**	
Session VI Moderators: *S. Ramsubramanyan* *Soumyava Basu*	16.30 - 16.40	**FP9** Divyani Nayak *Narayana Nethralaya, Bengaluru*	Efficient generation of iPSC derived corneal endothelial cells via neural crest fate induction
	16.40 - 16.50	**FP10** Muthuramalingam Karpagavalli *Pondicherry University, Pondicherry*	Identification of tRNA derived piwi-interacting RNAs in retinal pigment epithelial cells
	16.50 - 17.00	**FP11** Lakshmi Badrinarayanan *Sankara Nethralaya, Chennai*	Frequency, risk factors and genetic determinants associated with intravitreal steroid-induced ocular hypertension
Session VII Moderator: *Sayan Basu*	17.00 - 17.30	**Industry talk**	Johnson & Johnson
IERG Quiz Moderators: *Anthony V. Das* *Inderjeet Kaur*	17.30 - 18.30	**iQUEST (Online)**	
Dinner	19.00 onwards	**Venue: Park Hyatt, Road No. 2, Banjara Hills, Hyderabad**	

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September 11, 2022 (Sunday)

SESSION	TIME	SPEAKER	TOPIC
Session VIII Moderators: *G. Chidambaranathan* *Swathi Kaliki*	09.00 - 09.10	**FP12** Naheed Afrin Borah *LV Prasad Eye Institute, Bhubaneswar*	Therapeutic targeting of aurora kinase A and investigating its association with *MYCN* oncogene in human retinoblastoma
	09.10 - 09.20	**FP13** Rizza Abdul Nayeem *Sankara Nethralaya, Chennai*	Epigenetic biomarkers in diabetic retinopathy cohorts of a South Indian population
	09.20 - 09.30	**FP14** Velmurugan Kailasam *Birla Institute of Technology and Science - Pilani, Hyderabad*	Enhancing the stability of Amphotericin-B using polymeric patch for corneal delivery
	09.30 - 09.40	**FP15** Tanmoy Dutta *Dr. Shroff's Charity Eye Hospital, Delhi*	Downregulation of *KLF4* and prolonged inflammations are associated with persistent epithelial defect
	09.40 - 09.55	**Special Talk 4** Mamatha Reddy *LV Prasad Eye Institute, Bhubaneswar*	The *MYCN* oncogene in retinoblastoma: Regulation of metabolic reprogramming and cell cycle
Session IX Moderator: *K. Dharmalingam*	09.55 - 11.00	**D BALASUBRAMANIAN ORATION** K. Thangaraj *DBT - Centre for DNA Fingerprinting and Diagnostics, Hyderabad*	Population genomics and public health
BREAK	11.00 - 11.30	**Tea / Coffee**	
Session X Moderators: *Nirmal Jayabalan* *Mamatha Reddy*	11.30 - 11.40	**FP16** Mehak Vohra *Dr. Shroff's Charity Eye Hospital, Delhi*	Bioengineered liquid cornea: Prevents scarring in mechanical injury wound model of rabbits
	11.40 - 11.50	**FP17** Deepika C. Parameswarappa *LV Prasad Eye Institute, Hyderabad*	Comparison of retinal pigmented epithelial cell viability with 41G and 29G cannula – an *in vitro* experiment
	11.50 - 12.05	**Special Talk 5** J. Narayanan *Sankara Nethralaya, Chennai*	Mechanobiological investigations using corneal epithelial cells and keratoconus as model system
Session XI Moderator: *Ronnie George*	12.05 - 13.00	**S. S. BADRINATH ORATION** Mahesh P. Shanmugam *Sankara Eye Hospital, Bengaluru*	Where there is a will, there's a way
BREAK	13.00 - 14.00	**Lunch**	

SESSION	TIME	SPEAKER	TOPIC
Session XII E - Posters	14.00 - 15.00	**Poster Session - II**	
Session XIII Moderators: *S. Senthilkumari* *Virender Sachdeva*	15.00 - 15.20	**FP18** Manoj K. Manoharan *LV Prasad Eye Institute, Hyderabad*	Rapid myopia progression in young adults and the associated factors
	15.20 - 15.30	**FP19** Bhavya Gorimanipalli *Narayana Nethralaya, Bengaluru*	Role of artificial intelligence in understanding ocular surface pain
	15.30 - 15.40	**FP20** Lavanya M.P. Easwaran *Sankara Nethralaya, Chennai*	Microfluidics of T regulatory cells and tubercular uveitis
	15.40 - 15.50	**FP21** Bhagya Lakshmi Marella *LV Prasad Eye Institute, Hyderabad*	Optical phase shifts may contribute to the loss of visual acuity and stereoacuity in keratoconus
	15.50 - 16.00	**FP22** Marmamula Srinivas *LV Prasad Eye Institute, Hyderabad*	Prevalence, pattern and compliance with spectacles use among the elderly in homes for the aged centres in South India – the Hyderabad Ocular Morbidity in Elderly Study
	16.00 - 16.10	**FP23** Hanith Raj Deivarajan *Aravind Medical Research Foundation, Madurai*	Development and validation of a novel CRISPR/ Cas12a-based nucleic acid detection platform for the diagnosis of ocular fungal infections
	16.10 - 16.25	**Special Talk 6** Vijaya K. Gothwal *LV Prasad Eye Institute, Hyderabad*	Utilization and abandonment of low vision devices: An important element of low vision rehabilitation
Session XIV **Valedictory** Moderator: *Sachin Shukla*	16.25 - 16.35	D. Balasubramanian *LV Prasad Eye Institute, Hyderabad*	Wrap-up of ARVO-India 2022
	16.35 - 16.45	**Prize Distribution**	
	16.45 - 16.55	K. Dharmalingam *Aravind Medical Research Foundation, Madurai*	Remarks from the incoming President
	16.55 - 17.00	Sayan Basu *LV Prasad Eye Institute, Hyderabad*	Vote of thanks
End of Symposium	17.00 Onwards	**High Tea**	

Orations, Keynotes and Special Talks

Oration Awardee

BIRESWAR CHAKRABARTI ORATION

Dr. J. Mark Petrash

Professor and Vice Chair of Research

Department of Ophthalmology, Sue Anschutz-Rodgers Eye Center
University of Colorado School of Medicine, Aurora, CO, USA
Email: mark.petrash@ucdenver.edu
Website: https://medschool.cuanschutz.edu/ophthalmology/research/faculty/mark-petrash

Pathogenesis and novel therapies for cataracts and lens disorders

Cataracts, or loss of lens transparency, are a major cause of vision loss throughout the world. For the most part, cataract formation is an aging and protein aggregation disease. Therefore, major goals of our cataract research focus on developing a better understanding of lens protein solubility, and the mechanisms to stabilize lens transparency over a lifetime. Our work has focused on therapies directed at genetic and metabolic diseases that predispose the lens to cataract formation. Our studies identified functional changes to alpha crystallin, a major protein chaperone, associated with autosomal dominant cataract in humans. These findings stimulated studies to explore the potential of using lens crystallins, or their functional domains, as biotherapeutic proteins and peptide derivatives. Our work also demonstrated a role for aldose reductase (AR), a catalyst of glucose metabolism, in the pathogenesis of diabetic cataract. In studies with our collaborators, we described the structural basis for AR inhibitor binding, which provided a foundation to search for natural products that show promise as lead compounds for safe and effective inhibitors. We also demonstrated a role for AR in the pathogenesis of posterior capsule opacification (PCO), an aberrant wound response condition responsible for vision loss in a large number of cataract patients. Novel therapeutic approaches to suppress PCO formation are being guided by results extracted from a unique and robust registry of cataract patients treated in the Sue Anschutz-Rodgers Eye Center at the University of Colorado.

Oration Awardee

D. BALASUBRAMANIAN ORATION

Dr. K. Thangaraj

Director

DBT - Centre for DNA Fingerprinting and Diagnostics
Hyderabad, India
Email: thangs@cdfd.org.in
Website: http://ngc.cdfd.org.in/profile_page_tangaraj.php

Population genomics and public health

India is a region of remarkable cultural, linguistic, and genetic diversity with over 4,500 anthropologically well-defined groups. Our genetic studies provided evidence that the enigmatic tribal populations of Andaman Islands are the first modern humans who migrated out of Africa. Subsequently, we demonstrated that the contemporary Indian populations have descend from two divergent groups: (1) Ancestral South Indians (ASI), (2) Ancestral North Indians (ANI); and these founding groups have admixed during the past 2000 – 4000 years. Since then, almost all the populations of Indian subcontinent have been practicing endogamy. To assess the impact of endogamy, we have analysed the DNA of more than 2,800 individuals from over 275 distinct South Asian groups from India, Pakistan, Nepal, Sri Lanka, and Bangladesh using about 600,000 genome-wide markers. We found that 81 out of 263 unique South Asian groups have a strong founder event than the one that occurred in both Finns and Ashkenazi Jews in the West – these are founder groups known to have large numbers of recessive diseases. We identified multiple examples of recessive diseases in Indian subcontinent that are the result of such founder events. Our study provides opportunity for discovering population-specific disease causing genes in communities known to have strong founder events. Mapping of mutations that are responsible for population-specific disease would help in developing strategies for diagnosis, counseling, management and modifying the clinical course of these disorders and to reduce the disease burden among South Asians.

Oration Awardee

S. S. BADRINATH ORATION

Dr. Mahesh P. Shanmugam

Head, Vitreoretinal & Oncology Services

Founder, RetNet India

Sankara Eye Hospital, Bengaluru, India

Email: maheshshanmugam@gmail.com

Website: https://www.linkedin.com/in/mahesh-shanmugam-99a50125/?originalSubdomain=in

Where there is a will, there's a way

When we talk about research, we imagine glossy glass enclosed labs with white coated people seriously working with expensive equipment, the huge costs of setting up one such facility being rather obvious to even to a lay person.

But then research can be frugal, clinically relevant and impactful if one can train oneself to think out of the box, looking for solutions to the problems that we face in our daily practice. The big buck research definitely has its place but lack of access to such facilities should not deter the average clinical ophthalmologist from dabbling in research, trying to find clinically relevant solutions.

The talk will showcase examples from the author's experience of how even simpletons such as the author can come up with cost effective, innovative solutions even in a pure clinical set up and all that is required is the bent of mind to look for solutions.

Keynote Lecture I

Dr. Manish Jaiswal

Reader and Principal Investigator

Tata Institute of Fundamental Research
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Areas of interest: Study disease-linked mutations in Drosophila

Novel insight into retinal degeneration caused by mitochondrial dysfunction using Drosophila

Mitochondrial defects have been implicated in numerous retinal and neurodegenerative diseases, however, the pathogenic mechanisms are often unclear. We identified mutations in 32 nuclear genes that encode mitochondrial proteins through an unbiased genetic screen in Drosophila. This enabled us to uncover novel mitochondrial retrograde signalling mechanisms causing retinal degeneration. First, we found that in a subset of mutants degeneration is caused by a novel signalling mechanism induced by increased oxidative stress. Second, we identified that increased TOR pathway activation, e.g. in *NRD*, is a cause of retinal degeneration. Third, we found that excessive iron, e.g. in *FXN*, induces PDK/MEF activation and retinal degeneration. Fourth, we found that impaired ATP synthesis due to mitochondrial dysfunction dramatically impairs visual signal transduction in a subset of mutants. These mutants, therefore, resemble the phenotype associated with genes that affect the visual transduction pathway, and photoreceptor degeneration is typically not observed when the flies are kept in the dark. For example, we found that mutation in *lrpprc2*, a homolog of human *LRPPRC* which is required for mitochondrial RNA stability, results in activity/light-dependent degeneration of photoreceptor neurons due to reduced ATP synthesis in light. Reduced ATP synthesis in light leads to their inability to recycle the light-activated protein Rhodopsin1, which in turn causes activity/light-induced photoreceptor degeneration. These distinct mechanisms of degeneration show that different mitochondrial defects are likely to provoke distinct retrograde signalling inducing disease progression.

Keynote Lecture 2

Dr. Thirumurthy Velpandian

Professor & In-Charge

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Areas of interest: Ocular pharmacokinetics with major focus on xenobiotic transporters in blood ocular barriers

Re-engineering ophthalmic therapeutics: Off-label to on-table

Ocular drug discovery has always been a challenging task while considering the gap between investments and expected market size. Drugs used in Ophthalmic practices are mostly an extrapolation of drugs developed for other systemic conditions. Therefore, off-label use of drugs in ophthalmic practice is a common practice in clinics. Despite the increasing demand for such medications, the lack of expertise and infrastructure makes them unavailable for medical therapy. Our research area focuses on rationalizing ocular medications and making them affordable and available. Lack of access to vision-saving drugs in the acute phase of corneal injury and infections poses a challenge to the ophthalmologists at different health care centers in India to prevent corneal blindness. The commercial availability of these drugs is highly restricted as they are pharmaceutically unfavorable. Soluble natamycin (NataSol), intrastromal injection, and topical piperacillin-tazobactam are the few newer additions of recent innovations. With the help of 3D printing technology, a novel device "TransReCon" has been designed to solve one of the major commercial pharmaceutical problems. This patented device would allow instant onsite sterile preparation of eye drops without the help of any trained personnel and advanced facility. This innovation can now allow pharmaceutical companies to commercialize off-label/emergency medications that are unstable as eye drops. A New Ocular Emergency Management Kit (OEM-Kit) has been conceptualized and designed for the pharmaceutically unfavorable, and off-label drugs for their projected use in corneal vision-saving attempts. This innovation will enable ophthalmologists to get access to essential drugs for the emergency management of corneal injuries in India and other countries of the world.

Keynote Lecture 3

Dr. Sushmita Kaushik

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Areas of interest: Newer diagnostic tools, Childhood glaucoma, angle closure, and glaucoma surgery

Genetic aspects of congenital glaucoma: a clinician's tentative journey

Childhood Glaucoma is a potentially blinding condition, responsible for a more significant number of Blind Years, second only to cataracts. Though congenital glaucoma is a rare disease in terms of prevalence among ophthalmic diseases (0.01% to 0.04%), it accounts for 4.2%–5.0% of blindness in the pediatric population. With the varied phenotype of congenital glaucoma and the overlapping features among various forms of anterior segment dysgeneses, it sometimes becomes very difficult to reach an exact diagnosis by clinical evaluation and investigation alone. Glaucoma therapies are currently limited to reducing elevated intraocular pressure (IOP), a major risk factor for the disease. The discovery of disease-related genes could provide new insights into the underlying molecular mechanisms responsible for glaucoma that could form the basis of novel gene-based therapies, including strategies for neuroprotection. We will describe a clinician's journey of unravelling the molecular mystery of congenital glaucoma and how it has helped us in our clinical practice. We shall also highlight how our search has unearthed new information regarding congenital glaucoma phenotypes and their possible underlying genetic aetiology.

Special Talk - 1

Dr. Sharda Ramasubramanyan

Principal Scientist

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The impact of molecular modifications in regulating cellular homeostasis and disease development: an ocular perspective

The fate, stability and carryover of information from the central dogma is regulated by a dynamic shuttle of molecular modifications and their associated proteins in maintaining healthy cellular homeostasis and disease development. For instance, Post-translational modifications of proteins in regulating their expression alter the cellular activity underlying etio-pathological processes of diseases. Neddylation is one such post translational modification (PTM) that adds a small ubiquitin-like molecule, Neuralprecursor- cell-expressed developmentally down-regulated 8 (NEDD8) to target substrates to either modulate its function, alter the confirmation or target them for proteasomal degradation. We investigated the role of Neddylation in maintenance of Blood-Retinal-Barrier (BRB) integrity and its relevance to pathogenesis of intraocular diseases. We observed that Adult retinal pigment epithelial cells (ARPE19) were resistant to the toxic effects of neddylation inhibitor, MLN4924 with change in morphology of cells depicting an epithelial to mesenchymal transition. Although, gene and protein expression analysis revealed significant breakdown of the barrier integrity, cells treated with the inhibitor also displayed reduced proliferation and migration without any cell cycle arrest at the time point investigated. Thus, our preliminary data suggest a crucial and novel role of neddylation in maintaining blood retinal barrier integrity and further delineating its signalling molecules could highlight its role in ocular disease pathogenesis.

Special Talk - 2

Dr. Gowri Priya Chidambaranathan

Scientist, Immunology & Stem Cell Biology,
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Biology of adult ocular stem cells and their role in regenerative medicine

Adult stem cells (SCs) are present in almost every tissue in the body within a unique microenvironment and are responsible for the maintenance of tissue homeostasis throughout life. These SCs remain quiescent and divide when there is a need, to differentiate into tissue/lineage- specific cells. The focus of our research is to understand the biology of the adult ocular SCs – their identification, location, niche or microenvironment, molecular regulation and role in the maintenance of tissue homeostasis. This basic research is essential to characterize the changes in these SCs with ageing and in diseased condition, which is significant to develop better SC-based therapies for ocular conditions including limbal SC deficiency, primary open angle glaucoma, age-related cataract and retinal degenerative diseases. Recent studies from our laboratory:

- Established that there is a reduction in the trabecular meshwork SC content in donor eyes with glaucoma, along with a drastic reduction in the trabecular meshwork cells. Studies using a cell loss glaucomatous human organ cultured anterior segment model indicated that transplantation of cultured trabecular meshwork SCs aids in restoring the normal intraocular pressure. In addition, the SC-derived exosomes were demonstrated to enhance TM cell proliferation and increase cell viability under oxidative stress *in vitro*, indicating the possibility of establishing a SC/ SC product based therapy for glaucoma.
- Adult SCs with high proliferative potential were identified to be located in the peripheral region of human retinal pigment epithelium and were reduced with ageing indicating a probable role in the pathogenesis of age-related macular degeneration.

Special Talk - 3

Dr. A. Vanniarajan

Scientist, Molecular Genetics

Aravind Medical Research Foundation

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Epigenetic alterations in retinoblastoma

RB1 inactivation with other genetic alterations is the well-known phenomenon in retinoblastoma tumor initiation and progression. In addition, epigenetic alterations contribute significantly in this process through regulation of transcription by promoter methylation, chromatin modification and differential expression of miRNA. Promoter methylation of RB1 was analyzed by Methylation Specific- Multiplex Ligation dependent Probe Amplification and Bisulphite Sequencing. Mono-allelic or Bi-allelic methylation contributed to 3% of RB1 inactivation in our patient cohort. Total methylome analysis of RB tumors with Infinium Methylation EPIC Array detected the differential methylation of genes regulating the rhodopsin mediated signaling and phototransduction pathways. MicroRNA profiling showed the variable expression of the 246 miRNAs targeting the key cancer pathways including MAPK and TGFβ signalling. This multilayer analysis of the epigenetic landscape in retinoblastoma has indicated its potential role in tumorigenesis.

Special Talk - 4

Dr. Mamatha Reddy

Research Scientist

L.V. Prasad Eye Institute, Mithu Tulsi Chanrai Campus, Bhubaneswar

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The *MYCN* oncogene in retinoblastoma: Regulation of metabolic reprogramming and cell cycle

Retinoblastoma (RB) is a pediatric intraocular neoplasm caused by loss-of-function mutations in *RB1* tumor suppressor gene. Apart from *RB1* mutations, other molecular mechanisms play a role in retinoblastoma initiation and progression. Increased gene copy numbers and/or dysregulated expression of oncogenes *MYCN, MDM4* and *E2F3* contribute to RB pathogenesis. However, the mechanism(s) are not understood. From our study on retinoblastoma cell lines and enucleated RB patient specimens, we observed that *MYCN* is overexpressed in RB. shRNA-mediated knock-down of *MYCN* resulted in decreased cell proliferation, cell migration and cell cycle arrest. Inhibition of pathways downstream of MYCN with small molecule inhibitors resulted in decreased RB cell viability suggesting that MYCN pathway molecules could be potential drug targets against RB.

Special Talk - 5

Dr. Janakiraman Narayanan

Principal Scientist

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Mechanobiological investigations using corneal epithelial cells and kerataconus as model systems

The cornea is exposed to a plethora of mechanical stimulation and strains. Mechanobiology is a fast-developing field of study that investigates the impact of mechanical and physical stimuli on cell activity. Understanding these interactions will provide insight into the cornea's response to disease and trauma, as well as pave the way for innovative types of therapy. Keratoconus (KC), a frequent, visually devastating corneal dystrophy, is thought to be caused by an underlying instability of corneal biomechanics and affects practically all layers of the cornea. It thus serves as a good disease model to study the effects of mechanotransduction on cellular homeostasis. In a series of experiments on epithelial cells from patients diagnosed with KC, we attempted to unravel the mechanism that could explain the observed cellular changes. Our results indicate that when substrate stiffness changes, the cellular membrane of β- catenin delocalizes, triggering non-canonical WNT pathways. In KC, cellular shape and cytoskeleton organization are also changed, resulting in the loss of barrier function. We propose β-catenin as a potential mechanosensory molecule that affects disease progression in the early stages. Certain cellular functions, such as endocytosis of corneal epithelial cells, are also affected by mechanotransduction, as demonstrated by the in-vitro model. We also attempted to identify the pathways by analyzing the phosphoproteomics of keratoconus using mass spectrometry and discovered various significant pathways such as adhesions, spliceosomes, HIF-1 pathway, tight junction pathway, and mTOR among several dysregulated pathways affected. We feel that this approach provides novel insights into the pathogenesis of the disease and could lead to the identification of biochemical biomarkers of early disease and its progression.

Special Talk - 6

Dr. Vijaya K Gothwal

Head - Outcomes Research unit

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Utilization and abandonment of low vision devices: An important element of Low Vision Rehabilitation

Low vision devices aim to increase independence and enhance overall quality of life. The prescription of devices is one of the most common forms of intervention and is the cornerstone of management in low vision rehabilitation. With growing aging population and better survival rates among children with disabilities, it is expected that the number of individuals with vision impairment will increase over coming decades. It is urgent to gain a better understanding of the mechanisms explaining the use and non-use of low vision devices, in order to improve their success rate, the benefits gained, and their cost-effectiveness. The reasons why patients with low vision may or may not choose to utilize their low vision devices can vary widely and the variability among reports of device abandonment is large. The investigation of the factors predicting non-use of low vision devices is important. In our observational study of adult users (>18 years) of near low vision devices, the abandonment level of devices was 22%. Common reasons cited for abandonment were device-related (26%) such as complexity of use of the device followed by psychosocial factors such as forgetting the mechanism to operate the device. Device abandonment was not associated with age, time since prescription, visual acuity in better eye, presence of comorbidity, or education level. Overall, the acceptance and utilization of devices was good in our cohort and the abandonment rate was low. These insights can help clinicians to identify patients at higher risk of device abandonment and can provide evidence for interventions designed to improve adherence.

ABSTRACTS
(FREE PAPERS)

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Indian Eye Research Group

28th Annual Meeting of the Indian Eye Research Group

Free Papers

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BASIC SCIENCES

GENERATION OF ENRICHED POPULATION OF RETINAL PIGMENT EPITHELIAL CELLS FROM HUMAN INDUCED PLURIPOTENT STEM CELLS FOR RETINAL DISEASE MODELLING

Anwar A Palakkan[1], Gowthami Chandrasekar[1], TP Vignesh[2], Gowri P Chidambaranathan[1], Muthukkaruppan Veerappan[1]

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Purpose: An effective method is still not available for treating AMD, a progressive degenerative disease of retinal pigment epithelial cells (RPE). Discovery of new treatments are hampered mainly due to poor understanding of this disease mechanism, limited availability of human RPE and lack of clinically relevant models for research. This study investigates novel method for generating enriched population of functional RPE from human induced pluripotent stem cells (HiPSC).

Methods: HiPSCs (derived from healthy donor) were differentiated to RPE using two different protocols and were compared based on the area of pigmented patches formed. To further enrich RPE, cultures were subjected to differential trypsinization. Purity and the functionality of derived cells were evaluated by PCR and immunostaining.

Results: The second differentiation protocol, the one having prolonged Wnt exposure, generated more pigmented patches and was positive for eye field transcription factors (*RAX, SIX3* and *PAX6*) and RPE genes (*MITF*, *RPE65*, *CXRALBP, TYR* and *BEST1*). However, they also showed expression of *NANOG* (pluripotency) and *VSX2* (neural retinal) genes. Differential trypsinization and passaging helped to enrich RPE from such a population (after enriching, cells were negative for *VSX2* and *NANOG*) and immunostaining confirmed the lack of SSEA4, OCT4 or TRA-1+ve HiPSC. These enriched RPE were functional, expressing *MITF, TYR, BEST1*, and the visual cycle genes *RPE65* and *CRALBP*. Immunostaining further confirmed the tight junction (ZO1) formation and expression of MITF and RPE65.

Conclusions: An enriched population of functional RPE can be obtained from HiPSC, which can be useful for disease modelling and pharmacological screenings.

BSO02

THE FIFTH FIBRONECTIN TYPE III-LIKE (*Tn fnIII*) DOMAIN OF TENASCIN-C (*Tn fnIII 5*) FACILITATES CORNEAL WOUND HEALING

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Purpose: Corneal wound healing requires epithelial reorganization, and stromal extracellular matrix remodelling to achieve corneal transparency. The fibronectin type III repeat domain of *Tenascin C* (*TNFNIII 1-5*) interacts with cell surface receptors and growth factors to generate an array of cell signalling events. We sought to determine whether corneal wound healing can be promoted by recombinant fragments corresponding to *TNFNIII* (1-5).

Methods: *TNFNIII* (1-5) and its sub-domains were expressed in *Escherichia coli* and purified. Cell proliferation, adhesion and wound closure was examined using human corneal epithelial cells (HCEC), and primary human corneal fibroblasts (HCF). The effect on expression of fibrotic markers and extracellular matrix (ECM) proteins was analysed using *in-vitro* corneal fibrosis model. The effect of these domains was assessed in an e*x-vivo* corneal alkali burn model.

Results: TNFNIII (1-5), TNFNIII (4-5) and TNFNIII 5 promoted migration, adhesion and proliferation of HCECs. TNFNIII3 increased the migration and proliferation of HCFs. The anti-fibrotic nature of TNFNIII 5 was evidenced by (i) inhibition of corneal fibroblasts from developing contractile activity (collagen gel contraction assay) and (ii) decreased expression of fibrotic markers (*in-vitro* corneal fibrosis model). The *ex-vivo* experiments with goat corneal culture further confirmed that unlike TNFNIII 1-5 and TNFNIII3 domainsTNFNIII5 domain successfully healed the alkali-injured corneal wounds by day 7.

Conclusions: TNFNIII 5 has an anti-fibrotic effect and can be useful as a therapeutic molecule in the treatment of corneal wounds.

BSO03

EVALUATION OF ANTI-ANGIOGENIC AND ANTI-FIBROTIC POTENTIAL OF DIPYRIDAMOLE USING CAUTERY INDUCED RAT MODEL

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Purpose: This study evaluated the effect of dipyridamole on corneal scarring and neovascularization to rationalize its use for ocular surface disorders, including pterygium and corneal ulcers.

Methods: The effect of topical dipyridamole was assessed in the cautery-induced rat angiogenesis and scar model. The rats (n=6/each group) were anesthetized using ketamine and xylazine. One eye of each rat was cauterized by pressing an applicator stick (diameter = 1.5mm) coated with 75% silver nitrate and 25% potassium nitrate in the centre of the cornea for 5s, followed by washing with 15mL normal saline. Thereafter, the animals were randomly divided into negative control (normal saline 0.9%), positive control (Bevacizumab 0.125%), Dipyridamole 0.008% and 0.08% treatment groups. A 20µL drop of test or control solution was applied topically three times a day for five days from the day of cauterization. On days zero and six post-injury, the corneal neovascularization and scar area were assessed using Aphelion developer image analysis software and Image J software, respectively.

Results: Significant reduction in percentage angiogenic area was observed for 0.008% dipyridamole (126±50.2) compared to negative control (182.95±82). The decrease in the dipyridamole group was comparable with positive control Bevacizumab (143±15.38). Amongst all the study groups, maximum anti-fibrotic activity was observed for 0.008% dipyridamole (6.4±6.9) with a significant reduction in the percentage scar tissue in comparison to negative control (19.27±14.1).

Conclusions: This study highlights the potential anti-angiogenic and anti-fibrotic activity of topical dipyridamole. Further studies are in progress to evaluate its probable pathway in *ex-vivo* studies.

BSO04

ASSESSMENT OF VISUAL BEHAVIOR IN RETINAL DEGENERATION MODELS OF ZEBRAFISH: FEED CAPTURE MAZE PARADIGMS AND OPTOKINETIC RESPONSE DEVICE

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Purpose: To investigate the functional vision in *rd3-/-* and *abca4b-/-* knockout, transgenic zebrafish mutant models using custom designed feed capture response paradigms and an optokinetic response (OKR) device.

Methods: The *rd3-/-* and *abca4b-/-* mutant models of zebrafish were generated by CRISPR-CAS9 mediated gene editing of fertilized embryos. Visual behaviour of these mutants was assessed by their ability to capture prey/feed (live artemia and shrimp powder feed) using a rectangular and Y, n=10. An OKR drum was designed in house using the sine wave gratings (0.3, 0.15, 0.075 cycles per degree (cpd)) coupled with a motorized base, microscope, and a camera connected to a monitor to record the saccadic eye movements of zebrafish under evaluation.

Results: Fish movements were tracked using a threshold-based video tracking algorithm. Locational heat maps visually indicated differences in feed capture behaviour. Frame based quantification showed higher latency in both *rd3* and *abca4b* mutants when compared with wild type fishes. The polar plots showed restricted directional movements and turn angles of the mutants during feed capture. In wild type adults, the 0.3 cpd gratings evoked OKR stimulus. The saccadic movements in the opposite direction of the moving drum were captured at 22 rpm.

Conclusions: Significantly higher latency in feed capturing was observed in mutants and this could be attributed to the loss of cone sub-types in the retina. A simple and cost-effective design of OKR drum has demonstrated its effectiveness in assessing the visual acuity, contrast sensitivity and OKR stimulus in zebrafish.

BSO05

INHIBITORY ROLE OF S100A12 AGAINST *PSEUDOMONAS AERUGINOSA*

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Purpose: *Pseudomonas aeruginosa*, is a gram negative, ubiquitous human pathogen, which is responsible for the majority of the bacterial keratitis cases globally. It exhibits a great metabolic versatility and intrinsically advanced antibiotic resistance mechanisms. The World Health Organization (WHO) has listed *P. aeruginosa* as a critical antibiotic resistant species that requires the immediate need for the development of new antibiotics against it. S100A12, an antimicrobial peptide and a Ca+2 binding host-defense protein, has shown to have antimicrobial effects on various microbes by acting as damage associated molecular pattern and initiate a pro-inflammatory immune response. This study is aimed to determine the effect of S100A12 against *P. aeruginosa*.

Methods: *In vitro* expression of S100A12 in human corneal epithelial cells (HCEC) upon infection was seen by immunofluorescence assays The effect of S100A12 on *P. aeruginosa* was studied by SEM imaging, colony forming unit assay, qPCR and biochemical assays and in *in vivo* murine model of keratitis.

Results: We found an increased S100A12 expression in HCEC with *P. aeruginosa* infection. S100A12 inhibited the bacterial growth and downregulated several key genes involved in quorum sensing, biofilm synthesis and the virulence pathways. It also suppressed the anti-oxidant genes in *P. aeruginosa* resulting in the increase of reactive oxygen species. S100A12 lowered the corneal opacification and the bacterial load significantly in *in vivo* infections.

Conclusions: S100A12 showed antibacterial effect on *P. aeruginosa* both *in vitro* and *in vivo.* It exhibits promising results as an alternative therapeutic intervention against *P. aeruginosa*.

BSO06

IN SILICO DESIGN AND DEVELOPMENT OF MUTATED *PON2* BY SITE-DIRECTED MUTAGENESIS AND ASSESSMENT OF ITS FUNCTION IN *IN VITRO* CELL MODEL OF HRECS UPON CML TREATMENT

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Purpose: Paraoxonase 2(*PON2*) a multifaceted enzyme with antioxidant, anti-inflammatory and antiopoptotic property. Glycation has been considered as the potent factor decreasing its activity in diabetes and its complications therefore this study was aimed at constructing a mutated *PON2* which can defy glycation.

Methods: To deduce the glycation-prone residues in PON2, we used an *in silico* approach and developed a mutated mPON2 by site directed mutagenesis assay (SDM) assay and compared the efficiency of both wPON2 (wild type PON2) and mPON2 (mutant PON2-PON2-K70A) in human retinal endothelial cells (HRECs) upon N-carboxymethyl lysine (CML) treatment.

Results: We have deciphered CML glycates wPON2 and reduces its activity which was less significant in mPON2. The mPON2 designed using in silico studies revealed that the catalytic dyad residues (His114/His133) and Glu53 which play a prominent role in catalytic activity of wPON were intact in mPON2. Surprisingly, we found that mPON2 could interact much better with its substrates than wPON2. Additionally, mPON2 showed enhanced inhibition of CML-induced oxidative stress, ER stress, pro-inflammation, and mitochondrial fission than wPON2.Further overexpression of mPON2 inhibited the CML-induced phosphorylation of NFκB, similar to PTDC (inhibitor of NFκB) treatment.

Conclusions: This is the first report to infer the functional implications of mPON2 in mitigating ER stress and inflammation against CML induced vascular dysfunction and we propose mPON2 could be a potential therapeutic target in treating diabetic retinopathy.

BSO07

TRABECULAR MESHWORK STEM CELL DERIVED EXOSOMES ENHANCE TM CELL SURVIVAL AND PROLIFERATION

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Purpose: To evaluate the efficacy of trabecular meshwork stem cells (SC) derived exosomes on trabecular meshwork (TM) cell survival and proliferation as an attempt towards a cell free therapy for glaucoma.

Methods: Exosomes were isolated from conditioned medium of TM and TMSC cultures by ultracentrifugation and characterized by nanoparticle tracking analysis (NTA) using NS300 and western blotting. For functional characterization, *in vitro* wound healing assay followed by Ki-67 staining was performed to identify the effect of exosomes on TM cell proliferation. To identify the effect of exosome treatment in TM cell survival under oxidative stress TM cells were treated with 100 µM H_2O_2, incubated with 50µg of TM/TMSC exosomes followed by MTT assay.

Results: The isolated TM and TMSC exosomes expressed exosomal markers syntenin, neurophilin while emilin positivity was restricted to TM exosomes. NTA analysis revealed the size of TM (122.9±5.6nm) and TMSC (121.2±4.8nm) exosomes to be within exosomal size range 30-200nm. *In vitro* wound healing assay and Ki67 expression upon exosome treatment indicated that TMSC exosome enhances TM cell proliferation. In addition, the TMSC exosomes enhances TM cell survival by 23.76% under oxidative stress and TM exosomes by 3.9% compared to control.

Conclusions: The ability of TMSC exosomes to induce TM cell proliferation and their anti-oxidant potential indicated the possibility of developing a TMSC exosome based therapy for glaucoma.

BSO08

miRNA REGULATES POTENTIAL GENETIC PATHWAYS INVOLVED IN DIABETIC RETINOPATHY: IMPLICATION FOR AN EARLY DISEASE DIAGNOSIS

Sushma Vishwakarma,[1,3], Pallavi Goel[1], Rajeev R Papparu[2], Mudit Tyagi[2], Raja Narayan[2], Subhabrata Chakrabarti[1], Inderjeet Kaur[1]

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Purpose: Diabetic Retinopathy is a common microvascular retinal disease, classified into non-proliferative (NPDR) and proliferative diabetic retinopathy (PDR). Hypoxia and hyperglycemia along with dysregulation of genes/genetic pathways, are known to modulate the risk of DR. Neurodegeneration as an early event in DR development has not been explored much. The present study assessed the regulation of genes associated with early DR and its progression for their role in early risk prediction.

Methods: Cadaveric human retinal tissue with and without the history of diabetes (n=15), blood samples from NPDR (n=3), PDR (n=3), and age-matched controls (n=3), were collected with prior informed consent. Tissue sections were stained with hematoxylin and eosin, periodic acid-schiff. Global Gene expression profiling was performed for retina and miRNA from blood using microarrays. The data obtained was analyzed using Partek Software and further compared with published data (GSE130306). Significantly dysregulated genes and their regulatory MiRNA were further validated by qRT-PCR.

Results: H&E and PAS staining showed ganglion cell layer thinning and significant increase in the number of blood vessels and its thickness in diabetic retina. A total of 1217 differentially expressed (fold change +2.0, FDR<0.05) genes were found in diabetic retina. Of those 30% genes were significantly deregulated and were found to be involved in apoptosis, chemokine signaling, AGE-RAGE signaling cell inflammation, angiogenesis and neurodegeneration etc. which were also being regulated by the significant MiRNAs in the present study data.

Conclusions: This study confirms the potential roles of miRNAs in predicting the risk of DR development and progression.

BSO09

EFFICIENT GENERATION OF iPSC DERIVED CORNEAL ENDOTHELIAL CELLS VIA NEURAL CREST FATE INDUCTION

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Purpose: Corneal endotheliopathies (CEs) is a primary reason for corneal blindness globally. Current treatment modalities to address CEs are dependent on human donor tissue for surgical transplantation. Induced pluripotent stem cells (iPSCs) could be an ideal source of corneal endothelial cells (CEnCs) aiding in overcoming the shortage of donor tissue. Here, we have deduced a robust method to induce a neural crest (NC) fate from iPSCs as an intermediate step for efficient generation of CEnCs.

Methods: Peripheral blood mononuclear cells (PBMCs) were reprogrammed to iPSCs using sendai virus. The iPSCs were characterized and sequentially differentiated to CEnC phenotype. We developed a protocol for generating high quality neural crest cells, towards deriving CEnCs. The iPSC derived NCs and the CEnCs were validated by RT-PCR and immunocytochemistry.

Results: iPSCs derived from PBMCs were characterized based on their expression of pluripotent markers and their ability to differentiate into 3 germ layers. The iPSCs were sequentially differentiated to CENCs via intermediate neural crest (NC) generation. The NC cells were validated by their expression of *SOX10, NGFR, Slug* and *Snail*. iPSC derived mature CEnCs exhibited typical hexagonal/cobblestone morphology along with robust expression of CEnC markers- *TGFBiP, COL4A1, COL4A2, COL8A1, COL8A2, SLC4A11, AQP1, ATP1A1* and *FOXC1*. Functional attributes were evident by expression of *ZO-1*, *Sodium potassium ATPase* and *N-Cadherin* in the iPSC derived CEnCs.

Conclusions: Our protocol for inducing NC fate as an intermediate towards generation of CEnCs from iPSCs can aid towards establishing modelling and therapeutic platforms to address CE pathologies.

BSO10

IDENTIFICATION OF tRNA DERIVED PIWI-INTERACTING RNAs (td-piRNAs) IN RETINAL PIGMENT EPITHELIAL CELLS

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Purpose: To understand the non-exclusive binding of PIWI protein with td-piRNAs produced via non-canonical pathways.

Methods: Small RNA sequencing data has been retrieved from array express (Accession ID: E-MTAB-3792) consisting of 16 samples of human retina and 2 samples of RPE for piRNA profiling. Further, RNA immunoprecipitation was performed in ARPE19 cell line to identify the piRNAs interacting with HIWI2 (human homolog of PIWI protein). These piRNAs were aligned with tRNAs using bowtie v1.1.2 short read aligner and further checked for motifs, and functions.

Results: In retina and RPE, 266 piRNAs were differentially expressed, of which 261 were immunoprecipitated with HIWI2 in ARPE19 cells. Interestingly, we found a large number of piRNAs matched with mature tRNAs, mainly tRNA-valine, tRNA-serine, tRNA-alanine, and tRNA-glycine. This would be the first report showing td-piRNAs in the retina and RPE. Moreover, among the four motifs identified td-piRNAs were restricted to two motifs, “ACCACTANACCAC” and “AKCACGYTCSC”, implicated in cell cycle regulation, sensory perception, hypoxic stress, and tRNA metabolic process. Particularly, AKCACGYTCSC containing td-piRNAs regulated transcription factors *HIF1α* and *ARNTL* responsible for cellular response to hypoxia and circadian rhythm (CR) respectively, whereas td-piRNAs specific to motif ACCACTANACCAC regulated *NR1D1*, and *MYBL2* correlated to CR and cell-cycle arrest respectively.

Conclusions: We identified td-piRNAs in RPE and retina with specific motifs that regulate important pathological events like angiogenesis and epithelial to mesenchymal transition. This novel class of td-piRNA might play a significant role in retinal diseases and can be used as potential therapeutic targets.

BSO11

THERAPEUTIC TARGETING OF *AURORA KINASE A* AND INVESTIGATING ITS ASSOCIATION WITH *MYCN* ONCOGENE IN HUMAN RETINOBLASTOMA

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Purpose: To investigate the role of *Aurora kinase A* (*AURKA*), and its interaction with *MYCN*, in the progression of human retinoblastoma.

Methods: The expression of AURKA was determined in retinoblastoma (RB) patient specimens using immunohistochemistry. *AURKA* was targeted in RB cells using – (i) small molecule inhibitors, and (ii) lentiviral mediated shRNA approach. *AURKA* knockdown was confirmed with immunoblotting. Cell viability using Trypan blue dye exclusion method, cell cycle analysis with propidium iodide staining and apoptosis analysis by Annexin-V/FITC staining were carried out on the inhibitor treated and *AURKA* knockdown cells. An in-silico promoter analysis of *AURKA* was performed to detect the presence of *MYCN* binding sites. The binding of *MYCN* on *AURKA* promoter in RB cells was confirmed with Chromatin immunoprecipitation (ChIP)-qPCR. AURKA protein levels were detected in *MYCN* knockdown RB cells using immunoblotting.

Results: Immunohistochemistry study showed that AURKA is overexpressed in RB when compared to morphologically uninvolved retina. Inhibition and selective silencing of *AURKA* led to – (i) decreased cell viability, (ii) increased apoptosis, (iii) cell cycle arrest at G2/M phase and subsequent induction of polyploidy. The results were compared with untreated controls/scrambled cells. In the *in-silico* study, MYCN binding sites were detected upstream of the *AURKA* transcription start site and ChIP-qPCR confirmed that *MYCN* binds to the *AURKA* promoter. Furthermore, immunoblots showed that AURKA was downregulated in *MYCN* knockdown RB cells.

Conclusions: Targeting *AURKA* directly or through its interaction with *MYCN* could be a novel therapeutic strategy for RB.

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BSO12

EPIGENETIC BIOMARKERS IN DIABETIC RETINOPATHY COHORTS OF A SOUTH INDIAN POPULATION

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Purpose: Diabetic Retinopathy (DR) is a microvascular sight-threatening complication of type 2 diabetes. Epigenomics is currently one of the most significant areas of study. This study focuses on the methylation patterns of DR patients in two specifically identified cohorts: i) Protected Goldencohort (diabetic for ~25 years without DR), ii) Susceptible Golden cohort (diabetic for ~25 years with DR). The purpose is to identify differentially methylated regions (DMRs) and genes (DMGs) in these cohorts which will serve as epigenetic biomarkers.

Methods: Differential DNA methylation profiling was performed on 16 samples, identified from a South Indian cohort. The samples consist of 8 diabetic patients with DR and 8 diabetic patients without DR. The methylation assay was performed using Human MethylationEPIC BeadChip kit (Illumina). The methylated genes were segregated into hypermethylated upregulated and hypomethylated downregulated genes. The heatmaps and biological functions for the DMRs underwent functional enrichment analyses for GO and KEGG pathway using the clusterProfiler package. A P-value of $P<0.01$ was considered to be significantly enriched. Statistical analysis was done using R software package.

Results: Epigenetic modifications were seen between the diabetic patients with DR and the diabetic patients without DR. Several DMRs and DMGs were identified between the two groups. Some significant DMRs were found within the transcription factors on the promoter regions.

Conclusions: Application of epigenetic inhibitors and specific epigenetic editing is ongoing in many diseases such as Type II diabetes. Thus, the identified DMRs may have the potential to be used as biomarkers for DR patients in the future.

BSO13

ENHANCING THE STABILITY OF AMPHOTERICIN-B USING POLYMERIC PATCH FOR CORNEAL DELIVERY

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Purpose: Amphotericin B, a hydrophobic drug is used to treat fungal keratitis-has poor water solubility and bioavailability. Amphotericin B liposomes is the current standard of care to treat fungal keratitis. However, the reconstituted liposomal Amphotericin B has poor stability upto 7 days and also requires frequent topical administration. We developed a stable, sustained release Amphotericin B loaded ocular patch to treat fungal keratitis.

Methods: Poloxamer 407 and Tocopheryl Polyethylene Glycol Succinate were used to prepare Amphotericin B nanocrystals using anti-solvent precipitation technique. The nanocrystals were loaded into ocular patch prepared with hydroxypropyl methylcellulose (mucoadhesive polymer), chitosan (sustained release polymer), and along with crosslinking agents. The prepared patches were characterized for its physical and mechanical properties.

Results: The developed nanocrystals were found to be amorphous in nature with higher drug loading capacity. *In vitro* release studies of ocular patch shows that above 90 % of the drug was released over a period of 120 h which indicates that the developed patch can be used as a long-acting drug delivery system. Moreover, amphotericin nanocrystal loaded ocular patch was found to be stable at room temperature (25°C) for two months, whereas the marketed liposomal product was stable only till 4 days, determined majorly by its drug content.

Conclusions: The present work concludes that the developed Amphotericin B nanocrystal loaded ocular patch can be used as long-acting drug delivery system. It shows stability at room temperature for at least two months.

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BSO14

DOWNREGULATION OF *KLF4* AND PROLONGED INFLAMMATIONS ARE ASSOCIATED WITH PERSISTENT EPITHELIAL DEFECT (PED)

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Purpose: Failure of rapid re-epithelialization within 10-14 days after a corneal injury, even with standard supportive treatment is referred to as persistent corneal epithelial (CE) defect (PED). Though an array of genes regulates reepithelization, mechanisms are poorly understood. We sought to understand the network of genes driving the re-epithelialisation in PED.

Methods: After obtaining informed consent, patients underwent ophthalmic examination. Epithelial scrapes of 6 PED patients and 6 individuals (control) undergoing photorefractive keratectomy (PRK) were collected. RNA isolation and quantification were done followed by quantitative polymerase chain reaction (qPCR) to detect the expression of a few important genes in CE homeostasis, inflammation and cell-cell communication, viz., *Kruppel-like factor 4 (KLF4), GPX4, IL6, TNFα, STING, IL8, desmoglein,* and *E-cadherin* among others. Their expressions were normalized with their respective housekeeping genes and fold changes were recorded.

Results: *KLF4*, a transcription factor important for CE homeostasis, was downregulated in PED patients (0.08-fold) compared to the healthy PRK group. Cell-cell communication genes were also downregulated (*desmoglein*, 0.42-fold; *E-cadherin* 0.17-fold) in the disease group. Whereas genes involved in proinflammation (*IL6*, 282-fold; *TNFα*, 43- fold; *IL8*, 4.2-fold) were highly upregulated in PED patients.

Conclusions: This study suggests that downregulation of *KLF4* coupled with proinflammatory milieu is driving the PED disease pathology. Poor cell-cell communication is also observed as genes involved are downregulated in PED patients. Interferons, pro-inflammatory genes, and their pathways are involved in PED, which can be a potential target for inducing epithelialization of the cornea.

BIOENGINEERED LIQUID CORNEA: PREVENTS SCARRING IN MECHANICAL INJURY WOUND MODEL OF RABBITS

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Purpose: Loss of corneal transparency and poor refractive function are among the leading causes of blindness. Globally, around 200-300 million people are visually impaired, of which 5 million are affected with bilateral corneal blindness and 23 million by unilateral blindness. Corneal transplant is gold standard for management of corneal conditions. However, the balance between corneal donors and recipients is skewed towards recipient which leads to extensive wait time. To address this, artificial cornea is being employed, where an injured cornea will be removed and replaced with liquid cornea for treatment.

Methods: New Zealand Rabbits were used in the study. Corneal mechanical wound injury of 5mm diameter and 200um depth created using a graded trephine. Wounded animals were divided, first group received no treated (controls), second group was treated with tissue adhesive and third group with bioengineered liquid cornea. Animals were imaged using the ophthalmological parameters: i) OCT, ii) Slit lamp iii) Pentacam and iv) Galilei, over a period of 3 months. After 3 months, rabbits were sacrificed and eyes were enucleated and further processed for histopathology.

Results: Slit lamp revealed re-epithelization of the wound treated with bioengineered cornea, within 15 days. Central Corneal thickness of control rabbits ranged around 350-360um while bioengineered liquid cornea treated rabbits showed central corneal thickness (380-390um) almost similar to the control. In addition, the transparency of the regenerated cornea mimicked the native cornea as measured by opacity score.

Conclusions: The bioengineered liquid cornea is a regenerative treatment and this biopolymer acts as a sacrificial matrix for accelerating the growth of host tissue to cover the wound site.

BSO16

DEVELOPMENT AND VALIDATION OF A NOVEL CRISPR/CAS12A BASED NUCLEIC ACID DETECTION PLATFORM FOR THE DIAGNOSIS OF OCULAR FUNGAL INFECTIONS

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Purpose: To develop a rapid, sensitive and specific CRISPR/Cas12a-based molecular diagnostic assay (Rapid Identification of Mycoses using CRISPR, RID-MyC Assay) to detect fungal DNA and to compare it with existing conventional mycologic methods for the clinical diagnosis of ocular fungal infections.

Methods: Isothermal amplification was performed using recombinase polymerase amplification (RPA) method targeting the 18S rDNA region followed by the CRISPR/Cas12a reaction. Development and validation of the RID-MyC assay were performed using identified clinical isolates. The results of the RID-MyC assay were compared to those obtained by microscopy, culture and polymerase chain reaction (PCR) in patients with suspected microbial keratitis and endophthalmitis. Corneal swabs and scrapes collected from 55 consecutive cases of clinically suspected microbial keratitis were analysed prospectively. Intraocular specimens were collected from 10 control patients and 33 patients with suspected endophthalmitis.

Results: The sensitivity, specificity, positive predictive value and negative predictive value of the RID-MyC assay was 95.9% (CI, 86% - 99.5%), 83.3% (CI, 35.9% - 99.6%), 97.9% (88.7% - 99.7%) and 71.4 (CI, 38.1% - 91.1%) respectively. Among the 38 intraocular specimens with suspected microbial endophthalmitis, fungal DNA was detected in three by both PCR and RID-MyC and in one sample only by RID-MyC and not by PCR.

Conclusions: CRISPR-mediated detection of fungal DNA is a highly sensitive and specific tool for the diagnosis of ocular fungal infections. The RID-MyC assay can be developed into a field-applicable, visual, faster and low-cost alternative to PCR for the diagnosis of ocular fungal infections.

CLINICAL SCIENCES

CSO01

FREQUENCY, RISK FACTORS AND GENETIC DETERMINANTS ASSOCIATED WITH INTRAVITREAL STEROID- INDUCED OCULAR HYPERTENSION

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Purpose: Triamcinolone-acetonide (TA) and Dexamethasone (Dex) are the majorly used intravitreal Glucocorticosteroids that induce secondary ocular hypertension (OHT) and irreversible glaucoma in 30-40% of subjects. Precise causative biomarkers for secondary OHT are unavailable. Hence, this study aims to analyse the frequency, risk factors, and genetic determinants associated with TA-OHT and Dex-OHT among Indian subjects.

Methods: A retrospective study on 765-TA and 784-Dex administrations was performed to understand the frequency, risk (refractive errors, diabetes, hypertension, hypercholesterolemia, connective-tissue disorder) associated with OHT. Subsequently, whole genome sequencing (WGS) on 53-TA and 50-Dex administrations was performed to unravel the genetic determinants associated with OHT. Significant variants' pathogenicity, gene ontology, and pathway associations were studied.

Results: OHT was observed in 28%-TA and 17%-Dex-treated subjects. Myopia is found to be a risk, whereas diabetes and hypercholesterolemia were protective for OHT. WGS identified 45-intronic and 18- exonic, and 3-intronic and 7-exonic variants associated with TA-OHT, and Dex-OHT respectively. Variants in *CRPPA, PLOD1, CHD9, TIMELESS*, and *ARHGAP1* and *GLB1*, and *ADAMTS8* genes directly implicated TA-OHT, and Dex-OHT, respectively. Gene ontology analysis decoded that variants causing TA-OHT were related to eye, heart, brain, and bone deformities; while congenital disorders were related to Dex-OHT. Pathway analysis revealed that cardiomyopathy, focal adhesion, extracellular matrix, and actin cytoskeleton re-organization were the signaling coordinates for TA-OHT. Whereas, carbohydrates and amino acid metabolism strongly influenced Dex-OHT.

Conclusions: Molecular etiology and pathway associations of variants causing TA-OHT and Dex-OHT were unraveled among Indian subjects. Further, broad cross-section validation can yield putative clinical biomarkers for secondary OHT.

CSO02

COMPASRISON OF RETINAL PIGMENTED EPTHELIAL CELL VIABILITY WITH 41G AND 29G CANNULA – AN *IN VITRO* EXPERIMENT

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Purpose: To evaluate and understand the optimal bore dimensions for injection needles or polytip cannulas, for their suitability in retinal pigmented epithelial (RPE) cell injections.

Methods: This is a laboratory experimental study wherein the RPE cell suspensions were injected via two different bores of cannulas of inner bore sizes of 29G and 41G. The experiments were performed by two independent vitreoretinal surgeons. Percentage cell viability or cell death was evaluated by Trypan blue dye exclusion test and cell counting using a haemocytometer.

Results: The inner diameter of a 29G needle is about 287µm. Similarly, the inner diameter of a 23G/38G polyTip cannula is 41G which corresponds to about 71µm. An average outer diameter of RPE cells in suspension is 20-30µm. We evaluated two different concentrations of cell suspensions namely, 10 million/mL and 2 million/mL. In case of 10 million/mL cell suspension, the pre injection cell viability of 98.88% is reduced to 95.96% post injection with a 41G cannula and to 95.38% post injection with a 29G needle. Similarly, for 2 million/mL cell suspension, the pre injection cell viability of 98.88% is reduced to 83.87% post injection with a 41G cannula and to 94.92% post injection with a 29G needle. Over 93-98% of the injected cells continued to remain viable at 6hrs post-injection.

Conclusions: This *in vitro* study results have confirmed that the viability of RPE cell suspension injection via 41G cannula is comparable to that of 29G cannula and maintained an average viability index of >90% post injection.

CSO03

RAPID MYOPIA PROGRESSION IN YOUNG ADULTS AND THE ASSCOCIATED FACTORS

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Purpose: Considering that myopia can continue to progress during the adulthood, we aimed to investigate what proportion of young adults undergo rapid myopia progression (≥ 1D) and the factors associated with it.

Methods: This retrospective study included 2679 myopes with spherical equivalent (SE) ranging from -0.5 to -14.7D. The spherical and cylindrical components were separately categorized into mild, moderate and high magnitude groups, and the axis was further classified into with-the-rule astigmatism, against-the-rule, and oblique-astigmatism. Myopia progression was calculated as the difference between the previous spectacle prescription (obtained from 1-year old spectacles) and current refraction. The logistic regression model was used to obtain the odds ratio.

Results: The mean ± SD age of myopic individuals was 24.5 ± 2.7 years (range: 18-30) and annual myopia progression was -0.2 ± 0.4D. Out of 2679 individuals, 2093 (78.1%) had stable refraction (<0.5D), 462 (17.2%) and 124 (4.6%) individuals had progression ≥ 0.5 to < 1.0D and ≥ 1.0D, respectively. High-sphere (OR 7.0 [95% CI 3.9-12.5], p<0.001), high-cylinder (OR 14.6 [95% CI 3.5-60.6], p<0.001), with-the-rule (OR 1.5 [95% CI 1.1-2.0], p=0.004) and oblique-astigmatism (OR 1.6 [95% CI 1.2-2.1], p<0.001) was found to be associated with rapid myopia progression. Current age of individual, age of apparent onset of myopia, gender, and against-the-rule astigmatism were not associated with myopia progression.

Conclusions: Keeping in view of high-sphere, high-astigmatism, with-the-rule, and oblique-astigmatism, regular monitoring of biometry even in young adults could help in identification of rapid myopia progressors and thereby initiating myopia control interventions.

CSO04

ROLE OF ARTIFICIAL INTELLIGENCE IN UNDERSTANDING OCULAR SURFACE PAIN

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Purpose: To analyse confocal nerve parameters, systemic and orthoptic parameters in patients with ocular surface pain using a random forest artificial intelligence (AI) model.

Methods: 120 patients (240 eyes) with ocular surface pain or discomfort,31 control subjects (60 eyes) underwent in-vivo confocal microscopy (IVCM) and nerve parameters were evaluated. Orthoptic anomalies and autoimmune disorders were included in the AI. Subjects were grouped as- Group1- symptoms more than signs, Group2- similar grades of symptoms and signs, Group3- without symptoms but signs, Group4-without symptoms and signs.

Results: AI achieved an area under the curve (AUC) of 0.736, accuracy of 86%, F1-score of 85.9%, precision of 85.6% and recall of 86.3%. The accuracy was the highest for Group 2 and least for Group 3 eyes. The top 5 parameters used for classification by the AI were micro-neuromas, dendritic cells, orthoptic issues and nerve fractal dimension parameter.

Conclusions: IVCM, systemic and presence or absence of orthoptic issues coupled with AI can improve the diagnosis and customized therapy of ocular surface pain.

CSO05

MICROFLUIDICS OF T-REGULATORY CELLS AND TUBERCULAR UVEITIS

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Purpose: To determine the pattern of T-regulatory (Treg) cells from peripheral blood of TB Uveitis (TBU) patients.

Methods: A prospective study of patients visiting uvea clinic with diagnosis of TBU as Group A and Non-TBU as Group B. 51 (29=Male, 22=Female) patients including age matched control group were recruited. Blood samples drawn from the participants and PBMC were isolated by density gradient centrifugation method and analysed with flow cytometer. CD4+, CD25+ and FOXP3+ were used as hallmark of Treg cells. IL17A+, was used to identify active inflammation. CD45RO+ defines memory T cell responders.

Results: We looked at inflammatory T cell populations as well as Tregs. The mean age of the patient was 35.13 ± 11.2 years. Uveitic patients (A&B) have increased mean value of Tregs (8:11:4 ::Tregs of Grp A: Grp B: Control). IL17A/Treg ratio is higher in uveitis patients (Grp A, 17:8, Grp B, 20:11, Control, 10:3). Consistent increase in the mean value of T cell memory marker CD45RO+ is observed in uveitic patients compared to that of control (26: 30: 9). There was an increase in mean value of memory Tregs in group A (TBU) patients compared to that of control (7.6: 2.6).

Conclusions: Study showed that Treg markers CD4+, CD25+, FOXP3+ and IL17/ Treg cells ratio is increased in uveitis patients. Increase in memory marker was also observed in uveitis patients and may be used for presumptive diagnosis of Uveitis and TBU along with the existing clinical parameters.

OPTICAL PHASE SHIFTS MAY CONTRIBUTE TO THE LOSS OF VISUAL ACUITY AND STEREOACUITY IN KERATOCONUS

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Purpose: Image quality degradation is a combination of contrast loss and phase shift. The impact of contrast loss on visual functions of keratoconic eyes is well-understood and little is known about effect of phase shifts. This study investigated the impact of phase shifts of keratoconic eyes on visual acuity and stereoacuity by inducing them on visually-normal adults.

Methods: Monocular high-contrast visual acuity and stereoacuity of 10 visually-normal adults (22– 31yrs of age) were tested with induced HOA's of 4 keratoconic patients with mild (n=2) and moderate (n=2) disease severity by convolving their habitual and phase rectified point spread functions with optotypes for acuity testing or random-dot stereograms for stereoacuity testing. The convolution was applied either to both monocular images or to the only one image of stereogram to simulate bilateral or unilateral keratoconus. Visual acuity (9 conditions) and stereoacuity (17 conditions) were obtained through 2mm artificial pupils.

Results: Visual acuity (Four keratoconic conditions (mean±1SD):0.24±0.05logMAR, 0.44±0.05logMAR, 0.53±0.03logMAR and 0.59±0.05logMAR) and stereoacuity (Four unilateral keratoconic conditions:63.76±19.42arc-sec, 93.27±39.07arc-sec, 152.97±46.96arc-sec and 197.81±132.7arc-sec), deteriorated significantly with keratoconic blur, relative to no blur [visual acuity: -0.01±0.08logMAR ($p<0.001$); stereoacuity: 48.86±20.13arc-sec ($p<0.007$)]. This loss was partially restored following phase rectification for visual acuity [approx. 30% in all four conditions] and stereoacuity [Four keratoconic conditions:28.9±10.7%, 37.8±18%, 45±12.3% and 49.3±22.5%]. The quantum of improvement for both functions was greater for moderate than mild keratoconus ($p=0.003$).

Conclusion: Phase shifts in retinal image contribute to the loss of visual acuity and stereoacuity in keratoconus, which may be partially recovered through phase rectification.

CSO07

PREVALENCE, PATTERN AND COMPLIANCE WITH SPECTACLES USE AMONG THE ELDERLY IN HOMES FOR THE AGED CENTRES IN SOUTH INDIA – THE HYDERABAD OCULAR MORBIDITY IN ELDERLY STUDY

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Purpose: To report on the pattern of spectacles use and compliance among the elderly (aged ≥60 years) in homes for the aged centres in Hyderabad region in the Indian state of Telangana.

Methods: The elderly participants were recruited from 41 homes for the aged and comprehensive eye health assessments were conducted. A questionnaire was used to collect information on current and past use of spectacles, type of spectacles, and the spectacles provider. In total, 331 participants were provided with spectacles after the baseline eye examination. Compliance with spectacles use was assessed after eight months of provision of the spectacles.

Results: A total of 1,182 participants were examined out of 1,513 participants enumerated. The mean age of the participants examined was 75 years (standard deviation:8.8 years; range: 60-108 years); 764 (64.6%) of them were women and 240 (20.3%) had no formal education. The prevalence of spectacles use was 69.9% (95% CI: 67.1- 72.4). Bifocals were the most commonly used type of spectacles (86.7%). Private eye clinics were the largest service provider (85.5%) followed by local optical outlets (6.9%). Among the 259/311 participants who were available at follow-up, 211 (81.5%) participants were using spectacles that were provided at the baseline.

Conclusions: Use of spectacles and compliance is high among the elderly living in residential care homes in the Hyderabad region. Spectacles use can be further improved by periodic eye assessments on the lines similar to school eye programmes.

ABSTRACTS (POSTERS)

BASIC SCIENCES

ARVO International Chapter Affiliate

ARVO-INDIA

Indian Eye Research Group

28th Annual Meeting of the Indian Eye Research Group

E-Posters: Basic Sciences

Poster ID	Name
BSP01	Anil Tiwari
BSP02	Anupama Hela
BSP03	Ashwathy Nair
BSP04	Goutham Pyatla
BSP05	Gowtham Lakshminarayanan
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BSP07	Lakshmi Priyankka Alagappan
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TEAR PROTEOMIC PROFILING OF DIFFERENT GRADES OF VERNAL KERATOCONJUNCTIVITIS (VKS) PATIENTS AND ITS CLINICAL CORRELATION

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Purpose: Vernal keratoconjunctivitis (VKC) is a severe allergic inflammatory disease of the ocular surface, resulting in permanent corneal damage if not adequately treated. An increased production and activation of pro-inflammatory cytokines, proteolytic enzymes, and inflammatory cells by the stressed ocular surface as well as the glandular epithelial cells have been described. Here we show the clinical changes taking place in the different grades of VKC patients from North India.

Methods: Patients were recruited after obtaining informed consent. Clinical Grading of VKC (from 0 to 4 scale)- Quiscent-0, Mild seasonal (MiS)-01, Moderate seasonal (MoS)-02A, Moderate persistent (MoP)-02B, Sevre (S)-03, Very Severe (VS)-
04. Patients were examined using- Ophthalmic machines, and unstimulated tears for proteomic analysis using LC-MS on Q Exactive Plus machine.

Results: The clinical findings of different grades of the disease represent the presence of papillae of variable sizes in accordance with the severity of the disease. The mean central corneal thickness are: MiS- (527.75), MoS- (559.75), MoP-(528), S-(503.5) & VS (509.00) um. Dry was observed in V and VS. Proteomics analysis reveled significant alteration different grades of VKC; MiS- 34, Mos-89, MoP-138, VS-88 and S-35. MoP was the group showing maximum upregulated and downregulated proteins.

Conclusions: The clinical evaluation indicates significant changes in the hyperreflectivity and tear migration in MoP group compared to control, whereas dry eye was observed in sever and very severe group. Proteomics profiling showed a dynamic shift in the proteins in different grades of VKC mostly related to inflammatory and tissue damage.

EXPLORING THE TEAR MICROBIOME ASSOCIATED WITH MEIBOMIAN GLAND DYSFUNCTION

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Purpose: Meibomian gland dysfunction affects the tear film stability leading to evaporative dry eye disease. Previous studies infer that ocular microbiome may have a role in the pathophysiology of the disease. Thus, the purpose of the study is to understand the microbiome changes in Meibomian Gland Dysfunction (MGD) compared to healthy controls.

Methods: 80µl tear samples were collected from healthy (n=18) and MGD (n=19) individuals and DNA was isolated using QIAGEN QIAamp DNA mini kit. Extracted DNA was quantified and V3-V4 hypervariable region of 16S rRNA gene was amplified. Sequencing of the amplified samples were done using Illumina HiSeq2500 platform. Generated data were processed in QIIME to assign the taxa. Statistical analysis was done in R. Wilcoxon significance test, principle component analysis (PCA) and linear discriminant analysis (LDA) were done to visualise the changes.

Results: Significant changes were observed both at phylum and genera level in MGD compared to healthy. Phylum *Firmicutes* and *Bacteroidetes* were significantly abundant in MGD group. Genera *Lactobacillus* and *Bacillus* accounted for 73% of the total abundance in both the cohorts. PCA and heatmap analysis indicated a clear distinct cluster for both MGD and healthy cohorts. LDA showed significant increase in the genera *Bacillus, Rhodobacter, Pseudomonas, Prevotella* in MGD.

Conclusions: The study indicates significant changes in the tear microbiome in MGD compared to healthy cohort. Distinct biofilm forming and pro-inflammatory bacteria was observed in high abundance in MGD group compared to healthy may indicate the characteristic of the disease state.

BSP03

A STUDY ON THE PROTECTIVE EFFECT OF MITOCHONDRIA IN LEBER'S HEREDITARY OPTIC NEUROPATHY (LHON)

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Purpose: Leber's Hereditary Optic Neuropathy (LHON) is a mitochondrial inherited disorder caused by three primary mitochondrial mutations (MT-ND1, MT-ND4 and MT-ND6) which leads to central vision loss in young adults. LHON is characterized by retinal ganglion cell (RGC) degeneration through mitochondrial damage especially associated with complex1 function and energy depletion. Effective treatment option for LHON is still in infancy. Evidence suggests that the direct transfer of healthy mitochondria to damaged cells through intercellular connections rescues mitochondrial damaged cells. In this study, we are trying to explore the protective effect of mitochondria in LHON.

Methods: Cell culture conditions for LHON ND4 mutant fibroblast cell lines and control cells (ARPE 19 and PBMCs) were optimized. Control cells and LHON mutant cells were cocultured (1:1 ratio) for the efficient mitochondrial transfer from the control cell to LHON mutant cells. Mitochondria of healthy cells were stained with Mito tracker green and F-actin was stained with rhodamine phalloidin for visualizing TNT (Tunneling Nanotubes) formation. Cells were visualized under fluorescence microscopy for mitochondrial transfer analysis.

Results: We observed the formation of TNTs between the control and LHON mutant cells which were stained with rhodamine-phalloidin. The mitochondria were observed in green which was stained with GFP. We observed the movement of mitochondria inside the TNTs clearly under the microscope from control to mutant cells.

Conclusions: Mitochondrial transfer would effectively protect the LHON mutant cells from mitochondrial damage and cell death. The outcome of this study helps to implement further research in this area for the protective effect of mitochondria and cell-based treatment approach in several diseases associated with mitochondrial dysfunction.

THE POTENTIAL INVOLVEMENT OF DEVELOPMENTAL PATHWAYS IN PRIMARY CONGENITAL GLAUCOMA

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Purpose: Primary congenital glaucoma (PCG) is a genetically heterogeneous autosomal recessive disease that occurs due to developmental defects in the trabecular meshwork (TM) and anterior chamber angle. As the mutation spectrum in the known candidate genes does not explain the entire genetic basis of PCG, we analyzed anterior segment dysgenesis (ASD) and other glaucoma related genes to understand their underlying involvement and potential molecular mechanisms behind in PCG.

Methods: A large cohort of PCG cases (n=586) and ethnically matched controls (n=1758) were screened by deep sequencing with a customized gene panel comprising of 55 ASD and 29 glaucoma-associated genes using the Ion Ampliseq chemistry. Potential variants were validated by Sanger sequencing and characterized for pathogenicity based on SIFT, PolyPhen2 and Mutation Taster scores. Network analysis was done to understand the relationship between the genes involved in the development pathways using Ingenuity pathway analysis (IPA) software.

Results: We identified 157 novel and rare pathogenic variants in 159 (27.1%) PCG cases across 38 ASD and glaucoma related genes that were conserved across multiple species and either absent or rarely observed in our controls and global databases. Embryonic stem cell pluripotency, axonal guidance signaling and regulation of the epithelial-mesenchymal transition were the top developmental pathways with pathogenic variants identified in *SOX2, TGFB2, GLIS1* and *MMP9* pathway genes. Co- occurrences of pathogenic variants indicating potential multi-allelic interactions were seen in 120 (20.4%) PCG cases.

Conclusion: The identified developmental pathways involved in the formation of ocular structures and pathogenic variants could result in developmental defects and PCG.

PROFILING LIPIDOMIC VARIATION IN GLAUCOMA PATIENTS USING HIGH RESOLUTION MASS SPECTROMETER

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Purpose: To determine the alteration in the aqueous humor and plasma lipidomic profiles of primary open- angle (POAG) and angle-closure glaucomatous (PACG) patients compared to the cataract control. Understanding the lipidomic alterations may be expected to delineate the underlying pathological lipid signaling mechanisms involved in glaucoma.

Methods: Human aqueous humor (n=33) and plasma samples (n=60) were collected from glaucomatous patient groups and controls during trabeculectomy and cataract surgeries respectively. Lipids were extracted using chloroform and methanol, which were subjected to high-resolution mass spectrometer (HRMS) analysis. Serum samples (n=60) were collected following overnight fast and routine serum lipid profiles were carried out using the biochemical-based analyzer. Lipid identification and relative quantification were carried out using Lipid search ver4.1. Statistical analysis was carried out using Metaboanalyst ver5.

Results: Combined univariate and multivariate analysis has shown the significantly elevated lipid species localized to the aqueous humor. This study showed that most phospholipid and sphingomyelin species were found elevated in the aqueous humor of both POAG and PACG. Di- and Triglycerides were found to be down-regulated in both glaucomatous conditions. Clinical serum lipid profiles were found to be insignificant among the study groups versus the control.

Conclusions: This study demonstrated an altered lipidome in aqueous humor and plasma during glaucomatous conditions. The functional role of individual lipids species and their involvement in offering trabecular meshwork outflow resistance and mechano-signaling must be understood further.

OLIGOGENIC INHERITANCE IMPLICATED IN THE ETIOLOGY OF BARDET BIEDL SYNDROME PATIENTS FROM INDIA BY TARGETED PANEL-BASED RE-SEQUENCING

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Purpose: Bardet-Biedl syndrome (BBS) is a syndromic form of retinitis pigmentosa (RP), inherited as an autosomal recessive disorder with 21 candidate genes/loci mapped till date. This study reports the mutation spectrum of a large cohort of BBS patients from India.

Methods: Patients with confirmed diagnosis of BBS (N=108) were recruited after a detailed evaluation for ocular (clinical) and other systemic features (questionnaire-based method. Panel-based resequencing (ciliopathy and other IRD genes) was performed in the genomic DNA followed by annotation and prioritization of variants using a custom in-house pipeline built on Python; further validated and co segregated using Sanger sequencing method.

Results: Disease causing mutations were observed in 85% (N=92) of the study cohort, of which 70% were monogenic biallelic distributed in the decreasing order of frequency as *BBS10, BBS12, BBS1, ARL6, BBS2, BBS5, BBS6, BBS7, BBS4, BBS9, TTC8* and *LZTFL1* genes. The remaining were digenic biallelic (15%) and trigenic triallelic variants (<1%) that segregated with the disease.

Conclusions: This is the first study in a large cohort of BBS patients from India. We report primary mutations (i) with a varied spectrum in our population (BBS10, BBS12 and BBS1) when compared to worldwide reports (BBS1 and BBS11) (ii) in other ciliopathy and IRD genes in 16% of the study cohort (iii) in other candidate genes in addition to disease-associated polymorphism in BBS2 gene (p.S70N). NGS based method has revealed a comparatively increased prevalence of causal oligogenic variants in the etiology of BBS in our population.

BSP07

GENOTYPE AND PHENOTYPE CORRELATION IN POLYPOIDAL CHOROIDAL VASCULOPATHY IN INDIAN POPULATION

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Purpose: Idiopathy polypoidal choroidal vasculopathy (PCV), a prevalent disease in Asians is characterized by the formation of polyps in the choroidal vasculature, leading to irreversible vision loss. Single nucleotide polymorphisms (SNPs) are associated with PCV. We attempted to screen the association of 8 SNPs and correlate them with the clinical features and phenotypes. These SNPs have the potential to be genetic biomarkers for patient screening.

Methods: We screened 104 PCV cases and 196 controls in the study. Genomic DNA was extracted from peripheral blood. Sanger sequencing method was used to genotype 6 SNPs (*ARMS2* (rs10490924), *HTRA1* (rs11200638), *CFH* (rs1061170), *HERPUD1* (rs2217332), *C2* (rs547154, rs2242572) and 2 SNPs (*C3* (rs1047286), *PHLEKHA1* (rs2292625) were genotyped using RFLP (Restriction Fragment Length Polymorphism) method. The significance of the association of these SNPs with PCV was statistically analysed using SPSS V 23.0 tools.

Results: Strong genotype associations of the genetic variants of ARMS2, HTRA1, and CFH with PCV were observed in the Indian population. In *HERPUD1*, *C3*, *C2* show significant association in dominant/ recessive regression models. The five polymorphisms (*HERPUD1*, *HTRA1*, *ARMS2*, *C3*, and *CFH*) show a strong allelic association. The risk alleles show a significant correlation with disease phenotypes. Genotype-based phenotype correlation for PCV was identified for the first time in the Indian population.

Conclusions: The clinical severity (Phenotype) of the PCV is correlated with the tested multiple genotypes. The current analysis is the first report on the Indian population. Selected SNPs have a strong potential as genetic biomarkers for patient screening.

BSP08

METABOLOMIC BIOMARKERS IN HUMAN OPTHALMIC DISEASES: A SYSTEMATIC REVIEW

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Purpose: The review aims to collect information on the metabolite biomarkers for ocular diseases like Age-related macular degeneration, Diabetic retinopathy, Uveitis, Retinoblastoma, Dry eye disease, and Glaucoma from various journal articles.

Methods: We searched PubMed and Google Scholar for literature on metabolomics in eye disorders and its application and compiled a list of approximately 1000 papers. We excluded around 943 papers that are not relevant in metabolomics associated with ocular disease in humans and not in the English language. We chose the most relevant 19 publications for inclusion in the review.

Results: We arrived at the following result based on the information obtained from all of the literature. Lipid and amino acid derivatives have the potential to be used as biomarkers for the ocular disorders. Glutamine serves as a potential biomarker for all ophthalmic diseases excluding uveitis.

Conclusions: In this review, we discussed the different metabolites for the various ocular diseases. Venn diagrams were used for the comparison of the whole list of obtained metabolites. Further research is going on to find more metabolites for the disease diagnosis and also for the treatment infrastructure development. This review will undoubtedly be useful for academics and professionals involved in the study of ocular disorders and metabolomics.

BSP09

GENETIC ASSOCIATION OF CORNEAL DEVELOPMENTAL GENES IN THE PATHOGENESIS OF KERATOCONUS

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Purpose: Keratoconus (KC) is a debilitating, corneal disease-causing visual impairment due to progressive asymmetric astigmatism. The KC cornea loses structural integrity subsequent to thinning and protrudes out. The current study aims to uncover genetic causes of KC in families with clinical evidence of disease.

Method: The families with multiple KC individuals were examined and nine families with 41 individuals (24 KC subjects and 17 healthy first-degree relatives) were selected. With IEC approval and written consent, the blood samples were collected for Whole Exome Sequencing (WES).

Results: WES analysis identified 485 variants in 57 genes with diverse inheritance pattern. Out of which 28 variants were found to be non-synonymous SNPs with deleterious effect and Minor Allelic Frequency (MAF) < $1X10^{-5}$. Further the SNPs present in two or more families were shortlisted. The variant prioritization revealed novel genes and variants involved in corneal developmental process including ADAMTS18, *CTBP2*, ANKRD36B/C, *KIR2DL1*, etc. The network analysis of these genes show interaction with the genes involve in major signalling pathways including inflammation, MAPK signalling cascade and positive regulation of cell proliferation. In addition, the gene expression analysis of the shortlisted genes shows the differential expression in corneal epithelium of control and KC.

Conclusions: Our data reveal novel genes and autosomal dominant variants involved in corneal developmental process and cell proliferation. The individuals with such mutations may have altered corneal stromal structure leading to reduced stiffness. Our findings provide novel directions towards plausible mechanisms underlying the pathogenesis of KC.

RB1 MUTATION SPECTRUM OF CHILDREN WITH RETINOBLASTOMA FROM NORTH INDIA

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Purpose: As retinoblastoma occurs due to inactivation of both RB1 alleles in the tumor, identification of RB1 germline status helps differentiate between sporadic and heritable retinoblastoma. This abstract focuses on the genetic affection status of children in North India and a closer analysis of bilateral familial versus bilateral sporadic cases.

Methods: RB1 gene analysis for point mutations was carried out by next generation sequencing. When no sequencing variation was identified, deletion/ duplication analysis in RB1 by multiple-ligation probe analysis was done. For mutation positive patients, parental screening was performed via Sanger sequencing.

Results: The analyzed cohort had 43 unilateral and 44 bilateral affected patients. A pathogenic germline mutation could be identified in 33/43 (77%) bilateral cases and 7/43 (16%) unilateral cases. Of the mutation positive patients, 13 patients presented with novel mutations, 26 had in-frame mutations and 14 had frameshift mutations. There were 10 individuals among the bilateral cohort with multiple members affected (10/43=29%) however the germline mutation remained unidentified in 4 individuals.

Conclusions: Among the bilateral individuals with healthy parents, only 3% were silent carriers, all other cases were de novo. As per world literature, ~90% patients with bilateral disease despite family history should yield a positive RB1 germline mutation, however this data demonstrates 23% unidentified RB1 variations at the molecular level in our cohort. Such cases where no changes in RB1 gene were identified could be attributed to factors such as RB1 promoter methylation, gonadal mosaicism, presence of deep intronic variants or involvement of other driver mutations.

BSP11

INTEGRATED PROTEOMIC AND PHOSPHOPROTEOMICS TO UNDERSTAND DYSREGULATED CELLULAR PATHWAYS IN KERATOCONOUS EPITHELIUM

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Purpose: Keratoconus (KC) is a non-inflammatory disease characterized by bilateral progressive corneal ectasia and established biomechanical instability. Although previous studies contributed to a better understanding of the disease, little is known about global protein phosphorylation changes associated with proteomics in Keratoconus tissue.

Methods: We analyzed the phosphoproteome and proteome of corneal epithelium from control (n=5) and KC patients. Tandem mass tag (TMT) multiplexing technology and immobilized metal affinity chromatography (IMAC) were utilised to enrich and quantify phosphopeptides. On the Orbitrap Fusion Tribrid mass spectrometer, enriched peptides were examined. TMT labeling was used to evaluate 10 to 20µg of protein for proteomic research, yielding 1800 protein identifications. Phosphoproteomics isolated 2939 distinct phosphopeptides from 1270 proteins.

Results: We discovered substantial differences in the phosphorylation of 591 phosphopeptides, which corresponded to 375 proteins. Hypo-phosphorylated proteins were shown to be involved in the spliceosome, mRNA surveillance pathway, melanogenesis, nucleotide excision repair, and protein processing in the endoplasmic reticulum, according to KEGG pathway analysis. Interestingly, the study showed reversible Lamin polymerization and depolymerization mediated by phosphorylation of Lamins as key processes of cell cycle progression and cell division, as well as signalling mediated through ERK/Map kinase, TGF-β, and β -catenin. Protein-protein interactions of hyperphosphorylated proteins in KC were found in networks of MAP kinase, β catenin, and spliceosome. Proteomics revealed anomalies in WNT signalling, adhesion junctions, the Rho/Rac pathway, and endocytosis.

Conclusion: Keratoconous tissue phosphosignalling and proteomics data assist us in understanding disease development and identifying potential treatment targets.

BSP12

ALTERED TEAR METABOLOMIC PROFILE IN ENDOPHTHALMITIS CASES REVEALS HOST RESPONSE TO INFECTION

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Purpose: Endophthalmitis is an intraocular inflammation which predominantly affects the inner chambers of the eye including vitreous and aqueous humor. Aggressive treatment of such cases is usually necessary due to the rapid rise in the infection which may even lead to loss of the eye. Therefore, it is important to understand the host molecular response status in endophthalmitis cases which may help stratify subjects at risk or prognosticate.

Methods: Tear samples were collected after ethical approval and written, informed consent from 30 subjects (healthy controls=12, bacterial endophthalmitis= 18), aqueous humor from 16 individuals (control=6, bacterial endophthalmitis= 10,) and vitreous humor from 4 subjects (control=2, bacterial endophthalmitis=2). Metabolites were extracted from aqueous humor, vitreous humor and tears from both control and patients. Untargeted metabolome profiling was performed using UHPLC-MS/MS followed by Metaboanalayst R https://www.metaboanalyst.ca/MetaboAnalyst/ModuleView.xhtml) data analysis tool and KEGG database.

Results: From the analysis we found 1857 metabolites were differentially expressed in tears of bacterial endophthalmitis subjects as compared to control. The top score metabolites were 1-palmitoyl-sn-glycerol-3-phosphocholine, Myristoleoylcarnitine, Landomycin D and (E)-4-(Trimethylamino)-but-2-enoate involved in important biological pathways such as Glycerophospholipid metabolism, ABC transporters, Neuroactive ligand-receptor interaction and Autophagy. Though we observed differences in the top score metabolites in tears, aqueous humour and vitreous humour samples, most of the biological pathways were similar.

Conclusion: Differences in the metabolite level in tears of bacterial endophthalmitis as compared to healthy controls may lead to identification of non-invasive biomarker for clinical diagnosis.

IMPLICATIONS OF CRYSTALLIN GENE MUTATIONS IN PRIMARY CONGENITAL GLAUCOMA

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Purpose: Primary congenital glaucoma (PCG) is a developmental disease with corresponding loss of retinal ganglion cells but the magnitude of loss remains elusive. As photopic negative response (PhNR) provides a measure of retinal ganglion cell activity, we aimed to understand the implications of crystallin gene mutations based on PhNR profiles across PCG patients.

Methods: Mutations screening was accomplished by targeted screening of PCG patients (n=323) and controls (n=1157). The PhNR characteristics were recorded in 81 PCG probands who were classified into four groups including (a) cases harbouring crystallin and candidate genes mutation (n=2), (b) those with only candidate genes mutation (n=33), (c) those with only crystallin genes mutation (n=6) and (d) cases with no mutations (n=40). The PhNR amplitude and implicit time along with the clinical parameters were compared between these groups followed by tests of correlation across these categories.

Results: There was a strong correlation between CDR and PhNR amplitude among cases harbouring both the candidate and crystallin genes mutation (r=0.99) compared to cases without any mutations. The correlation was relatively stronger (r=0.87) for cases with mutations in crystallin gene alone. However, the PhNR amplitude and implicit times were not significantly associated between cases with and without any mutations ($p>0.05$).

Conclusions: This study indicated that reduced retinal ganglion cell response in PCG cases harbouring mutations either in crystallin genes alone or in combination with other candidate genes. Further functional validations of this phenomenon may provide additional insights into PCG pathogenesis.

EXOME SEQUENCING UNVEILED RECURRING MUTATIONS IN NF-κB PATHWAY IN OCULAR B-CELL LYMPHOMA

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Purpose: Ocular B-cell lymphoma is the most common orbital neoplasm that primarily affects the adult. To date, several chromosomal aberrations and genetic lesions have been described in lymphoma pathogenesis. However, their role in prognosticating the disease outcome is not known

Methods: To investigate the genetic aberrations in Ocular B-cell lymphoma, whole exome sequencing (WES) was performed in eleven tumor samples with six paired blood controls.

Results: An average of 158 somatic variants were identified by WES based on stringent filtering criteria. Homozygous variants of several known lymphoma-associated genes were detected. Mutations in TNFAIP3, MYD88, CD79Ba, and BCL6 genes were identified. These genes cluster in the BCR signalling pathway which consecutively activates the NF-κB pathway. In addition, pathogenic variants were found in the TP53, CASP9, CDKN2B, and EP300 genes reportedly associated with the cell cycle and apoptosis. Correlation of genomic data with clinical profile revealed the average progression free survival of patients with mutations was 2.5 ±1.4 years.

Conclusion: Our WES analysis unveiled pathogenic variants in the NF-κB signalling pathway that play an important role in Ocular B-cell lymphoma.

IDENTIFICATION OF CRUCIAL MOLECULAR PATHWAYS INVOLVED IN DEVELOPMENT OF DIABETIC RETINOPATHY

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Purpose: Diabetic retinopathy (DR) is a retinal vascular disease with a prevalence of 18% in India. The disease diagnosis depends on routine retinal examination and treatment modalities available only alleviates its symptoms. Therefore, simple molecular markers involved in DR pathology need to be identified for diagnostic and therapeutic purposes. Previous studies have identified coagulation and complement pathways and the complete aetiology of disease is not known. Hence, we profiled DR vitreous proteome to explore the novel and known proteins/pathways associated with DR.

Methods: Vitreous humour samples (PDR;n=3, DM;n=3, Control;n=3) were collected from patients undergoing vitrectomy. The samples were lysed with RIPA buffe, purified proteins were trypsin digested and subjected to LC-MS-MS analysis. The acquired raw data was searched against the human vitreous proteome, further analysed by various bioinformatics and proteomics tools.

Results: Total 1079 proteins including 16 novel ocular proteins were identified with minimum 1 unique peptide identification and 0.05% FDR (false discovery rate). Some significantly expressed proteins were; FRZB (Fc=2.26, p-value<0.001), APCS (Fc=2.2, p-value<0.05), (LDHA (Fc=-2.64, p-value<0.001), HBB (Fc=-8.55, p-value<0.00001), PLTP (Fc=-2.2, p- value<0.01). Top pathways identified by Ingenuity Pathway analysis (IPA) included LXR/RXR activation (lipid metabolism), ROS generation by macrophages, apoptosis, protein degradation and phagosome maturation. Besides, several regulatory proteins associated with cell death, phagocytic activation, angiogenesis and apoptosis were significantly downregulated in DR.

Conclusions: An impaired regulation of major DR associated pathways based on the downregulation of involved regulatory molecules indicated their role in disease pathogenesis. Increased protein degradation in PDR cases suggests for blood retinal barrier breakdown and degradation of cellular debris.

ANALYSIS OF THE VITREOUS PROTEOME REVEALS NOVEL PATHWAYS IN AGE-RELATED MACULAR DEGENERATION

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Purpose: Neovascular Age-related Macular Degeneration (nAMD) is an inflammatory and proangiogenic retino-choroidal disease. The study aims to analyze the nAMD- associated vitreous humor (VH) proteome to study translational changes in the eye.

Methods: VH (100µl) were collected from patients diagnosed with nAMD and controls (3 samples in each category) enrolled from a cohort of subjects with age-related cataracts without any signs or symptoms of other ocular or systemic conditions. Proteome profiling of the VH was accomplished by LC-MS/MS and novel and differentially regulated proteins were identified. Differentially regulated proteins were performed for functional and network analysis using Ingenuity Pathway Analysis software.

Results: Mass spectroscopy revealed 758 proteins in nAMD cases and 902 in controls with at least two unique peptides. A total of 38 differentially regulated proteins were identified, 23 were found to be upregulated and 15 to be downregulated. 15 novel proteins were identified that have not yet been reported in any human eye proteome data. Disease pathways such as lens disorders (CRYAA, CRYAB, CRYBA1), angiogenesis (COL18A1, HSPG2), apoptosis (DKK3, TGFB2), and cellular movement of endothelial cells across the extracellular matrix (CDH2) were observed. Among the differentially expressed unique proteins, SPOCK1 was significantly upregulated (fold change: 6.5, $p<0.05$), while CRYAA was significantly downregulated (fold change: - 8.5, $p<0.05$).

Conclusions: The vitreous proteome data revealed novel pathways in AMD along with the potential contributions of nucleic acid metabolism and small molecule biochemistry. Further research is warranted towards functional validations of these proteins as biomarkers and/or therapeutic targets in AMD.

ANTERIOR SEGMENT DYSGENESIS - A RARE OPHTHALMOLOGICAL PRESENTATION OF BCOR GENE MUTATION IN OCULOFACIOCARDIODENTAL (OFCD) SYNDROME

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Purpose: Oculofaciocardiodental (OFCD) is an X-linked disorder characterized by ocular, dental, cardiac and skeletal anomalies and facial dysmorphism, caused by mutations in the BCL-6 corepressor gene (*BCOR*). The common ophthalmological features include congenital cataract, microphthalmia, or secondary glaucoma. The purpose of this study is to report a rare ophthalmological manifestation of *BCOR* gene mutation.

Methods: Deep phenotyping of a patient (6-year-old female) who presented with poor vision since birth, congenital cataract and cardiac abnormality was performed. Clinical exome sequencing was performed to detect the pathogenic mutation causing the phenotype.

Results: The patients phenotype included bilateral ocular manifestations (nystagmus, perception of light and projection of rays vision, microcornea, no microphthalmos, broad peripheral anterior synechiae involving nasal 180 -210 degrees, iris atrophic holes, microphakia, and nuclear cataract), cardiac malformation (large Atrial Septal Defect and Wolf Parkinson White syndrome), skeletal abnormalities (right forearm radioulnar synostosis, shortening and absent supination, long thumbs of both hands, hammer toes), dental anomalies (defective tooth enamel) and broad nasal tip. She had normal psychomotor and cognitive development revealing no signs of intellectual disability. Exome sequencing revealed a heterozygous nonsense variation in exon 11 of the *BCOR* gene, located on the X chromosome that results in a stop codon and premature truncation of the protein at codon 1514 (c.4540C>T, p.Arg1514Ter).

Conclusions: The ocular manifestation of anterior segment dysgenesis and absence of microphthalmos were peculiar to this *BCOR* gene mutation, widening the phenotypic spectrum of this disease. This patient also lacked facial dysmorphic features reported in other OFCD patients.

ANALYSIS OF INTRINSICALLY DISORDERED REGIONS IN LINE-1 ORF1 AND ORF2 PROTEINS AND ITS ROLE IN AGE-RELATED MACULAR DEGENERATION

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Purpose: Late-stage Age-Related Macular Degeneration (AMD) – Geographic Atrophy (GA) is influenced by multiple regulatory mechanisms. LINE-1 retrotransposon is one such transposable element whose expression levels are upregulated in GA. The abundance of Intrinsically Disordered Regions (IDRs) in ORF1 and ORF2 protein remain unknown that prompted us to analyse its presence in LINE-1 protein. The purpose of this study is to identify Intrinsically Disordered Regions (IDRs) in LINE-1 ORF1 and ORF2 proteins and their possible role in pathophysiology of AMD.

Methods: The protein sequence of LINE-1 ORF1 and ORF2 proteins were retrieved from UniProt and utilized for the prediction of IDRs. For the evaluation of IDRs in ORF1 protein we used 2 forms of IUPred2 tool – IUPred1 long and IUPred2 short for the prediction of long and short IDRs in ORF1 protein. The disordered regions were also predicted using the MobiDBpredictor.

Results: Our analysis showed IDRs in ORF1 protein although we did not find significant IDRs in ORF2. Alu-RNA dependent RPE degeneration is known to be a major factor in the progression of GA. Thus, Identification of IDRs in LINE-1 ORF1 protein might enable its multi-functional role in LINE-1 lifecycle and its ability to hijack other cellular RNAs including Alu-RNA.

Conclusion: The identification of IDRs in ORF1 protein may explain various phenomenon such as trimerization of ORF1 protein, LLPS, stress granule formation and its potential interaction with other cellular proteins. The IDRs identified in ORF1 protein may serve as a novel target for disordered based drug designing.

GENETIC AND EPIGENETIC ANALYSIS OF CANDIDATE GENES IN PSEUDOEXFOLIATION PATIENTS FROM INDIA

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Purpose: Pseudoexfoliation (PXF) syndrome is an age-related ocular and systemic disorder, characterized by the deposition of fibrillar material on all anterior segment structures in the trabecular meshwork. In the current study we aim to assess the association of *LOXL1, POMP* and *TMEM136* gene with PXF.

Methods: A total sample size of 309 subjects were included in the study (N=219 controls and 90 PXF cases). PCR based direct sequencing was performed for candidate genes (LOXL1, POMP and TMEM136). Haplotype analysis was performed using HAPLOVIEW software and c2 analysis was done using SPSS statistics for statistical significance. The promoter methylation status of LOXL1 gene was assessed by Methylation specific PCR and direct sequencing of the DNA extracted from genomic DNA and their primary fibroblasts cultures established from patient's Tenon's tissue samples (N=21).

Results and Conclusion: SNPs rs3825942, rs41435250, rs8818 (*LOXL1*) and rs3737528 (*POMP*) showed significant association with PXF by additive/autosomal dominant or recessive models. Haplotypes analysis showed GAGC haplotype of *LOXL1* gene to be more frequently represented in cataract-alone controls (p=4.196´10-6) compared with cases and the GGTC haplotype was more frequently distributed in cases (OR, 4.800; 95%CI ,2.256-10.214; p= 1.2096´10-5). The TCC haplotype of *POMP* gene was more represented in cases (44.9%) (p= 1.4447´10-14) compared with controls (15.7%) and TTC haplotype in cataract-alone controls (28.8%) (p = 2.784´10-11) than in cases (4.5%). We observed site specific methylation pattern between cases and controls that significantly correlated with the expression levels.

ANALYSIS OF MICROSTRUCTURAL CHANGES IN AN X-LINKED JUVENILE RETINOSCHISIS PATIENT HARBORING RS1 G668A MUTATION BY EN-FACE OPTICAL COHERENCE TOMOGRAPHY IMAGING

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Purpose: Juvenile X-linked Retinoschisis (JXLR) is an X-linked recessive retinal dystrophy caused by retinoschisin (RS1) gene mutations. The current study aimed to investigate the detailed schisis pattern in a south Indian JXLR patient through en-face optical coherence tomography (OCT) imaging and identify causal RS1 mutation.

Methods: A seven-year-old male child from non-consanguineous parents presented with JXLR phenotype on comprehensive ophthalmic assessment by OCT en-face imaging, fundoscopy, and electroretinography (ERG). RS1 mutational screening for proband and his parents were performed through bidirectional Sanger sequencing followed by in silico analysis.

Results: On clinical evaluation for both eyes (OU), patient's fundus showed cart-wheel appearance at macula without peripheral retinoschisis. Horizontal OCT B-scan showed schisis in different retinal layers. En-face OCT imaging revealed characteristic schitic lesions exclusively in the ganglion cell layer (GCL), inner plexiform layer (IPL), inner nuclear layer (INL) and outer plexiform layer (OPL). Selective reduction in b wave was also seen. Proband harbored a hemizygous pathogenic RS1 mutation (c.G668A; p.Cys223Tyr) in exon-6. Segregation analysis demonstrated heterozygosity for mother and father had normal genotype, corroborating X-linked inheritance.

Conclusions: Our study describes the collective findings of en-face OCT for a JXLR patient from south India harboring Cyst223Tyr mutation. Cysteine residue 223 is vital for RS1 octamerization and cellular adhesion, thus maintaining the retinal structure integrity. Our report adds to Indian RS1mutations spectra and aid in carrier status determination. This study cast further insights into the importance of en-face imaging to understand schisis microstructure for JXLR.

GENETIC AND FUNCTIONAL ASSOCIATION OF *PGS1* POLYMORPHISMS WITH FUCHS ENDOTHELIAL CORNEAL DYSTROPHY IN AN INDIAN POPULATION

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Purpose: Fuchs endothelial corneal dystrophy (FECD) is a progressive bilateral corneal disorder inherited in autosomal dominant pattern. Disease characteristics include corneal endothelial cells depletion, thickened Descemet membrane, extracellular matrix deposition and guttae formation resulting in poor visual acuity. A genome wide analysis study (GWAS) has previously reported five linkage regions from multipoint analysis present on chromosomes 1, 7, 15, 17, and X. Moreover, studies have identified population specific genetic variations playing roles behind the disease pathology. In a quest to find any novel genetic associated variants, in this study, we have investigated the genetic association of peak marker SNPs of the above mentioned GWAS analysis with FECD in Indian population.

Methods: Blood samples were collected from 356 controls and 120 FECD patients after specular microscopic examination. Extracted genomic DNA was genotyped by Sanger's sequencing after age and gender matching. The associations of single nucleotide polymorphisms (SNPs) were calculated by Chi-squared test. Dual luciferase reporter assay was done to check the functional role of the disease associated SNPs. In Silico analysis was done for transcription factor (TF) binding site prediction.

Results: Phosphatidylglycerolphosphate Synthase1 (PGS1) variant rs938350 and the SNPs those are in linkage disequilibrium (LD) with rs938350 showed strong significant association (P value< 0.0005) with FECD in Indian population and they are present in a regulatory region on the PGS1 gene hinting at risk allele specific TF binding. Another intergenic variant rs918980 was also found to be significantly associated with FECD.

Conclusions: PGS1 variant rs938350, along with its LD SNPs and intergenic variant rs918980 are associated with FECD in Indian population.

PROMOTER DELETIONS IN TTC8 GENE SEGREGATES WITH DISEASE IN TWO UNRELATED BARDET BIEDL SYNDROME CASES FROM INDIA

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Purpose: *BBS8* gene (14q31.3) forms an integral component of the BBSome complex and is required for ciliary trafficking. Deletions in this gene are associated with deregulated RPE cell functions in knockout mice models. Here we report 2 BBS families segregating with deletions in promoter region of TTC8 gene.

Methods: We performed (i) Homozygosity mapping and copy number analysis using NspI250K Affymetrix gene chip for index case 1 (ii) Whole exome sequencing (WES) and Genome wide methylation analysis using 850K EPIC array in index case 2. The prioritized regions were validated by PCR based direct sequencing.

Results: Index case1 showed region of homozygous block of length > 10MB for BBS6,11, and 14 genes that were excluded for mutations by direct sequencing. Copy number analysis showed a call state of 1 suggesting a probable heterozygous deletion of length 125 kb from 89225000-89350000 bp in the proband as against that observed in the unaffected sib (CN=2). WES analysis in index case 2 did not reveal disease causing mutations in novel/candidate genes. EPIC Array analysis showed low total signal intensity for the CpG island in BBS8 gene promoter region (89289263-89299302 bp). This suggests a probable homozygous deletion which was confirmed by multiplex polymerase chain reaction.

Conclusions: The report expands the *BBS8* gene mutation spectrum and emphasizes the need to screen promoter region in addition to coding and non-coding regions of candidate genes. Further, functional studies are required to validate the observed results.

Alu COMPLEMENTARY DNA TRIGGER RETINAL PIGMENT EPITHELIUM TOXICITY VIA cGAS/STING MEDIATED CYTOSOLIC INNATE IMMUNITY PATHWAY

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Purpose: Geographic atrophy (GA) is a late stage of age-related macular degeneration (AMD). Currently there is no FDA approved therapy for GA and to identify molecular target to fight this disease is unmet health need. Long interspersed nuclear element-1 (L1)–mediated reverse transcription (RT) of Alu RNA into cytoplasmic Alu complementary DNA (cDNA) has been implicated in retinal pigmented epithelium (RPE) degeneration. The mechanism of Alu cDNA–induced RPE cytotoxicity in macular degeneration is unknown. The purpose of this study was to determine the mechanism of Alu cDNA-mediated RPE toxicity in GA.

Methods: Non-integrated Alu cDNA was detected by Alu c-PCR (modified version of 5'RACE qPCR), in situ hybridization and equator blotting. Alu c-PCR method can specifically detect linear Alu cDNA while avoids detecting circular form of extrachromosomal Alu DNAs. RPE degeneration was assessed by fundus photography and ZO-1 staining. cGAS levels checked by western blotting.

Results: We found that cGAS engages Alu cDNA to induce cytosolic mitochondrial DNA escape, which amplifies cGAS activation, triggering RPE degeneration via the inflammasome. The threshold of cGAS activation required to induce RPE degeneration is crossed only after the first signal Alu cDNA induces a second signal cytosolic escape of mtDNA.

Conclusions: The higher cytotoxic potency of Alu cDNA compared to Alu RNA might reflect stoichiometric inefficiencies in L1- mediated RT of Alu RNA. Deciphering how Alu cDNA is trafficked or chaperoned to cGAS versus other DNA sensors could provide additional mechanistic insights and therapeutic targets.

PRE-DIABETES TO DIABETIC RETINOPATHY: THE EARLY BIOMARKERS

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Purpose: Early metabolic changes as in a pre-diabetic status is not limited to impaired fasting glucose and/or impaired glucose tolerance. The study aimed to evaluate biochemical parameters that are prognostic markers as early as pre-diabetic stage that can progress to Diabetic retinopathy (DR).

Methods: An IRB approved prospective hospital-based cross-sectional study (2018-19) that enrolled 155 subjects classified based on diagnostic/inclusion criteria as healthy controls (n =33;mean age: 47±6.4; M:F = 1.36:1), Pre-Diabetes (n =41; mean-age:52±7.9y; M:F = 1.28:1), Type-2 Diabetes mellitus (T2DM) (n=39;mean age 54.20±7.2y;M:F=0.95:1),Non-Proliferative DR(NPDR) (n=20; mean age:62±7.5y; M:F = 2.33:1) and Proliferative DR (PDR) (n = 22; mean age: 54.04 ± 8.55y; M:F = 2.14:1). Fasting samples of whole blood, EDTA blood were collected for analysing various biochemical parameters by clinical biochemistry analyser and ELISA.

Results: Kruskal Wallis test after age/sex adjustment revealed increase in fasting blood sugar, 2hr GTT, C-peptide (fasting), HBA1c, Urea, Creatinine, Microalbumin, Neutrophils and Cortisol(AM) levels as well as decrease in Total-Bilirubin, Albumin, Haemoglobin, Monocytes and the calculated eGFR were significantly associated with disease progression, particularly from Pre-Diabetes to proliferative DR. Amongst the plasma neurotrophins (NT3, NT4, NGF) fall in NT4 level was significantly associated with DR development. Univariate binary logistic regression analysis identified the risk factors for development of pre-diabetes that includes, lowered levels of plasma T.Bilirubin, Albumin, DC Basophils, and HOMA-IR along with decline in the eGFR values, in addition to increase in fasting and post-prandial blood glucose.

Conclusion: Various biochemical parameters evaluated in pre-diabetes were found to show characteristic risk factors for the development of diabetic retinopathy.

INFLAMMATION MEDIATED ALTERATIONS IN THE IRON HOMEOSTASIS OF EALES' DISEASE

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Purpose: Eales' Disease is an idiopathic retinal periphlebitis, characterized by recurrent vitreous hemorrhage, neovascularization and inflammation. The disease distresses the retina of adult males between 15 and 45 years. In the present study proteins involved in iron homeostasis were assessed in serum and peripheral blood mononuclear cells.

Methods: Forty male subjects, 20 with ED and 20 healthy controls were recruited for the study. Their blood samples were used to measure serum ferritin, transferrin, serum transferrin receptor, ALAS and hemeoxygenase. In PBMCs ferritin, heme and hemeoxygenase along with the mRNA expression of hepcidin and ferroportin were measured.

Results: In the ED group, serum ferritin ($p < 0.002$) were significantly increased, while serum transferrin ($p < 0.02$) was decreased when compared to control subjects. In addition, the levels of heme ($p < 0.001$), ferritin ($p < 0.001$) and activity HO ($p < 0.001$) were increased in PBMCs of patients with ED. Interestingly, the expression levels of hepcidin and HIF were increased whereas the ferroportin was found to be decreased of ED patients.

Conclusion: These results propose evidence for the involvement of altered iron homeostasis in the pathogenesis of ED.

CYTARABINE INDUCED CORNEAL TOXICITY – POSSIBLE ROLE OF NUCLEOSIDE TRANSPORTERS IN THE TOPICAL DISPOSITION OF SYSTEMICALLY ADMINISTERED CYTARABINE

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Purpose: High doses of systemic cytarabine are known to produce toxicity in deeper corneal layers. Cytarabine is highly hydrophilic drug which cannot cross cellular barriers without assistance. The purpose of the study was to ascertain the role of nucleoside transporters (NT) in the trans-corneal disposition of cytarabine.

Methods: The molecular characterization of NTs was carried out in ocular tissues of the rabbit through reverse transcriptase polymerase chain reaction (RT-PCR). Trans-corneal disposition study was done with control and blocker pre-treated rabbits (n=4; each group and each time point). In blocker pre-treatment group, dipyridamole (2mg/ml; 4 mmol) at a volume of 20 µl was instilled 30 min prior to cytarabine (0.2mg/ml; 0.8 mmol, 20 µl topical). At 0.5, 1 and 2 h, aqueous humor was aspirated by paracentesis. All the samples were subjected to validated LC-MS/MS method for quantification.

Results: NT isoforms ent1, ent2, ent3 and cnt3 were found in rabbit corneal tissues. The LC-MS/MS method could separate cytarabine from endogenous isomeric interference cytidine. Dipyridamole pre-treatment exhibited a significant ($p<0.05$) drop at 1 h in the cytarabine concentration in aqueous humor. Mean AUC0-2 of the control group was significantly higher ($p<0.05$) compared to blocker pre-treated rabbits. The % penetration for control group was ~6 times higher as compared to blocker pre-treated group.

Conclusions: The present study discovered role of NT in corneal permeation of hydrophilic cytarabine. The corneal toxicity of systemic cytarabine could be explained by the facilitated entry via NTs.

COMPUTATIONAL IDENTIFICATION OF PEPTIMOMIMETIC INHIBITORS TARGETTING LIMK2-COFILIN AS A THERAPEUTIC MODALITY FOR GLAUCOMA

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Purpose: The RhoA-ROCK-LIMK pathway is a well-known glaucoma target and LIMK inhibitors are already proven to reduce IOP with fewer side effects than ROCK inhibitors. However, the available LIMK2 inhibitors namely, the drug 22j and LX7101, lack target specificity, and lead to adverse side effects on a higher dosage. Hence, there is a dearth of need for identifying LIMK2-specific inhibitors with the least off-target effect and high efficacy. So far promising substrate competitive inhibitors targeting pLIMK2-cofilin have not been explored.

Methods: Identification of peptidomimetics-based inhibitors targeting pLIMK2-cofilin by structural bioinformatics approaches were implemented. Initially, the modelled pLIMK2 was analyzed for its stability by molecular dynamics studies. Further protein-protein docking of pLIMK2 and its downstream substrate cofilin was performed to determine the binding energy and the hotspot residues favoring the stability of the complex. Subsequently, the pLIMK2 was screened against the peptidomimetic library compounds, following which, these ligands were subjected to in silico validations involving ADMETOX, MD-based binding stability analysis, and binding free energy calculation to prioritize the potential hits.

Results: The outcome of this study provided insights into the kinase-substrate recognition which acts as a gatekeeper to regulate actin cytoskeletal dynamics. From this study, it was inferred that among the Peptidomimetic compounds dataset (941592 compounds), based on cumulative analysis only three compounds with high MMGBSA, ADMETox were identified as potential hits.

Conclusions: The identified LIMK2 inhibitors with optimal pharmacological properties shall be considered as the therapeutic intervention.

CHARACTERISATION OF BIOMATERIAL POLY VINYL ALCOHOL (PVA) COMPOSITE NANOFIBER FOR THE OCULAR DRUG DELIVERY SYSTEM

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Purpose: Bio composite nanostructures are viable substitute in the field of tissue engineering due to biomimetic, immunomodulation, and compatibility. Hence, we studied the effect of Coriandrum sativum and Trigonella foenum-graecum composite poly vinyl alcohol nanofiber matrix (PVA) on ocular cells.

Methods: PVA composite nanofiber with and without drug have been synthesised. Molecular composition and size, was analysed by Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). The surface's topography was determined using Brunauer-Emmett-Teller (BET) analysis. The stiffness of the composite nanofibers was examined. Drug release from composite nanofiber was studied through HPLC analysis. The biocompatibility of the fibres was tested using primary human tenon fibroblast cells.

Results: The nanofibers exhibited size diameters ranging from 150nm to 200nm. FTIR results confirmed the heterogeneous molecules from the natural material. BET measurement, revealed effect on the surface topography. The stiffness of PVA nanofibers fell from 103.6 to 70.15 KPa when the drug 5-Fluorouracil was added. Simultaneously, the drug enhanced stiffness from 150 to 180 Kpa. HPLC data indicated that the composite matrix fibre mat exhibited sustained drug release for 4 hours. Cell toxicity assay findings revealed a difference in cell survival for the composite nanofibers. Further, research on the toxicity of the composite material is required to determine the mechanism.

Conclusions: PVA biomaterial composite nanofiber exhibited toxicity against human primary tenon fibroblast cells. Further experiments are required to delineate the mechanism.

DYSREGULATED EXPRESSION OF CIRCULATING MIR-320A IN PSEUDOEXFOLIATION PATIENTS

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Purpose: Dysregulation of microRNAs have been implicated in several age-related disorders, including glaucoma. An understanding of the pathways perturbed by dysregulated miRNA expression will aid in enhancing our understanding of pseudoexfoliation (PEX) progression. In addition, circulating miRNAs can serve as potential biomarkers. To determine the role of miRNAs in PEX, an age-related systemic disorder, we examined the expression profile of miRNAs in ocular tissues and plasma from PEX and control patients.

Methods: Plasma samples and conjunctiva tissue samples were obtained from donors with pseudoexfoliation syndrome and glaucoma, and age-matched controls. MicroRNA was isolated using the miRNeasy kit and expression of miR-320a was analyzed by real time PCR. Putative targets of the miRNA candidate were identified by computational analysis of potential miRNA target sequences in mRNAs of major constituents of exfoliative material as well as key components of the perturbed signaling pathways using the TargetScan and MiRanda algorithms.

Results: In conjunctiva, significant downregulation was seen in the expression of miR-320a in PEXS and PEXG samples compared to control samples. Analysis of circulating miRNA in plasma samples revealed decreased expression of miR-320a in PEXS and PEXG compared to control samples, suggesting a synergistic expression pattern in tissue and circulating fluid. Computational analysis and network building revealed the putative mRNA targets and pathways targeted by miR-320a, notably, the cellular degradation pathways.

Conclusion: Our data highlights the dysregulation of miR-320a in circulating fluids and ocular tissues affected by pseudoexfoliation.

ELUCIDATING THE UNDERLYING MECHANISMS IN LOCAL AND SYSTEMIC INFLAMMATION OF CHRONIC STEVENS-JOHNSON SYNDROME PATIENTS

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Purpose: Various ocular complications are caused in the chronic stages of Stevens-Johnson syndrome which leads to visual impairment. The resemblance between local and systemic inflammation in chronic ocular sequelae is vaguely understood. Therefore, this study aims to elucidate the correlation between systemic and local inflammation in disease manifestation.

Methods: Tear and sera samples were collected from chronic SJS patients (n=6) with age-gender matched controls (n=6) and analyzed by liquid chromatography-mass spectroscopy for protein profiling and label-free quantification of tear and serum proteins. The common proteins in tear and sera were analyzed by gene ontology to know their biological functions. Highly differentially regulated proteins were selected by z-score normalization followed by t-test significance using abundance values.

Results: The total tear and serum proteins identified in both controls and patients were ~1760 and ~250 respectively, of which 204 proteins were commonly expressed. These proteins were found to be involved in the innate immune response, complement activation, proteolysis, platelet degranulation, etc. Eleven protein levels were significantly different in tears which include Protein S100-A9 ($p<0.02$), Lactotransferrin ($p<0.02$), and Clusterin ($p<0.007$), but not significantly varying in sera of SJS. And twelve proteins are significantly different in serum including Complement C3 ($p<0.03$), and Complement C1r ($p<0.002$), but no significant difference was observed in SJS tears.

Conclusions: The findings of this study show that in the chronic ocular sequelae of SJS, the local inflammatory response is independent of systemic inflammation. These findings are under validation using ELISA in a more number of samples.

BSP3`

FADS1: A NOVEL THERAPEUTIC TARGET IN RETINOBLASTOMA

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Purpose: To evaluate *FADS1* expression and its role in regulating Retinoblastoma tumour cell growth and proliferation.

Methods: The mRNA expression of *FADS1* in Retinoblastoma cell lines and control retina was measured using real-time qPCR. The expression of FADS1 protein in formalin-fixed, paraffin-embedded retinoblastoma tissues was assessed by immunohistochemistry. Protein expression was analysed using immunoblotting in scrambled control and FADS1 knock-down cells. Additionally, the effects of celecoxib on FADS1 inhibition and retinoblastoma cell survival were studied. Investigations into the cell cycle and apoptosis were done using flow cytometry.

Results: Retinoblastoma cell lines and primary tumour specimens showed overexpression of FADS1 when compared to healthy control retina. The effectiveness of the knockdown of FADS1 was confirmed by immunoblotting. Pharmacological inhibition with celecoxib and FADS1 knockdown resulted in decreased cell viability, cell cycle arrest and increased apoptosis.

Conclusions: The growth and proliferation of retinoblastoma cells is influenced by deregulated expression of FADS1. Targeting FADS1 may be a possible therapeutic strategy in Retinoblastoma.

IN-SILICO MODELS TO COMPREHEND THE DRUG-TRANSPORTER INTERACTIONS

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Purpose: Transporters in the lacrimal gland (LG) serve as one of the entry ports for systemic drugs into tear. Many of the systemic drugs are organic cations, which are recognized and trafficked through organic cation transporter (OCT1) present in LG. We have earlier demonstrated expression and functional role of OCT1 in rabbit LG. In the current study, we apply machine learning (ML) and computer simulation (CS) models to predict the OCT1 interaction with a range of systemic drugs, to understand the drug entry into eye, and thereby prevent ocular toxicity.

Methods: A training dataset of known substrate/non-substrate of OCT1 was used to develop ML model. Predictions of ML model from screening dataset (systemic drugs causing ocular toxicity) were validated using CS. OCT1 homologue was developed to dock the ligands (drugs) at OCT1 binding pocket followed by equilibration of protein-ligand complex through molecular dynamic simulations. Metadynamics was performed for the equilibrated complex to understand the movement/direction of ligand across OCT1.

Results: The ML model showed an accuracy about 89% and the OCT1 homologue was validated using Ramachandran plot. Metadynamics revealed the free movement of substrates across the transporter with minimum free energy near the binding pocket. CS validated the predictions from ML model indicating 71% accuracy.

Conclusions: The developed ML and CS models have predicted various drug-OCT1 interactions – not known earlier (cyclophosphamide, gabapentin). These models can be used as a platform to screen the drug interaction with OCT1 and thereby aid in drug discovery with less systemic drug induced ocular toxicity.

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BSP33

ARTIFICIAL INTELLIGENCE AND BIOPHYSICAL SIMULATION DELINEATES THE POTENTIAL ROLE OF ORGANIC ANION TRANSPORTER-1 IN SYSTEMIC DRUG INDUCED OCULAR TOXICITY

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Purpose: Patients undergoing chronic therapy often suffer from systemic drug induced ocular toxicity. Systemic drugs gain access to intraocular tissues despite the tight barriers and cause toxicity. We hypothesize organic anion transporter 1 (OAT1) expressed in ocular barriers could transport systemic drugs into the eye. This study applies artificial intelligence (AI) and biophysical simulations to understand the role of OAT1 in systemic drug-induced ocular toxicity.

Methods: A dataset of 110 known substrates and non-substrates of OAT1 was prepared to train an AI model, which was used to screen a database of 500 systemic drugs causing ocular toxicity to predict potential substrates of OAT1. The protein structure of OAT1 was developed using homology modelling. Further molecular dynamics (MD) and metadynamics simulations were performed by docking known and predicted substrates with OAT1 to visualize their interactions and mechanism of transport.

Results: The AI model predicted systemic drugs causing ocular toxicity as substrates of OAT1 with an accuracy of 70-75%. The homology model of OAT1 was developed and validated. MD simulations revealed the interaction between drugs and OAT1 at the molecular level. Metadynamics simulated the process of transporting drugs through OAT1 and substantiated the predictions from the AI model.

Conclusions: The AI model and biophysical simulation elucidated the interactions and potential role of OAT1 in systemic drug-induced ocular toxicity. Upon further validation through experimental studies, the developed in-silico models could establish a platform to guide the future drug discovery process to develop drugs with less or no toxicity to the eye.

BSP34

SERUM SMALL EXTRACELLULR VESICLES-DERIVED RNA ANALYSIS IDENTIFY POTENTIAL RNA REGULATORY NETWORKS IN HUMAN RETINOBLASTOMA

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Purpose: To evaluate the serum small extracellular vesicles (sEVs)-derived RNAs from retinoblastoma (RB) patients and age-matched controls, and analyze their regulatory networks.

Methods: Serum sEVs from RB (n=9) and age-matched controls (n=5) were isolated from Total Exosome Isolation Kit (Invitrogen). Physical properties of isolated EVs were analyzed by TEM and NTA. Large RNA (>200 nt) and small RNA (<200 nt) were extracted from pooled sEV preparations of RB (n=3) and controls (n=3) using Total Exosome RNA Isolation Kit (Invitrogen). Long RNAs were subjected to whole transcriptome analysis and small RNAs to miRNA sequencing on Illumina HiSeq 2500. Differential gene expression (DE) analysis was performed by EdgeR. Bioinformatics methods were used to analyze functions and miRNA-mRNA and lncRNA-miRNA-mRNA regulatory interactions.

Results: The isolated sEVs are round-shaped with a size <150 nm, $5.3\times10^{11}\pm8.1$ particles/mL, and zeta potential of 11.1 to -15.8 mV. A total of 6514 DE mRNAs, 123 DE miRNAs, and 3634 DE lncRNAs were detected. Both miRNA-mRNA and lncRNA-miRNA-mRNA network analysis revealed MALAT1, AFAP1-AS1, miR145, 101, and 16-5p as hub ncRNAs that promote RB progression by targeting cyclins, cyclin-dependent kinases, c-MYC, EZH2, ZEB1, TP53, and BCL2. Protein-protein interaction network analysis showed that eye-related DE mRNAs are involved in rod cell differentiation, cone cell development, and retinol metabolism.

Conclusions: The present study provides a comprehensive overview of the RB sEV RNAs and their regulatory interactions, which may aid in understanding complex molecular mechanisms involved in RB pathogenesis.

AMPHIPHILIC NANOMICELLES FOR TOPICAL DELIVERY OF DIFLUPREDNATE

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Purpose: Difluprednate available as emulsion is used to treat ocular inflammation. But it is associated with poor corneal permeability, frequent administration and ocular irritation which reduce the patient compliance. Moreover, poor water solubility of difluprednate poses challenges to develop a topical ocular formulation. Therefore, we attempted to develop amphiphilic nanomicelles to improve the topical delivery of difluprednate.

Methods: Difluprednate loaded nanomicelles were prepared by thin film hydration method using octoxynol-40 and hydrogenated castor oil. The formulation was optimized using Box Behnken design and characterized for particle size, polydispersity index, zeta potential, entrapment efficiency, in vitro release, and ex vivo corneal permeation. The biocompatibility of the formulation was assessed by Draize test.

Results: The average particle size, polydispersity index, zeta potential and entrapment efficiency of optimized difluprednate nanomicelles were 21.9 nm, 0.15, -7.55 mV and 75.4% respectively. Transmission electron microscopy analysis showed spherical and aggregate free nanomicelles. The in vitro drug release was found out to be 99.6% upto48 hrs from nanomicelles and 97.4 % at12 hrs from emulsion. The ex vivo corneal permeation of difluprednate was 15.1 µg/cm^2 and 2.4 µg/cm^{2}from nanomicelles and emulsion respectively – indicates improved permeability due to nanomicelles.

Conclusion: The present study suggests the role of topical nanomicelles in delivering difluprednate, which is better than the commercial emulsion formulation to treat ocular inflammation.

Acknowledgement: We would like to acknowledge Parenteral Drug Association for funding support.

A SELF-ASSEMBLED RESVERATROL LOADED NANOCARRIERS FOR TREATING KERATOCONUS.

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Purpose: Keratoconus treatment includes surgical interventions like corneal crosslinking procedure, corneal transplant, deep anterior lamellar keratoplasty, and phakic intraocular lenses - which has many limitations. Resveratrol, a natural product with properties like anti-inflammatory and anti-oxidant could alleviate keratoconus. But it requires a stable carrier for its delivery. Therefore, we developed nanomicelles loaded with resveratrol to treat keratoconus - an alternative to the existing treatments.

Methods: Resveratrol-loaded nanomicelles were formulated with Poloxamer – 407, Tocopherol Polyethylene Glycol Succinate (TPGS), Polyvinyl Pyrrolidine K-30 (PVP K-30), and Chitosan-Stearic Acid co-polymer (C-SA). Different drug-to-polymer ratios were used to optimize nanomicelles (product and process parameters) by thin-film hydration and dialysis method. Nanomicelles were compared for its particle size, polydispersivity index (PDI), %drug loading, % entrapment efficiency and invitro drug release.

Results: Resveratrol nanomicelles at 1:50 ratio had a particle size and PDI of 24.25nm and 0.233 (Poloxamer-407), 18.75nm and 0.484 (PVP K-30), 14.53nm and 0.254 (TPGS) and 34.39nm and 0.627 (C-SA). The process parameters were optimized with 100rpm at a pressure of 34±5 kPa for thin film method and 300rpm at 60°C for dialysis method. %drug loading and %entrapment efficiency was found to be in the range of 0.6-56% and 1-99% respectively. The invitro release was found to be 17.7% for PVP K-30 (1:200), 20.9% for Polaxomer-407 (1:100), 33.3% for TPGS (1:300) and 71.5% for C-SA (1:5) for 24 hours.

Conclusions: The PVP based nanomicelles showed a sustained resveratrol release for upto 24 hours. Further studies are required to establish resveratrol's role in treating Keratoconus.

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FUNCTIONAL STUDIES ON MYBL2 TRANSCRIPTION FACTOR IN HUMAN RETINOBLASTOMA

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Purpose: To investigate the role of MYB proto-oncogene like 2 (MYBL2) in human retinoblastoma (RB) and its involvement in tumor survival and progression.

Methods: The relative mRNA expression of *MYBL2* was analysed in RB cell lines and patient samples by qRT-PCR and compared with control retina. Immunoblotting was performed to analyse the level of *MYBL2* protein expression in RB cell lines. The protein expression of MYBL2 was also determined in archived human RB tissue specimens by immunohistochemistry (IHC). Further, *MYBL2* was targeted with small molecule inhibitors and shRNA-mediated knockdown and changes in cell viability, apoptosis, and cell cycle regulation were recorded.

Results: Immunoblotting and IHC analysis confirmed the overexpression of MYBL2 protein in retinoblastoma cell lines and patient specimens compared to uninvolved healthy retina. Further, small molecule inhibition and shRNA-mediated knockdown of MYBL2 showed decreased cell viability, increased apoptosis and G2/M phase arrest in cell cycle when compared to untreated or scrambled control cells respectively.

Conclusions: MYBL2 is overexpressed in RB and could be specifically targeted to restrict RB tumor cell growth.

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TARGETED MODULATION OF *E2F3* and *KIF14* IN RETINOBLASTOMA

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Purpose: In Retinoblastoma (RB), recurrent copy number gains were seen in E2F3 and KIF14. Our goal is to determine whether inhibition of E2F3 and KIF14 could serve as potential drug target for RB.

Methods: The expression of *E2F3* and *KIF14* transcript were assessed using RT-qPCR and protein by Western blot in RB cell lines. The cells were treated with small molecule inhibitors of *E2F3* and *KIF14*. Effect of the inhibitors were functionally checked by RT-qPCR, Western blot, TUNEL assay and Growth kinetics assay.

Results: RB cell lines showed upregulation of *E2F3* and *KIF14*. IC50 concentration of small molecule inhibitors were determined. Analysis of the inhibitor treated cells showed the decreased expression of *E2F3* and *KIF14* at mRNA and protein level. TUNEL assay revealed increased apoptosis and growth kinetic assay showed delayed doubling time in treated cells.

Conclusion: Small molecule inhibitors inhibited the expression of *E2F3* and *KIF14*, increased apoptosis and delayed cell proliferation in RB cell lines. These inhibitors might serve as potent drugs for the chemo-refractory retinoblastoma, which needs further validation.

BSP39

UNDERSTANDING THE ROLE OF miRNA IN ASPERGILLUS FLAVUS KERATITIS PROGRESSION

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Purpose: Most patients with Aspergillus flavus Keratitis experience a progression to severe keratitis requiring early surgery even after treatment. Recent studies on ocular miRNAs have shown altered expression in response to keratitis and they show their role in microbial virulence and host immunity. Here, we aim to identify the role of dysregulated miRNAs in A. flavus keratitis and their role in the disease progression.

Methods: Corneal swabs were collected during the clinical examination at the first visit and at follow-up, and corneas were collected after post-surgery. Human donor corneas served as control. Total RNA was isolated from both corneal tissues and swabs. The small-RNA library preparation and sequencing were outsourced. The differentially expressed (DE) analysis was performed to identify the dysregulated miRNAs and was filtered based on log fold change> ± 2; -Log10P-value >2 and LogCPM>4. Final Prioritized miRNAs were taken forward for qPCR validation. In silico functional analysis was performed.

Results: we prioritized 20 miRNAs significantly dysregulated during A. flavus infection from the DE analysis. we further identified seven miRNAs that have concordance with the NGS data and qPCR validation in a different cohort of samples. Functional network analysis of gene targets of selected miRNAs showed significant pathways involved in disease progression, including TGF-beta signaling and MAPK signaling pathway.

Conclusions: This study explores the role of corneal miRNAs in A. flavus keratitis progression, which requires further functional studies. These set of identified miRNAs will serve as a potential candidate to predict the keratitis progression early.

BSP40

THE IMPACT OF AIR POLLUTION AND UV EXPOSURE ON OCULAR SURFACE AMONG OUTDOOR WORKERS IN SOUTH INDIAN POPULATION – A PROSPECTIVE STUDY

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Purpose: The aim of the study was to evaluate the effect of chronic air pollution and lifetime UV exposure on ocular surface of outdoor workers in South Indian population.

Methods: A total of 336 patients were recruited for the current study and categorized into four groups – Controls/Cataract/Pterygium/Pinguecula. The impact of lifetime UV exposure was assessed using (a) Melbourne Visual Impairment Questionnaire (b) Conjunctival UV Autofluorescence imaging and (c) CPD - ELISA kit measuring UV-induced DNA damage from impression cytology samples (n=75). Air quality index (AQI) for place of occupation was obtained from either archived data and/or manually recording using the Aeroqual S500 pollution monitor. Tear samples (n=75) were collected using Schirmer's strip and inflammatory cytokines such as IL-6 & TNF- α were measured using commercially available kits. Statistical analyses were carried out to capture the difference among the four groups in response to UV exposure and air pollution.

Results: There were 138 controls, 91 cataract, 70 pinguecula, and 31 pterygium cases with mean age of 48 ± 9 years. Significant difference among the diseased group were observed in (a) AQI significantly associated with Cataract ($p < 0.011$) (b) CUVAF values with pterygium being the highest (40 mm^2) compared to controls (19 mm^2) ($p < 0.00$) (c) UV-induced DNA damage measured using CPD-ELISA kit higher in pterygium (4.19 ng/ml) versus controls (1.53 ng/ml) ($p < 0.04$) and (d) Inflammatory cytokine TNF- α levels were significantly associated with pterygium (3.48 pg/ml) compared to controls (1.18 pg/ml) ($p < 0.023$)

Conclusion: This pilot study shows effect of ocular surface exposure to air pollution and UV radiation among outdoor workers to be significantly associated with the risk of cataract and pterygium.

RELATIONSHIP OF IMMUNO-INFLAMMATORY FACTORS AMONG VITREOUS HUMOR, AQUEOUS HUMOR, TEAR FLUID AND PLASMA SAMPLES IN HUMAN SUBJECTS

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Purpose: Ocular fluids are being increasingly used as a sample source for biomarkers to assist disease stratification, prognostication, treatment planning, and improving knowledge of pathogenic mechanisms. However, some sample types though biologically appropriate, are not feasible to obtain due to clinical and ethical constraints. Hence, determining the association of molecular factors across the matched sample types – vitreous humor–“V”, aqueous humor–“A”, tear fluid–“T”, and plasma–“P” would be beneficial in interpreting results from non- or minimally-invasive sampling methods.

Methods: “V”, “A”, “T”, and “P” samples were collected from subjects undergoing vitreoretinal surgery as the standard of care. 53 soluble factors were measured in the four sample types by multiplex ELISA. Proportions of 10 immune cell types were determined in “A” and “V” by immunophenotyping.

Results: Levels of 28% of soluble factors positively correlated ($P<0.05$) among the four sample types. Positive correlations were observed between one or more of the sample types in 96% of the soluble factors. Direct correlations in the levels of a variety of soluble factors were also observed among V-A (79%); V-A-T (38%); V-A-P (38%); V-T (45%); V-T-P (30%); V-P (43%); A-T (55%); A-T-P (38%); A-P (60%) and T-P (53%). Positive correlations in the proportion of 80% of immune cell subsets were also observed between “A” and “V” samples.

Conclusions: Association of specific inflammatory, angiogenic factors, and immune cells among the four sample types open up prospects of using them from non- or minimally-invasive sample sources for molecular characterization in cross-sectional and longitudinal studies.

BSP42

IDENTIFICATION OF POTENTIAL BLOOD MIRNAS FOR DIAGNOSIS OF INTRAOCULAR TUBERCULOSIS

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Purpose: Serum miRNAs are feasible diagnostic markers for many diseases. In this study, we aim to identify serum miRNAs for diagnosis of Intraocular tuberculosis.

Methods: miRNA profiling and differential expression (DE) analysis was performed in Intraocular tuberculosis (IOTB) using Aqueous (AH) and vitreous humor (VH) separately. Altered miRNAs in active TB were identified using metadata analysis of publically available datasets. In-house bioinformatics analysis was performed. The altered miRNAs were further filtered based on AH and VH data. qRT-PCR confirmation was carried out in five patients' blood of IOTB samples (n=5) compared to healthy controls (n=5).

Results: From AH and VH small-RNA sequencing data analysis and further validated data by qRT-PCR in a large cohort provided four and three miRNAs, respectively. Systemic TB metadata analysis identified 24 DE miRNAs. Among them, seven miRNAs were also present in AH and VH data. Thus, these seven miRNAs were further validated in five blood samples of IOTB to identify their diagnostic potential.

Conclusions: This study identifies potential miRNAs with diagnostic value for IOTB patients, which requires further study with a large cohort.

BSP43

EXPANSION AND CHARACTERIZATION OF HUMAN LIMBAL MESENCHYMAL STROMAL/STEM CELLS (hLMSCs) IN XENO-FREE MEDIUM

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Purpose: This study aims to expand and characterize hLMSCs *in vitro* in xeno-free medium (STEM MACS XF; SM) in comparison with DMEM/F12 with 2%FBS (control) to overcome the ethical and safety complexities.

Methods: Limbal tissue was obtained from the biopsy of therapeutic grade corneoscleral rims, followed by expansion of primary cells till tertiary cells in SM and in control media. To characterize the growth and retention of MSC characteristics of hLMSCs in SM, population doubling time (PDT), proliferation ability, phenotypic markers expression using FACS and Immunofluorescence according to ISCT guidelines, tri-lineage differentiation, colony forming potential and wound healing assay were carried out.

Results: The xeno-free medium supported growth of primary hLMSCs, retaining an average doubling time of 23 hours, and their morphological and phenotypic characteristics. hLMSCs cultured in SM had comparatively lesser PDT as that of control (*$p < 0.01$). FACS analysis showed that ≥90% hLMSCs were positive for *$CD90^+$, $CD73^+$, $CD105^+$,* and ≤5% were positive for *$CD45^-$, $CD34^-$ and $HLA\text{-}DR^-$.* Immunofluorescence analysis confirmed similar expression of *$Pax6^+$, $COL\ IV^+$* (ocular surface marker), stem-cell biomarkers *($ABCG2^+$, $ABCB5^+$)* and the mesenchymal biomarkers *(VIM^+, $CD90^+$, $CD105^+$, $CD\ 34^-$, $HLA\text{-}DR^-$ and $CD45^-$, αSMA^-)* in both the media without any significant difference. Tri-lineage differentiation potential, Colony forming ability and wound healing property of hLMSCs were supported by SM similar to that of control medium. All the results were quantified and performed in triplicates.

Conclusion: The findings of this study shows that hLMSCs successfully expand and retain the MSC characteristics adapting to serum-free environment.

BSP44

CHARACTERIZATION OF TRANSIENT RECEPTOR POTENTIAL VANILLOID CHANNELS IN HUMAN CORNEAL ENDOTHELIAL CELLS.

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Purpose: To study the expression of Transient Receptor Potential Vanilloid (TRPV) channels in human corneal endothelial cells (HCECs) as TRP channels are known to play a vital role in mechanotransduction and are proven to be essential for health maintenance and visual processing in ocular tissues.

Methods: Donor corneas were procured from Ramayamma International Eye Bank, Hyderabad. The Descemet's membrane-corneal endothelium complex was peeled and left for recovery overnight in Opti-MEM media. The peels were either used for RNA isolation, fixed for immunostaining or cultured for immunostaining/western blot. Gene expression of TRPV1-6 channels was determined by PCR. Protein expression was determined by immunostaining and western blot. Precise localisation of TRPV1-4 channels within cells was determined using reference proteins like Zonula occludens-1(ZO-1) or N-cadherin and colocalization quantified by calculating Pearson's coefficient using ImageJ software.

Results: A positive expression for TRPV1-4 and TRPV6 was observed in fresh tissues and cultured cells by PCR. The localisation of TRPV1 and TRPV4 was mostly cytoplasmic in fresh tissues while TRPV2&3 localized to the membrane. The Pearson's correlation between
TRPV1/N-cadherin(p-0.132) and TRPV4/N-cadherin(p-0.336) was poor indicating little overlap in these proteins corroborating with the largely cytoplasmic expression of the channels. Better colocalization was noted between TRPV2/N-cadherin(p-0.558), suggesting that this channel is partly located at the basolateral region of a cell. Colocalization was also noted between TRPV3/ZO-1(p-0.794) indicating that TRPV3 is localized at the intercellular junction which is in the apical part of the cell.

Conclusions: The study shows conclusively the expression and location of TRPV1-4 channels in the HCECs.

BSP45

CORNEAL EPITHELIUM HOMEOSTASIS AND CELL POLARITY FACTORS ARE DOWNREGULATED IN KERATOCONUS PATIENTS

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Purpose: Keratoconus (KC) is a common progressive corneal degenerative disorder associated with excessive stromal thinning and central conically shaped protrusion of cornea which results in significant visual impairment. Etiology of keratoconus is affected by multiple factors including different genes, but the direct relation of corneal epithelial genes in keratoconus is poorly defined. The purpose of this study is to compare a few genes and their expressions, known to be regulating epithelial nature and inflammation.

Methods: After obtaining informed consent, eight epithelial tissue samples from keratoconus patients undergoing corneal collagen-crosslinking (C3R) and individuals who went for photorefractive keratectomy (PRK) were collected from Dr Dr. Shroff's Charity Eye Hospital Epithelial tissues were used for RNA extraction, quantification, and complementary-DNA conversion. Complementary-DNA samples were used to analyze the gene-expression profile of homeostasis, inflammation and cell-polarity markers using quantitative polymerase chain reaction (qPCR).

Results: KLF4 is a master-transcriptional regulator, maintaining homeostasis of corneal epithelium, was downregulated in keratoconus patients. Cell polarity maintaining genes, viz., PAR3, PALS1, SCRIB etc. were mostly downregulated. Whereas, inflammatory markers (IL6, TNFA, IL8) were not much different in KC group compared to PRK-group.

Conclusions: KLF4 maintains epithelial homeostasis, downregulation of this gene indicates poor homeostasis of epithelial cells in KC. Cell polarity, if lost, causes cell death and deregulation of tissues. In our patient group, cell polarity markers were downregulated, indicating disproportion of corneal epithelium tissue. Overall, this study suggests that the CE homeostasis is compromised in KC patients and could be a potential driver of corneal thinning.

BSP46

VITREOUS INFILTRATING CELL PHENOTYPIC PROFILING FROM PATIENTS WITH UVEITIS

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Purpose: To investigate surface phenotypes of vitreous inflammatory cell infiltrates in infectious and non-infectious uveitis.

Methods: Vitreous infiltrating inflammatory cell from uveitis patients (n=32) requiring pars plana vitrectomy for management of intraocular inflammation. These cells were stained for different surface antigens (or the nuclear antigen FoxP3) and immunephenotyped by flowcytometry. Anatomical and etiological categories were compared by non-parametric tests.

Results: Pan-uveitis group (median= 44.24, IQR=31) had significantly higher number of vitreous infiltrating cells than intermediate or posterior uveitis (median= 20.95.24, IQR=22) (p=0.01). The CD45 expressing immune cell population comprised not only the CD3+ve T-lymphocytes (median=87.3, IQR=18) but also CD19+ve B-cells (median 1.88, IQR=1.97), CD3-ve CD56+ natural killer cells (median 2.89, IQR= 2.94) and CD14+ myeloid monocytes (median=41, IQR=34.97). Among CD3+ cells, CD4+ helper T-cells (median 66.40, IQR 17.41) were more common than CD8+ cytotoxic T cells (median= 17.5, IQR= 10.45). The distribution of these cell types was similar between tubercular and non-infectious uveitis.

Conclusions: The intraocular immune landscape is diverse in both infectious and non-infectious uveitis. The T-cell mediated adaptive immune response is the predominant phenotype among all etiological entities.

STEM CELL PRODUCTION IN CURRENT GOOD MANUFACTURING PRACTICE FACILITY FOR VARIOUS CORNEAL PATHOLOGIES

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Purpose: To manufacture clinical grade stem cells in the current Good Manufacturing Practice (cGMP) facility for clinical transplantation of various Corneal Pathologies.

Methods: The starting material clinical grade cadaveric corneal tissue is received from the Ramayamma International Eye Bank. Stem cells such as Limbal stromal stem cells were isolated from the tissues and cultured in cGMP facility using the validated method, qualified technicians, raw materials, equipment and aseptic environment. The manufacturing of these stem cells are done as per IRB approval no: LEC-01-14-015 and Manufacturing licence no: TS/HYD/2022-90883 following the National guidelines for Stem cell Research (2017) and schedule M. The cells were subjected to series of quality tests to ensure its strength, identity, safety, purity and efficacy. The release of the cells for the transplantation was approved based on the compliance to the quality tests specifications such as cell count, viability, bio-burden, mycoplasma and Bacterial Endotoxin (BET) testing to make sure that the final product is safe. Upon successful results on all the testing, the reports will be reviewed and released by the Quality Assurance (QA) head for intended use of clinical transplantation.

Result: The cells manufactured in the cGMP facility met the critical quality attributes; product specification of cell count(>$0.5x10^6$), viability (>70%), free from endotoxin(<0.125EU/mL), mycoplasma (Not Detected) and Bioburden (No colony forming Units).

Conclusion: The Stem cells manufactured successfully in the cGMP facility satisfies all the stem cell guidelines and in-house product specifications resulting in successful transplantation in patients.

BSP48

SEPARATION OF FILTERING AND NON-FILTERING REGION OF HUMAN TRABECULAR MESHWORK

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Purpose: Our previous study confirmed the presence of adult tissue resident stem cells for human trabecular meshwork (TM) in the anterior non-filtering region. In order to elucidate the molecular regulation of these stem cells, this study aims to establish a method for the separation of the filtering (F) and non-filtering (NF) region of human TM.

Methods: The F and NF regions of TM were dissected from donor tissues (n=6) from Rotary Aravind International Eye Bank, Madurai under stereomicroscope. The separation of the specific region of TM was analyzed by haematoxylin-eosin staining of paraffin sections of the tissues after dissection. For further confirmation, F and NF regions were immunostained for the universal stem cell marker - ABCG2 and neural crest stem cell marker - p75. Images were acquired and analyzed in Leica SP8 confocal microscope

Results: Haematoxylin-eosin staining confirmed the separation of F and NF regions of TM from the donor tissues. Confocal microscopic analysis revealed higher expression of ABCG2 and p75 in the NF region compared to the F region.

Conclusions: The higher expression of stem cell markers only in NF region confirmed the separation of F and NF region from donor tissue. Further studies on the transcriptomic and proteomic profile are being carried out to identify the TM stem cell specific marker and associated signalling pathway.

BSP49

ADULT HUMAN ANTERIOR LENS EPITHELIAL STEM CELLS – CHANGES DURING AGEING AND IN CATARACT

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Purpose: We have earlier confirmed the presence of lens epithelial stem cells (SOX-2" Cx- 43") in the central zone and such cells were absent in the cataractous lens. This study aims to quantify and functionally characterize the adult stem cells with ageing and in cataract.

Methods: Donor lens of both normal (n=16) and cataract (n=3) were obtained from eye banks of Aravind Eye Care System. The whole mount of anterior lens epithelium was immunostained for SOX2 and Cx-43. Sequential confocal images were acquired and the percentage of stem cells were quantified. Lens epithelial explant cultures were established from central+germinative, transitional, equatorial zones and the label retaining cell (LRC) ability, a functional property of adult stem cells was analysed using BrdU along with SOX-2 expression.

Results: With aging there was no change in the proportion of SOX2" Cx-43 " stem cells:<30 years - 2.2+1.3%, 30-60 years - 2.3+1.1% and > 60 years - 1.3%. Upon culturing, LRCs (BrdU") expressing SOX-2 were observed to be located in central (23 years - 35%; 40 years - 18 %) and equatorial (47%; 20%) zones of normal donor lens. But the BrdU" SOX-2" cells were reduced and restricted to central zone (1.73+0.87%) in cataractous donor lens.

Conclusions: The mean percentage of lens epithelial stem cells remained the same with ageing. The absence of SOX-2" cells in native tissue and the reduction in the percentage of LRCs in cultured lens epithelial cells in cataractous lens indicates a probable role of these stem cells in cataract development which requires further analysis.

BSP50

MESENCHYMAL STEM CELL THERAPY FOR CHRONIC VERNAL KERATOCONJUNCTIVITIS: AN *IN VITRO* COMPARISON OF CYTOTOXICITY AND CORNEAL EPITHELIAL REPAIR POTENTIAL WITH ANTI-ALLERGIC DRUGS

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Purpose: Chronic recalcitrant vernal keratoconjunctivitis (VKC) is one of the most severe forms of allergic conjunctivitis which is often associated with vision-threatening complications that may eventually result in blindness. Current treatments including commercially available anti-allergic drugs are unable to provide complete cure and stop the recurrence of the disease. Moreover, their long-term use may have potential side-effects. Mesenchymal stem cells have shown promising therapeutic potentials due to their tissue repair and immunomodulatory properties. However, their role in mediating allergic ocular surface inflammation is poorly explored.

Methods: This study was approved by the institutional ethical committee (LEC 10-19-366). Human bone marrow-derived MSCs (BM-MSCs) and corneal epithelial cells (HCECs) were commercially procured, cultured, characterized, and maintained *in vitro*. Conditioned media from the cultured BM-MSCs (MSC-CM) was isolated and stored at -800C till further use. Cytotoxicity and epithelial repair potential of commercially available formulations of Bepotastine (Betoact, 1.5% w/v, Ajanta Pharma Ltd., India), Alcaftadine (Cafta™, 0.25% w/v, Sun Pharma Ltd., India), and Olopatadine (Winolap®Max, 0.7% w/v, Sun Pharma Ltd., India) were evaluated using Methyl Thiazolyl Tetrazolium (MTT)-based colorimetric assay, scratch assay, and microscopic observations *in vitro*; and compared with MSC-CM. HCECs cultured in DMEM-F12 or PBS were used as controls.

Results: BM-MSCs and HCECs were characterized as CD90+CD73+CD105+CD34- and CK3/CK12+, respectively. Compared with aforementioned anti-allergic formulations: MSC-CM treated HCECs showed decreased cytotoxicity, increased cell viability, and faster corneal epithelial repair.

Conclusion: MSC-CM showed reduced cytotoxicity and enhanced epithelial repair in corneal epithelial cells, relative to aforesaid anti-allergic formulations.

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BSP51

IDENTIFICATION OF SUITABLE CULTURE CONDITION FOR PROMOTION OF EXPRESSION OF CORNEAL EPITHELIAL CELL DIFFERENTIATION MARKERS IN TELOMERASE-IMMORTALIZED HUMAN CORNEAL LIMBAL EPITHELIAL (HCLE) CELLS

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Purpose: Telomerase-immortalized corneal limbal epithelial (HCLE) cells have been widely used for reprogramming studies in the context of the cornea. This study was undertaken to identify the culture conditions resulting in promotion of epithelial differentiation markers, with low expression of stemness markers. Cells in such a media could be used as starting cells for de-differentiation, followed by induction of differentiation into corneal epithelial cells.

Methods: HCLE cells were cultured under three culture conditions: (a) proliferation medium (HCLE P), (b) differentiation medium (HCLE D) and (c) stratification medium (HCLE S). Expression levels of markers for differentiation (*KRT 3, KRT 12, PAX6*), stemness (*ABCG2, p63*) and pluripotency (*OCT 4, SOX 2, NANOG*) were analyzed using real time PCR. Confocal microscopy was done to assess pluripotency markers. Alkaline phosphatase (ALP) activity was measured.

Results: HCLE P cells showed increased expression of *KRT 3* but lower expression of *PAX 6* as compared with HCLE D. Expression of *p63* was statistically lower in HCLE S than HCLE P and HCLE D, but *ABCG2* expression was found to be higher in HCLE S than HCLE P. HCLE S showed lower expression of *OCT 4* and *NANOG* as compared to HCLE P, D. HCLE S showed statistically increased ALP activity when compared with HCLE P, D.

Conclusion: HCLE S cells have lower expression of pluripotency and other stem cells markers as compared to HCLE P, D cells. Thus, HCLE S cells are more amenable for reprogramming studies.

BSP52

MOLECULAR INSIGHTS INTO THE NUCLEAR FUNCTION OF *RD3* AND ITS EFFECTS ON LCA12 DISEASE PATHOGENESIS

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Purpose: To investigate nuclear functions of *RD3*, apart from its known role in guanylate cyclase trafficking from inner to outer segments of photoreceptors.

Methods: A patient-specific iPSC line (*RD3-/-)* was generated from dermal fibroblast cells and differentiated into retinal cups. Microarray profiling was done to compare the transcriptome of control vs patient-derived retinal cups and a sub-set of differentially expressed transcripts was validated by qRT-PCR. *In-silico* analysis was done to predict the RNA binding ability of *RD3*. Some interactions were validated by cross-linked immunopulldown of RD3WT protein and RT-PCR-based evaluation of RNA components of ribonucleoprotein complex.

Results: Differentiation of healthy and patient-specific iPSCs resulted in normal eye-field development and formation of retinal cups at comparable timelines and efficiencies, suggesting early retinal commitment remains unaffected in patient-specific cells. Global gene expression analysis of iPSC-derived retinal cups revealed significant downregulation of several small non-coding RNAs belonging to C/D box SNORD 113 and 114 families in patient-specific tissues. Immunolabelling confirmed that the nuclear puncta of RD3 colocalized with PML bodies; a subset of them colocalized with Cajal bodies and NOP58 containing nucleolar compartments involved in snRNA biogenesis. RNA analysis of RD3WT protein immunopulldown complex confirmed the presence of some SNORDs, suggesting the existence of *RD3* in SNORD containing ribonucleoprotein complex.

Conclusions: *RD3* interacts either directly or as a part of multi-protein ribonucleoprotein complexes with SNORDs, and may be involved in the regulation of SNORD maturation, stability, trafficking, and function. Loss of RD3 may negatively impact several SNORD dependent cellular functions, which warrants deeper investigations.

BSP53

SILK FIBROIN MEMBRANES FOR ENGINEERING HUMAN CORNEAL ENDOTHELIUM

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Purpose: Engineering a monolayer of corneal endothelium(CE) for transplantation requires a suitable scaffold that is comparable to Descemet's membrane in its structural, optical, topographical, and functional aspects. This study aimed at determining the use of silk fibroin membrane as for engineering the CE.

Methods: Silk films derived from fibroin protein of *Philosamia ricini* (PR), *Antheraea Assamensis* (AA) and *Bombyx mori* (BM) were prepared. Adhesion of CE on silk films was quantified using MTT assay. Expression and localization of CE markers (collagen-VIII, ZO-1, N-Cadherin, Na/K-ATPase) was determined using PCR and immunostaining. Cell to matrix dynamics between CE and silk was assessed by studying the secreted extracellular matrix (ECM) proteins (Collagen-IV, Collagen-VIII, Laminin and fibronectin) and integrin expression (α2,α3,α5,αv,α6, β1,β3,β5) both at gene and protein levels. The function of cells on the films was assessed *in-vitro* by measuring permeability to FITC dextran (10kDa) and *ex-vivo* by assessing the reduction in corneal edema and regain of transparency post-perfusion.

Results: MTT assay showed the cell adhesion in following order- fibronectin-collagen1 coated dish>AA≥PR>BM ($p \leq 0.01$). CE cells formed a monolayer expressing all the specific markers. Integrins(α2,α3,α5,α6,β1andβ5) and ECM proteins(Collagen-IV, Collagen-VIII and Laminin) expressed by cells on AA and PR were comparable to the native tissue. Cells were able to establish barrier integrity *in-vitro* and a significant reduction of 100-200μm in corneal thickness was observed post-perfusion *ex-vivo.*

Conclusion: Our data suggests that AA and PR closely mimic the Descemet's membrane and might offer a suitable alternative for engineering CE for transplantation.

BSP54

ROLE OF PLACENTAL VASCULAR AND MOLECULAR CHANGES AT MATERNAL-FETAL INTERFACE FOR PREDICTING THE RISK OF DEVELOPING RETINOPATHY OF PREMATUTIRY IN PRETERM INFANTS

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Purpose: To determine the association if any between placental vascular and molecular changes at maternal-fetal interface and the risk of developing retinopathy of prematurity (ROP) in preterm infants.

Methods: We investigated the histopathological and gene expression changes from ROP (n=6), without ROP (n=7) and full-term (n=10) placentae. The maternal and fetal history was recorded on a pre-designed questionnaire. Correlation and regression analysis was used to find out association and t-test was performed to compare the gene expression analysis.

Results: There was a non-significant decrease in placental weight and diameter in preterm with ROP placentae (0.311±0.05kg; 18.42±0.61cm) compared to preterm without ROP (0.389±0.015kg; 18.75±1.25cm) and full-term (0.468±0.03kg; 19.01±0.3cm) placentae. Among maternal and fetal factors fetal distress, birth weight, placental weight, gestational age, fetal growth retardation and apnoeic spell were significantly ($p \leq 0.00$) associated with ROP. The histopathological changes were observe in all the preterm placentae 6/6 (100%) with ROP. Focal distal villous hypoplasia was observed in 3/6 (50%), thin elongated villi and increased syncytial knotting (tenny parker changes), focal overcrowding of chronic villi in 5/6 (83%), ghost villi in 2/6 (33%) of the placentae with ROP. Gene expression analysis for proinflammatory and anti-inflammatory markers showed that both IL4 and IL10 are downregulated in preterm with ROP cases compared to without ROP.

Conclusions: Our preliminary data shows the association of histopathological and molecular changes in the placentae with ROP. However, the findings of this study need to be validated on larger sample size.

BSP55

RB1 IS CRITICAL FOR ZEBRAFISH DEVELOPMENT AND SURVIVAL

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Purpose: To study the effects of *rb1* mutation on normal embryonic development retinal tissue formation and pathogenesis in zebrafish models.

Methods: Targeted knockout of *rb1* was attempted in zebrafish using the CRISPR-CAS9 gene-editing. *rb1* specific CRISPR-gRNA and CAS9 was injected as RNP complexes into single cell stage embryos. The developing larvae were screened by tail-fin clip DNA isolation, followed by PCR and Sanger sequencing. The founder fishes (F0) carrying the genomic edits were backcrossed with *wt* animals to obtain F1 heterozygotes. Interbreeding of F1 resulted in 1:2:1 ratio of mutation segregation. Histological evaluation of the eye and retinal tissues was done by H&E staining.

Results: We have identified F1 heterozygous mutants containing four different types of in del edits, disrupting either the start codon within the *rb1* exon1, or few bases upstream. Absence of one allele of *rb1* did not affect the normal development or fertility of mutant fishes. The histology of *rb1+/-* zebrafish retinas was checked at 3, 6 and 12 months and showed no abnormal growth or tumor formation. The retina of mutant animals developed normally and was comparable to that of *wt* fishes. However, absence of both the alleles of *rb1* in F2 homozygotes resulted in lethality of the developing larvae, which could survive only for upto 10 days post-fertilization.

Conclusions: Presence of at least one normal allele of *rb1* is necessary for the survival and normal retinal development in zebrafish. The effects of total loss of *rb1* on retinal development, maturation and tumorous transformations needs further investigations

BSP56

ROLE OF BONE MARROW MESENCHYMAL STEM CELLS-DERIVED EXTRACELLULAR VESICLES IN CORNEAL REPAIR

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Purpose: Corneal injuries resulting in damage to cornea and its constituent layers may compromise vision and lead to blindness. Mesenchymal stem cells (MSCs) are known for their corneal repair and immunomodulation properties and extracellular vesicles (EVs) derived from them are thought to possess similar properties. However, the role of MSC-derived EVs in the corneal repair is largely unknown.

Methods: This study was approved by the institutional ethical committees (LEC-BHR-P12-20-559 and LVPEI-IC-SCR-05-21-007). Human bone marrow-derived MSCs (BM-MSCs) and corneal epithelial cells (HCECs) were commercially procured, cultured, characterized, and maintained *in vitro* as per the manufacturer's instructions. EVs were isolated from starved (for 24 hours) BM-MSCs media using differential ultracentrifugation and Total Exosome Isolation reagent (Invitrogen). The isolated EVs were quantified using EXOCET (System Biosciences) and characterized for protein expression of Tetraspanins (CD63, CD81), a cytosolic marker (TSG101), and an endoplasmic reticulum related protein Calnexin using Western blotting; for size and morphology using Scanning and Transmission Electron Microscopes, and Dynamic Light Scattering, as per the Minimal Information for Studies of Extracellular Vesicles 2018 guidelines. Epithelial wound healing potential of BM-MSC-EVs was determined by scratch assay with HCE cells *in vitro*. Non-EV
treated HCECs were used as control.

Results: The isolated BM-MSC-EVs (1.5 X 107 EVs/µl) were spherical (~ 50-200 nm) and characterized as CD63**+**, CD81**+**, TSG101**+**, and Calnexin- . The wounded HCECs treated with BM-MSC-EVs showed faster healing compared to control.

Conclusion: BM-MSC-derived EVs have potential to promote healing of the wounded corneal epithelium *in vitro,* following injury.

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BSP57

LIMBAL TRANSPLANTATION IN PERSISTENT CORNEAL EPITHELIAL DEFECT RABBIT MODEL

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Purpose: The purpose of the study was to develop a persistent corneal epithelial defect (PCED) in an animal model and to study the epithelial regeneration potential of allogeneic simple limbal epithelial transplantation (allo-SLET) and conjunctival limbal allograft (CLAL). This can help assess new therapeutics in the future.

Methods: After 360° limbal peritomy, the entire corneal and limbal epithelium of New Zealand White Rabbits (n = 10) was mechanically debrided with an Alger brush-II 1.0-mm round-ended burr and examined for corneal haziness, vascularization, and epithelial defects. Using a donor graft from the Dutch-Belted rabbit, allo-SLET without human amniotic membrane and CLAL were performed 4–8 weeks post debridement. The extent of epithelialization was correlated by measuring the change in the central corneal epithelial thickness (CCET) using anterior segment optical coherence tomography (AS-OCT).

Results: Epithelial defects were persistent in all the eyes up to 4 weeks, post which 70% of them showed superficial neovascularization. However, it reached the central cornea only in 42% of them. Even 5 weeks post debridement, the epithelial defect was observed in 70% of the eyes. Both the cases showed stable grafts with no rejection up to 3 months as well as epithelial migration till 3 weeks. Post transplantation, allo-SLET treated eyes showed a significant increase in CCET when compared to CLAL.

Conclusions: Persistent corneal epithelial defects were effectively established using alger brush-II in New Zealand white rabbits. Limbal allograft transplantation leads to significant corneal epithelialization in PCED, especially in allo-SLET.

BSP58

AGE-RELATED CHANGES IN THE FUNCTIONAL CHARACTERISTICS OF ADULT STEM CELLS IN HUMAN RETINAL PIGMENT EPITHELIUM

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Purpose: We have previously identified the presence of cells with high proliferative potential and label retaining property of adult stem cells in the periphery of human Retinal Pigment Epithelium (RPE). This study aims to analyze the age-related changes associated with RPE stem cells.

Methods: Donor eyes from three different age groups: <30, 30-60 and >60 years (n=5/group), were received from the eye banks of Aravind Eye Care System. Cells from either total or from three regions of RPE (Peripheral, Equatorial and Central) were isolated mechanically by brushing off the cells, trypsinised and subjected to sphere formation assay, clonal analysis and BrdU label retaining assay.

Results: Analysis of different regions of RPE confirmed that cells with the ability to form spheres and clones were restricted to the peripheral RPE. Such cells with sphere forming ability were observed only in young donors (<30 years=2.35±0.19%) and cells with clonal ability reduced with ageing (<30 years=23.13±2.55%, 30-60 years=11.62±2.25%, >60 years=2.41±1.51%). Similarly, a decrease in the percentage of label retaining cells expressing the stem cell markers KLF4 and CMYC was observed in the periphery (<30 years=11.5±3.95%, 30-60 years=7.3±0.76%, >60 years=1.5±0.71%). Such label retaining cells were also identified in the equatorial zone but only in young donors (<30 years=4.25±0.29%). The central RPE
cells did not express any of the functional characteristics of adult stem cells.

Conclusions: With ageing, a reduction in RPE stem cells was observed. Further studies are essential to elucidate whether this reduction is associated with the pathogenesis of age-related macular degeneration.

BSP59

ANALYSIS OF THE BACTERIAL DIVERSITY COMPOSITION IN ALLERGIC CONJUNCTIVITIS

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Purpose: Allergic conjunctivitis is a common ocular surface disease resulting from an inflammatory response of the conjunctiva to an allergen which is one of the common ocular surface diseases. The purpose of the present study is to compare the ocular surface bacterial diversity composition in allergic conjunctivitis and healthy individuals.

Methods: Bacteria were isolated from all the conjunctival swabs of healthy individuals (HC, n=20) and those with allergic conjunctivitis (AC, n=10). The sample was plated on nutrient agar and blood agar and incubated at 37°C for 24-48 h. The DNA from the isolates was used to amplify 16S rRNA gene and later identified by using Sanger sequencing and BLAST search approach. Significant changes in the bacterial diversity between HC and AC was analysed by statistical analysis. p-value is calculated by ANOVA test.

Results: In total 14 bacterial genera and 26 bacterial species were isolated from all the conjunctival swabs. 8 bacterial genera namely *Acinetobater, Aneurinibacillus, Bacillus, Cloacibacterium, Corynebacterium, Micrococcus, Pseudomonas* and *Staphylococcus* were isolated from HC. Similarly, 6 genera such as *Bacillus, Corynebacterium, Exiguobacterium, Kocuria, Pseudomonas* and *Staphylococcus* were isolated from AC samples. *Staphylococcus epidermidis* that accounted for 39% of the total diversity in AC was significantly higher in AC samples compared to HC ($p<0.05$).

Conclusions: The results of the study indicate significant decrease in the bacterial diversity composition in AC patients compared to healthy. However, there was an increase in the composition of pathogenic and biofilm forming isolates which may indicate characteristic of the microbiota in AC.

BSP60

DYSBIOSIS OF INTRA-OCULAR MICROBIOME IN PATIENTS WITH DIABETES AND DIABETIC RETINOPATHY – A PRELIMINARY STUDY

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Purpose: To compare the intraocular and gut microbiome of people with diabetes mellitus (DM) and diabetic retinopathy (DR) with healthy individuals.

Methods: Aqueous humor (AH) and stool samples were collected from people with
DM without and with DR and healthy controls (HC) undergoing surgery on naïve eyes. Metagenomes were extracted, microbiomes were generated and analyzed by
QIIME and R. Using a pre-validated questionnaire, healthy diet scores were assigned.

Results: Compared to HC individuals, dysbiosis was observed at both phyla and genera levels in the AH microbiomes from people with DM, and DR. Heat map analysis with discriminatory genera indicated that the microbiomes of HC, DM, and DR formed 3 distinct clusters. Interaction networks revealed the presence of several hub genera unique to either HC, DM, or DR groups. In addition, a comparison of AH
microbiomes with the respective gut microbiomes in DM and DR groups revealed several genera unique to the eye or the gut. There was a consistent reduction in the
abundance of anti-inflammatory bacteria in the DR than in the DM group.

Conclusions: This investigational study provides early information on the intra ocular vis-à-vis the gut microbiome. It showed dysbiosis in intraocular fluid (AH in this study) of people with DM and DR. Further analysis with larger sample and ethnic diversity could further confirm these preliminary findings.

BSP61

IS NEXT GENERATION SEQUENCING A PROMISING TOOL IN THE DIAGNOSIS OF ENDOPHTHALMITIS?

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Purpose: To evaluate the diagnostic utility of targeted next-generation sequencing (NGS) in diagnosing infectious endophthalmitis.

Methods: Vitreous fluid collected from patients with clinical diagnosis of post-operative infectious endophthalmitis between April 2019 and April 2022 was processed by traditional microbiology and NGS techniques. Conventional tests included aerobic and anaerobic culture of bacteria and fungi and were subsequently identified using Vitek-2 and lactophenol cotton blue wet mount, respectively. NGS technique included DNA extraction using Qiagen mini kit afterward amplification of V3–V4 regions of the bacterial and ITS 4 regions of the fungal genome by PCR, and deep sequencing on Illumina HiSeq 2500 machine. Paired reads were curated, taxonomically labelled, and filtered.

Results: Thirty-three vitreous samples from 100 clinically diagnosed endophthalmitis patients were culture positive; it included 29 bacteria and 4 fungi. All these samples were also positive by NGS. Additionally, 34 culture-negative samples also showed presence of organisms by NGS; including 26 bacteria (predominantly *Staphylococcus* spp, n=14*)*, 6 fungi (predominantly *Aspergillus* spp, n=3), and 2 mixed infections. Also, NGS allowed the detection of polymicrobial infections in many culture-negative samples (18/34; 52.9%) and a few culture-positive samples (9/33; 27.2%). Thus, together with conventional culture and NGS, microbiology positivity was 67% (33+34 of 100); including 55 bacteria and 10 fungi. The ability to detect microorganisms was statistically higher in NGS. *(p=0.005).*

Conclusions: The NGS is currently evolving into a molecular tool for identifying pathogens in postoperative endophthalmitis. Currently, cost is the main challenge. The conventional culture is still required for antibiotic susceptibility testing.

BSP62

IN-VITRO INFECTION MODELS OF FUNGAL AND AMOEBIC KERATITIS REVEAL HOST CELL-TYPE AND PATHOGEN SPECIFIC FEATURES OF HOST INFLAMMATORY RESPONSE

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Purpose: Therapeutic management of inflammation in infectious keratitis requires new strategy and targets for immunomodulation in a pathogen specific manner. In this study, we explore the possibility of pathogen and host cell-type dependent differences in the inflammatory pathways to identify potential immunomodulatory targets.

Methods: We have used human corneal epithelial cell line (HCEC) and PMA differentiated THP-1 macrophage line to infect with either *Aspergillus flavus* conidia or *Acanthamoeba* trophozoites and studied the pro-inflammatory factors IL-8, TNF-α and an upstream regulatory protein- Macrophage Migration Inhibitory Factor (MIF) by real-time PCR and ELISA. Also, we tested MIF's role in infection induced inflammation by siRNA knockdown in both cell lines.

Results: We found that both *A. flavus* and *Acanthamoeba* infection induces IL-8 and TNF α response in HCECs and THP-1 macrophages but to different levels. While MIF gene expression remained largely unaffected, MIF release by these cells were strikingly different, both in normal and infected conditions. Infection blocked the constitutive release of MIF by the HCECs while the THP-1 macrophages were stimulated to release MIF only during infection. Knocking down MIF by siRNA suggested that MIF partially contributes to IL-8 and TNF-α upregulation in HCECs but not in THP-1 macrophages, during fungal infection. In contrast, *Acanthamoeba* infection resulted in a dramatic increase in IL-8 and TNF-α expression in MIF depleted THP-1 macrophages.

Conclusions: These data imply a host cell-type and pathogen specific distinction in the MIF- related inflammatory signalling and MIF as a potential selective immunomodulator in infectious keratitis.

BSP63

TEAR BACTERIAL MICROBIOME IN THE AQUEOUS DEFICIENT DRY EYE DISEASE

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Purpose: To understand the bacterial microbiome associated with aqueous deficient dry eye disease (ADDE) compared to healthy.

Methods: Bacterial microbiome was generated from the DNA of tear samples of healthy (n=34) and ADDE (n=45) individuals. Sequencing of V3-V4 region of 16S rRNA gene was performed on the Illumina HiSeq2500 platform. Reads were processed in QIIME to assign the taxa. Statistical analysis of the healthy and ADDE microbiome was done in R to assess the alpha diversity and beta diversity indices. Significant changes between the healthy and ADDE cohorts were depicted by principal coordinate analysis (PCA), differential abundance and Network Analysis.

Results: Tear microbiome was generated in healthy and ADDE samples. ADDE cohort was sub categorised into Sjogren's syndrome (SS, n=17) and Non Sjogren's syndrome (NSS, n=28) cohorts. Phylum ***Actinobacteria, Firmicutes, Bacteroidetes*** showed significant changes in ADDE compared to healthy. Genera ***Lactobacillus*** and ***Bacillus*** were predominantly present in both healthy and ADDE cohorts. PCA and heat map analysis showed distinct cluster for SS and NSS from healthy cohort. Genera ***Prevotella, Coriobacteriaceae, Enterococcus, Streptomyces, Rhodobacter, Ezakiella*** and ***Microbacterium*** significantly increased in abundance in ADDE compared to HC cohort. Bacteria-bacteria interaction of SS, NSS and healthy cohorts were predicted by CoNet network analysis. This analysis predicted major hub of interaction for the pro-inflammatory bacterium ***Prevotella*** in SS and NSS cohort.

Conclusions: The results of the study indicate significant changes in the phyla and genera in ADDE patients compared to HC. Both discriminative analysis and network analysis indicated possible association of predominant pro-inflammatory bacteria with ADDE.

BSP64

NANOFIBRILLATED CELLULOSE CARRIER FOR TREATING BACTERIAL KERATITIS

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Purpose: Bacterial keratitis is one the major cause for blindness in the developing countries caused due to Staphylococcus aureus, Pseudomonas. They can form biofilms on corneal surface which is challenging for antimicrobials as they inhibit the penetration of antibiotics due to their extracellular matrix. We propose to fabricate moxifloxacin loaded nano-fibrillated cellulose (NFC) carrier for deep penetration of drug in biofilm, aiding in its elimination.

Methods: Moxifloxacin loaded NFC particles were prepared by citric acid hydrolysis of softwood pulp followed by its surface oxidation. It was characterized for entrapment efficiency and invitro drug release. Staphylococcus aureus biofilm grown in 96-well plate was treated with NFC ± moxifloxacin followed by crystal violet staining (CVS) and colony forming unit (CFU) to assess the invitro biofilm inhibition potential. Bacterial keratitis was developed in Wistar rat by intrastromal injection of S. aureus. Treatment (topical drops) was started immediately after infection and slit-lamp examination was performed. Rats were sacrificed after 48h, eye was enucleated and subjected to histology and CFU. Results: The prepared particles showed 90% drug entrapment with complete drug release in 48h. CVS and CFU showed the ability of moxifloxacin loaded NFC to reduce the biofilm by 60% in invitro assays. Preliminary invivo studies also showed the potential of moxifloxacin loaded NFC to be effective in treating bacterial keratitis.

Conclusions: The developed NFC particles were able to prevent bacterial keratitis. However, further *in vivo* studies are ongoing to establish the role of nano-fibrillated cellulose particles to eradicate bio-film in corneal infections.

BSP65

EVALUATION OF PROBABLE OCULAR ALTERATION DUE TO THE ACUTE EXPOSURE OF 95GHZ MILLIMETER WAVES

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Purpose: This study was performed to assess any probable ocular changes due to the acute exposure of 95 GHz millimeter waves (MMW).

Methods: The power density at various distances was calculated from the MMW source antenna to optimize the approximate point of 95Ghz MMW delivery to rodent eye. Ex-vivo ocular dosiometry study was performed on the goat eye for the acute different power density and exposure duration for 0.1, .025, 0.50, 1.0 W/cm2 for 1, 2, 3 seconds. The thermal injury extent and rise in temperature on ocular surface was assessed using the IR camera. For assessing the 95Ghz MMW effect on the vision, gold fishes were exposed to 0.1, .025, 0.50,1.0 W/cm2 for 1, 2, 3 second. The behavioral pattern and protein changes were analyzed using Gyro-Dot-Optomotor response and SDS-PAGE, respectively.

Results: The power density had a negative correlation with the distance and diverging angle from the MMW source antenna. The acute exposure of 0.1, .025, 0.50, 1.0 W/cm2 for 1, 2, 3 seconds on goat eye did not cause any noticeable changes in the ocular surface or rise in the temperature. Of note, the acute exposure of variable power density and exposure duration of MMW did not alter the behavioral response of gold fishes at various color. Further no noticeable changes were observed in protein profiling using SDS-PAGE.

Conclusions: The acute exposure of 95Ghz MMW does not cause any acute ocular changes. However, further chronic studies are in progress to rule its probable altered effect on eye.

BSP66

EFFICACY OF PHOSPHODIESTERASE-4 INHIBITOR TO TREAT ANTERIOR UVEITIS IN INVIVO MODEL

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Purpose: Anterior uveitis is caused due to inflammation in the iris-ciliary body and corticosteroids are the current standard of care. However, they possess side-effects such as cataract and increased intraocular pressure. In the current study, we determined the efficacy of apremilast - phosphodiesterase 4 (PDE4) inhibitor to treat anterior uveitis by regulating the T-regulator and T-effector cell balance. To improve its poor solubility, corneal permeability and ocular bioavailability apremilast was loaded into nanomicelles.

Methods: Apremilast nanomicelles were prepared by thin film hydration method and characterized. Endotoxin induced uveitis was developed in male Wistar rats and treated topically (3 times/day) with apremilast nanomicelles (0.5% and 1%), plain apremilast (0.5% and 1%), and prednisone (1%). The animals were sacrificed at 30h and invitro assays were performed to evaluate the efficacy of apremilast.

Results: Topical apremilast loaded nanomicelles significantly decreased the infiltrated cell count and protein accumulation in aqueous humor. The particle size, zeta potential and entrapment efficiency of prepared nanomicelles (0.5%) was found to be 11.57 ± 0.18 nm, -13.03 ± 0.38 mV and 92.93 ± 0.68 % respectively. Invitro drug release shows sustained release of apremilast upto 72 h. In 6 h, 20.78 ± 4.91µg/cm2 of the drug was permeated through the goat cornea for 0.5% apremilast micelles. Ocular irritation score 2, indicates no irritation.

Conclusions: 1. Apremilast inhibits the lipopolysaccharide induced inflammatory response in eye, therefore could be an alternative to treat anterior uveitis without increasing intraocular pressure. 2. Poor solubility and permeability of apremilast was improved by nanomicelles.

BSP67

COMPARATIVE STUDY OF TRANSFEROSOMES AND LIPOSOMES FOR IMPROVING TRANSCLERAL DELIVERY

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Purpose: Liposomes are lipid bi-layered structures which are relatively rigid in nature compared to transferosomes, due to the presence of edge activators which imparts elasticity to the lipid vesicles. In this study, we aim to compare liposomes and transferosomes as a carrier for transscleral permeation.

Methods: Transferosomes and liposomes were prepared using thin-film hydration method. The surfactants – span 60 and tween 80 were screened based on their deformability. A flexibility study was conducted using lipid extruder with the optimised formulations of transferosomes and liposomes. The ex-vivo permeation study was performed using porcine sclera with fluorescein isothiocyanate (FITC)-loaded liposomes and transferosomes. The samples were collected at various time points and analysed using spectrofluorometer.

Results: The formulation was optimised and tween 80 was selected to prepare transferosomes. Transferosomes did not show size reduction when passed through 0.2µ (Before = 175.2 nm, after = 162 nm) and 0.08µ filters (Before = 175.2 nm, after = 174.4 nm) in contrast to liposomes when passed through 0.2µ (Before = 1203 nm, after = 115.6 nm) and 0.08µ filter (Before = 1203 nm, after = 87.34 nm). The amount of encapsulated FITC permeated through sclera for liposomes is 16.44 µg/mm2 and for transferosomes is 19.48 µg/mm2.

Conclusions: Though transferosomes were seen to be more flexible than liposomes, the amount of permeation of FITC (model drug) from both the carrier systems was similar. This shows the higher flexibility of transferosomes could not influence the permeation of the encapsulated model drug.

BSP68

ALPHA B CRYSTALLINE MINIPEPTIDE ATTENUATES INFLAMMATORY AND STRESS RESPONSE TO RETINAL INJURY.

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Purpose: To evaluate the intravitreal use Alpha B Crystalline minipeptide for ameliorating inflammation incited by retinal injury.

Methods: Retinal injury was induced in one eye of New Zealand white rabbits. The eyes received either 0.2ml of PBS or equivalent volume of PBS containing alpha B crystalline peptide, by intravitreal injection immediately after inducing the retinal injury. The inflammatory response was monitored clinically, by gene expression of signature proteins, histopathology and by immunohistochemistry.

Results: There was significant reduction in gene expression of inflammatory cytokines and oxidative stress markers $p>0.5$. Histopathology revealed reduced inflammatory response with the therapy. Glial fibrillary acidic protein (GFAP) positive cells in the retina and vitreous were enhanced in the untreated vs the treated eye.

Conclusion: Alpha B crystalline minipeptide subdues post injury inflammation and oxidative stress in the retina, and may pave way for prevention of proliferative vitreoretinopathy.

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BSP69

EVALUATION OF THE EXPRESSION OF PEPTIDE TRANSPORTERS IN OCULAR TISSUES

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Purpose: Novel peptide-based drugs are having a potential role in the treatment of ocular diseases. Therefore, studying peptide transporters in ocular tissues is important to understand their role in the ocular pharmacokinetics of xenobiotics.

Methods: Healthy rabbits of either sex weighing 2-2.5Kg were used for the experiment. Rabbit ocular tissues viz cornea, sclera, conjunctiva, iris-ciliary body, and retina-choroid were isolated for PEPT1, PEPT2, PHT1 and PHT2. The expression of these peptide transporters in ocular tissues of the rabbit eye were characterized by PCR. The conventional protocol was used for the extraction of mRNA, which was further reverse transcripted into cDNA (using a commercial kit). Gene-specific primers were designed using NCBI's primer blast tool. The amplified PCR products were run on 1.2% agarose gel and visualized using ethidium bromide intercalating dye.

Results: The study revealed that ocular tissues extensively expressed peptide transporters. The ocular tissues such as retina-choroid, conjunctiva and sclera were found to have the highest expression of PEPT1. Whereas the expression of PepT2 was observed in all the ocular tissues.

Conclusion: Regional variation of the expression of PEPT1 and PEPT2 transporters in eye indicates the possibility of alteration in the ocular pharmacokinetics. These transporters can be exploited for peptide based therapy in ocular therapeutics. Further functional studies are in progress with selective substrates.

BSP70

COMPARISON OF CORNEAL DENSITOMETRY DATA OF HUMANS AND RABBITS USING DIFFERENT SCHEIMPFLUG DEVICES

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Purpose: To compare and normalize the corneal densitometry of rabbits and humans to be used in pre-clinical trials.

Methods: Two-month-old, 2-2.5 Kg New-Zealand Male rabbits were used in this study, and for humans, healthy individuals of 25-35 years of age were imaged using Pentacam, Galilei-G4, and RTVue. The densitometry values were collected from Scheimpflug devices and pachymetry values from all the devices. The inter-species difference in densitometry was compared between them to use it in translational studies.

Results: The densitometry values in rabbits are higher than the humans. This trend was confirmed by both Scheimpflug devices but the values on both the devices are different from each other for every individual. To validate the accuracy of the devices, pachymetry values from Pentacam, Galilei-G4 and RTVue were compared. The inherent difference was found in all the devices. The data trend was comparative and consistent but the difference between the values of Pentacam and Galilei-G4 is substantial, higher for Galilei-G4.

Conclusions: The normalization of the densitometry data is done which could be directly translated from rabbits to humans. After the comparative data, we can also conclude that Pentacam is a better device for densitometry as the data was comparative, and it is already established in normal clinical practice.

BSP71

DECIPHERING THE PROTEOME SIGNATURE OF PLASMA EXTRACELLULAR VESICLES FROM PROLIFERATIVE DIABETIC RETINOPATHY PATIENTS

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Purpose: Extracellular vesicles (EVs) are lipid-encased nanoparticles secreted from all cell types and participate in various physiological processes. They carry nucleic acids, proteins and lipids from the producing cell, travel through the circulation, and can alter the recipient cells' proximal/distal cell fate. While the role of EVs in tumour biology has been established, their role in angiogenic eye disorder diabetic retinopathy is largely unexplored. This study aims to evaluate the proteome signature of plasma EVs from patients with proliferative diabetic retinopathy (PDR).

Methods: EVs were isolated from plasma of PDR patients and patients with macular hole (MH) by ultracentrifugation and column-based method. EVs were characterized by Nanoparticle Tracking Analysis (NTA), Transmission Electron Microscopy and immunoblotting. Proteomic analysis was done using shotgun mass spectrometry (LC/MS).

Results: Using proteomic analysis, we have identified 149 and 162 common EV proteins from patients with PDR and MH respectively, where EVs were extracted by two independent isolation techniques. Bioinformatics analysis revealed that plasma EV proteins from PDR patients are involved in tumour progression, anti-oxidant activity, glucose homeostasis/insulin resistance, inflammasome activation and cell-cell adhesion. Interestingly, we found quantitative differences by NTA in plasma EVs depending on choice of EV isolation method. Furthermore, we discovered changes in proteome signatures depending on EV isolation method, which was shown to be broadly the case irrespective of the source of EVs.

Conclusions: We have identified for first time the specific protein signature of EVs from plasma of PDR patients and compared the differentially represented EV proteins in the MH patient.

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CSP01

RASCH ANALYSIS OF QUALITY OF LIFE IN CHILDREN WITH VERNAL KERATOCONJUNCTIVITIS AMONG INDIAN CHILDREN WITH VERNAL KERATOCONJUNCTIVITIS

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Purpose: This study aims to assess the psychometric properties of the Quality of Life (QoL) in Children with Vernal Keratoconjunctivitis (QUICK) among Indian children with Vernal Keratoconjunctivitis (VKC) using Rasch analysis.

Methods: This study was conducted in a tertiary eye care center in Chennai, India. Children diagnosed with VKC aged between 5 and 15 years who were able to respond to the questionnaire were included and a trained interviewer administered the QUICK questionnaire (daily activities-4 items/symptoms-12 items). The psychometric properties were assessed based on six indicators: rating scale behavior, precision measurement, item fit, unidimensionality, targeting and Differential Item Functioning (DIF).

Results: Fifty-six children with VKC (Mean age 10.53 years and 77.78% males) filled the questionnaire. The rating scale of the overall QUICK questionnaire (16 items) showed an ordered threshold, there was no noticeable DIF and excellent person-item targeting (0.56). However, the questionnaire showed inadequate person separation, four misfit items and lack of unidimensionality(2.80). Removing misfit items and contrasting items restored unidimensionality(2.02) leaving nine items related to symptoms in the questionnaire but the person separation continued to be poor(Person Separation Index: 1.52 and Person Separation Reliability: 0.70). Subscale analysis of daily activities (4 items) did not form a measure while results of symptoms (12 items) subscale showed similar to the results of overall QUICK questionnaire analysis.

Conclusions: QUICK questionnaire requires modification to be used as a tool to assess Quality of Life among Indian children with VKC. This questionnaire requires addition of items in all the domains pertaining to measure QoL and to validate using Rasch analysis for its psychometric properties.

CSP02

COMPARISON OF CYCLOPHOSPHAMIDE WITH ADRIAMYCIN INDUCED OCULAR SURFACE CHANGES WITH OTHER CHEMOTHERAPY DRUGS IN BREAST CARCINOMA – A CROSS-SECTIONAL STUDY

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Purpose: To evaluate and compare the ocular surface changes in patients undergoing chemotherapy for breast cancer.

Methods: Patients were divided into two different groups: cyclophosphamide (CTX) with Adriamycin (ADR) (Group II; n=18), and other group received chemo therapy other than CTX and ADR (Group I; n=21). OSDI questionnaire was administered. Schirmer's I & II, TBUT, and anterior segment examination were done.

Results: 4 out of 21 patients in group I and 1 out of 18 patients in group II had dry eye symptoms as per OSDI. The mean value of Schirmer's I & II in group I RE is 25.76±9.63 and 20.80±9.12; p=0.004* and for LE is 27.19±9.15 and 21.47±8.97; p=0. 004*. In Group II RE is 31.44±5.64 and 28.44 ±7.77; p=0.003*; LE is 31.5. ±4.60 and 28.38±6.14; p=.05. Schirmer's II value did not reduce significantly in group II compared to group I p=.004*, p=.01* for RE & LE respectively. The mean TBUT value for group I RE is 9.21±4.96, LE is 9.41±4.78. The mean TBUT value for group II RE is 9.00±3.83, LE is 9.22±4.91. 14 out of 18 patients in group II and 9 out of 21 patients in group I had corneal epithelial staining. Significant association between corneal toxicity and group II drugs p=.02*. No significant association was seen between the number of chemo cycles and corneal toxicity in both groups p=0.83, p=0.69, respectively.

Conclusions: Strong association of asymptomatic corneal toxicity in patients with CTX and ADR combination among breast carcinoma patients. Need further studies with larger cohort.

CSP03

CORNEAL DENSITOMETRY IN CONGENITAL HEREDITARY ENDOTHELIAL DYSTROPHY: A NOVEL ATTEMPT TO CLASSIFY CORNEAL CLOUDING

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Purpose: To objectively quantify cloudy corneas in children with CHED and correlate clinically

Methods: Retrospective, the case-control study consists of 55 cloudy corneas of 32 children with CHED compared with 35 clear corneas of 18 age-matched healthy controls. Corneal clouding was objectively measured (corneal densitometry) with the Scheimpflug imaging system and subjectively evaluated using slit-lamp images of the cornea and correlated with central 4 mm area densitometry. Central corneal thickness (CCT) was assessed using anterior segment OCT.

Results: Corneal cloudiness was categorized into mild (29 eyes), moderate (20 eyes), and severe (6 eyes) based on the visibility of iris details. The mean age at imaging was 9.7 ± 5.9 years. Seventeen (53.1 percent) were females. The mean best corrected visual acuity and CCT at the time of investigation was 1.24 ± 0.67 Log MAR and 1038.3 ± 105.3 µm, respectively. Mean Central 4mm area densitometry in CHED was significantly higher than age-matched healthy controls (37.2 ± 1.5 vs 15.0 ± 1.9, $p < 0.0001$). A comparative analysis of densitometry measurements showed a statistically significant difference among three clinical gradings ($p<0.0001$). CCT and Log MAR visual acuity were correlated with densitometry measurements (all, $p<0.0001$). Age at investigation and gender ($p= 0.32$ and $p=0.19$) did not show any correlation with area densitometry.

Conclusions: A scheimpflug imaging-based densitometry assessment is a robust tool for ascertaining corneal clouding in patients with CHED. There was concordance between clinical grading and objective assessment.

CSP04

IMPACT OF AIR POLLUTION AND UV RADIATION ON THE OCULAR SURFACE AMONG DRIVERS

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Purpose: Quantification of the conjunctival damage and evaluation of impact of ambient air pollution exposure and lifetime ocular UV exposure among drivers and its associated ocular diseases such as cataract, pterygium and pinguecula.

Methods: Subjects >21 years of age engaged in driving, and consent to participate were enrolled based on inclusion and exclusion criteria. A standardized questionnaire was administered to assess the lifetime ocular UV exposure and erythemal UV dos were noted from satellite service. Air quality index (AQI) for place of occupation was measured with Aeroqual500 pollution monitor. Standardized autofluorescence photographs of the nasal and temporal conjunctiva were taken by the CUVAF tool and were assessed for damage that indicate conjunctival cellular changes. Tear levels were measured by Schirmer's 1 and tear break-up time test.

Results: Total of 205 male participants, including 182 (88.8%) auto-drivers, 22 (10.7%) car-drivers and 1 (0.5%) bus-driver were recruited. The mean age was 47±8 years. The average hours of driving were 9 ± 3.1. The median conjunctival damage was significantly different among diseased 23.5mm2 (IQR - 32) and normal 12mm2 (IQR - 26) p = < 0.001. Schirmer's test showed difference in normal 24.6mm (± 9.6) and diseased categories 27.7mm (± 8.9), p =0.02. There was significant difference in exposure levels of air pollution among normals (AQI-88), cataract (AQI-118.1), pinguecula (AQI-80.4) and pterygium (AQI-100.5), p<0.001.

Conclusions: Exposure to ambient air pollution impacts the tear quantity and chronic UV exposure is associated with conjunctival damage as a part of an adaptive ocular surface response.

DELIVERY OF RESVERATROL USING COMMERCIAL CONTACT LENSES FOR DRY EYE DISEASE MANAGEMENT

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Purpose: To investigate the uptake and delivery of the anti-inflammatory drug Resveratrol by commercially available contact lenses for dry eye disease management.

Methods: Five different types of commercially available contact lenses, 4 lenses in each group, were investigated, including 3 silicone hydrogels and 2 conventional hydrogel lenses. Lenses were soaked in 0.01% resveratrol solution for 24 h, and the concentration of resveratrol in the solution was determined by UV absorbance at 305 nm at specific intervals. Lenses were placed in 0.9% buffered saline and the release of drug was measured over 72h at 305 nm.

Results: Silicone hydrogels demonstrated stronger affinity for resveratrol with higher loading and a sustained release rate as compared to the conventional hydrogel. These lenses demonstrated resveratrol release for upto 6 h while maintaining an optimum concentration required for the management of inflammation in dry eye disease.

Conclusions: The findings of this study suggest that commercially available silicone hydrogel contact lenses may be ideally suited as a resveratrol delivery system in a daily wear scenario for dry eye management.

CSP06

A GOAT EYE, WET LAB MODEL FOR TRAINING IN DESCEMETS MEMBRANE ENDOTHELIAL KERATOPLASTY

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Purpose: To describe a new, non-human, *ex vivo* model (goat eye model) for training surgeons in DMEK surgeons

Methods: In a wet lab setting, goat eyes were used to obtain a pseudo-DMEK graft of 8mm from the goat lens capsule that was injected into another goat eye with the same manoeuvres described for human DMEK.

Results: The DMEK pseudo-graft can be easily prepared, stained, loaded, injected and unfolded into the goat eye model reproducing the similar manoeuvres used for DMEK in a human eye, except for the Descemetorhexis, which cannot be performed.

Conclusions: The pseudo DMEK graft behaves similar to human DMEK graft and useful for surgeons to experience and understand steps of DMEK early in learning curve. The concept of a non-human *ex vivo* eye model is simple and reproducible and obviates the need for human tissue and the issues of poor visibility in stored corneal tissue.

CSP07

STABLE, CLEAR NANOMICELLES FOR ENHANCED CORNEAL PERMEATION OF NATAMYCIN

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Purpose: Natamycin is a FDA approved drug to treat fungal keratitis and is available as 5% suspension, which has poor ocular bioavailability and high dosing frequency. Formulating topical natamycin into nanomicelles (Natcel) could help to overcome the drawbacks associated with the suspension – solubility and corneal permeability.

Methods: 1% natamycin loaded nanomicelles were formulated by thin film hydration method and the process parameters were optimized. The optimized Natcel was then characterized for particle size, polydispersity index (PDI), zeta potential, %entrapment efficiency, dilution study, *in vitro* release, *ex vivo* permeation and stability studies. The safety of the topical Natcel was confirmed by cell viability assay, hen's egg-chorioallantoic membrane assay and Draize test.

Results: Natcel was successfully formulated, optimized, and characterized. The CMC for the tocopheryl polyethylene glycol succinate (TPGS) was found to be 31.25 µg/mL. The Natcel was clear, pale yellow in appearance, with pH 7.2±0.2. The particle size, PDI and zeta potential was 19.91±0.31nm, 0.27±0.01 and -18.27±1.38mV respectively, and the % entrapment efficiency was 91.33 ±9.8%. Transmission electron microscopy study revealed that the nanomicelles were spherical. The Natcel showed sustained release upto 24 hours. Transcorneal permeation was found to be 28.21±14.55 µg/cm2 and 1.83±0.94 µg/cm2 for 1% Natcel and 5% suspension respectively. The Natcel was found to be stable on dilution with tear fluid and at 4°C. *In vitro, in vivo and ex vivo* studies showed no ocular irritation.

Conclusions: The 1% Natcel was found to be biocompatible and permeate cornea better than the 5% suspension. Further studies are warranted to evaluate its pharmacokinetics and efficacy.

CSP08

PAIN MANAGEMENT PROTOCOL IN PRK AND CXL: COLD TO THE RESCUE

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Purpose: To compare post-operative pain perception in subjects using bandage contact lens (BCL) stored at 2–8ºC (Cold BCL, CL-BCL) or at room temperature (23–25ºC, RT-BCL), immediately after photorefractive keratectomy (PRK) or corneal collagen-crosslinking (CXL) and determine the expression status of key nociception associated factors on the ocular surface of study subjects.

Methods: Fifty-six subjects (112 eyes) undergoing PRK for refractive correction and 100 subjects with progressive keratoconus (KC) undergoing CXL were randomly divided into: Conventional (BCL maintained at room temperature – RT, 24ºC), and Cold (BCL maintained at 4ºC in a refrigerator) BCL groups. Pain was assessed by Wong-Baker (WB) scoring on the first post-operative day (PoD-1). RNA from POD-1 BCLs was collected from 20 PRK patients receiving Cold BCL in one eye and RTBCL in the other, to measure the expression of transient receptor potential channels (*TRPV1, TRPA1, TRPM8*) and Calcitonin gene-related peptide (*CGRP*).

Results: Significantly ($P<0.0001$) low pain was reported by subjects in CL-BCL group (Mean WB±SD: 2.6±2.1) compared to RT-BCL group (6.0±2.4), post-PRK. 80.4% of subjects had pain reduction, whereas 19.6% had no change/increase in pain with CL-BCL. *TRPM8* expression was significantly ($P<0.05$) increased in BCL of those with reduced pain with CL-BCL. Significantly ($P<0.0001$) low pain was also seen in CL-BCL group (3.2±2.1) compared to RT-BCL group (7.2±1.8), post-CXL. There was no significant difference in epithelial healing time.

Conclusion: This simple and economical approach may be effective in controlling post-operative pain and increasing patient comfort without delay in epithelial healing.

CSP09

ANTERIOR CHAMBER BIOMETRIC PARAMETERS ASSOCIATED WITH INTRA OCULAR PRESSURE REDUCTION AFTER UNEVENTFUL PHACOEMULSIFICATION IN NORMAL EYES

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Purpose: To evaluate intraocular pressure (IOP) change after uneventful phacoemulsification and its correlation with anterior chamber parameters measured by anterior segment optical coherence tomography (AS-OCT).

Methods: In this hospital based prospective, observational study, 44 normal eyes underwent phacoemulsification with intraocular lens implantation. IOP and anterior chamber parameters were measured preoperatively by AS-OCT, and were compared with parameters obtained at 3 months post-operatively. Change in IOP and its relation to the parameters, including anterior chamber angle (ACA), anterior chamber depth (ACD), angle opening distance 500 µm anterior to the scleral spur (AOD 500), anterior chamber width (ACW), lens vault (LV), trabecular iris space area (TISA500) and preoperative IOP, were evaluated. The main outcome measure was degree of IOP change after phacoemulsification in normal eyes.

Results: The mean patient age was 58.5 ± 9.4 years. Average IOP reduction was 2.43±1.64 mm of Hg from a preoperative mean of 16.77±2.54 mm (Hg), at 3 months after phacoemulsification surgery. Preoperative lens vault and preoperative IOP had a strong positive correlation with change in IOP at 3 months (r value = 0.606; p value <0.001) and (r value = 0.73; p value <0.001). There was a significant negative correlation between preoperative TISA and AOD with change in IOP at 3 months (r value = -0.545; p value<0.001) and (r value = -0.69; p value <0.01).

Conclusions: Phacoemulsification surgery results in IOP reduction in normal eyes. Preoperative IOP, lens vault, AOD and TISA were significant predictors for IOP reduction.

MORPHOLOGICAL VARIANTS OF MEIBOMIAN GLANDS: AGE-WISE DISTRIBUTION AND DIFFERENCES BETWEEN UPPER AND LOWER EYELIDS

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Purpose: To evaluate the distribution of various Meibomian gland morphologies across different age groups in healthy individuals.

Methods: Infrared Meibography was performed and morphologies of the Meibomian glands from upper and lower eyelids of 236 healthy individuals (mean age 38.4 ± 17.5 years; 80 females:156 males) were evaluated for their prevalence and differences across six decades of life, from 10-80 years. Linear mixed effects modelling test was used for statistical analysis.

Results: Of 14,452 glands, 8830 (61%) glands were of the upper eyelid. No significant differences in frequency were noted between different age groups for distorted, tortuous, hooked, overlapping, abnormal gap, fluffy areas, dropout (except 51- 60 vs. 10-20 years, P=0.023), and thick and thin morphologies. Short glands were significantly more in individuals aged more than 30 years (P=0.015), whereas moderately short and severely short glands were more common in upper eyelids of individuals older than 50 years of age compared to 10-20 years old (P=0.035). Compared with lower eyelids, the frequency of distorted, hooked, tortuous, overlapping, and tadpoling was significantly higher in the upper eyelids of all age groups. Dropout glands were more in the lower eyelids for individuals younger than 50 but no difference in upper and lower eyelids after 50 years of age. Dropout (P=0.006) and severely short glands (0.026) of the lower eyelid were associated with low NIBUT values.

Conclusions: Various morphological characteristics of meibomian glands considered abnormal can be present in healthy individuals. The relative frequency of abnormal morphologies rather than their absolute presence or absence maybe a better indicator of Meibomian gland dysfunction.

CSP11

TRENDS OF ADULT-ONSET ALLERGIC EYE DISEASE: DEMOGRAPHICS AND CLINICAL PROFILE

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Purpose: To study the clinical profile and demographic characteristics of adult-onset allergic eye diseases.

Methods: This was a retrospective study including 4475 new patients (age ≥21 years) presenting with adult-onset allergic eye disease (AED) to our tertiary eye hospital over a period of 10 years from June 2011 to June 2021. The electronic medical record data on demographics, vision, type of allergy, systemic association and complications of AED was retrieved and analyzed.

Results: The median age of presentation was 37 (IQR: 29-47) years. Most patients presented in the summer months with a peak in March that declined by June. The clinical forms of allergy were vernal keratoconjunctivitis (VKC) in 51.5%, seasonal allergic conjunctivitis in 5.6%, and atopic keratoconjunctivitis in 2.5%. However, the clinical type was unclassifiable in 40.4% of cases. The palpebral variant (83.32%) was the most common sub-type of VKC. Mechanical ptosis (2.19%) was the most common complication noted followed by keratoconus (1.87%), steroid induced glaucoma (1.29%), microbial keratitis (1.18%), limbal stem cell deficiency (1.05%), steroid induced cataract (0.49%), and shield ulcer (0.36%). Allergic rhinitis (6.7%) and bronchial asthma (2.52%) were the most common systemic allergies associated in these patients.

Conclusion: Adult-onset AED is a distinct disease entity with a large proportion of cases that do not fit into recognized clinical types. Further research on adult allergy could help us understand the pathogenesis, hormonal influence, differences with childhood allergy and aid in formulating effective treatment protocols.

CSP12

ASSOCIATIONS OF DRY EYE SIGNS, SYMPTOMS AND SEVERITY WITH VARIOUS SYSTEMIC AND OCULAR CONDITIONS IN AN INDIAN POPULATION WITH DRY EYE DISEASE

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Purpose: To evaluate whether systemic and ocular conditions are associated with higher dry eye signs and symptoms.

Methods: Cross-sectional study including 374 dry eye patients. Patients were asked for medical history, systemic medications, duration of symptoms/diagnosis. A composite dry eye severity score that lies between 0–1(1=most severe disease) was obtained by averaging six parameters: symptoms score, tear osmolarity, tear breakup time, Schirmer's 1 test, ocular surface staining scores and meibomian gland dysfunction score. Age, duration and gender adjusted generalized linear regression analysis was carried out to find out various systemic and ocular conditions associated with dry eye signs and symptoms.

Results: Mean age was 45.5±20 years with 67% females. Age and duration had positive correlation with sign score ($p<0.001$) and negative correlation with symptom score ($p<0.001$). There was no correlation between symptoms and signs ($p=0.08$). Conditions associated with higher symptoms were patients on hormonal replacement therapy (0.62 vs 0.46; β: 0.16; $p<0.001$), atopy (β: 0.09; $p<0.005$), chronic allergy (β: 0.10; $p<0.002$), presence of binocular vision anomaly (β: 0.10; $p<0.001$), non-Sjogren's dry eye (β: 0.11; $p<0.001$) and lesser symptoms with diabetes mellitus (β: 0.06; $p<0.001$). Higher signs were associated with female gender (β: 0.04; $p<0.001$), menopausal women (β: 0.06; $p<0.001$), rheumatoid arthritis (β: 0.09; $p<0.001$) and Sjogren's syndrome (β: 0.11; $p<0.001$).

Conclusions: Several systemic and ocular conditions may predispose individuals to higher dry eye signs or perception of higher dry eye symptoms. An awareness of this can help clinicians to look for specific diagnostic tests, further referral and decision making.

CSP13

CLINICAL PROFILE AND DONOR CHARACTERISTICS OF POSTKERATOPLASTY (PK, EK AND ALK) ADVERSE EVENTS – 9 YEARS ANALYSIS FROM A SINGLE EYE BANK IN INDIA

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Purpose: To report the clinical profile and donor characteristics of post keratoplasty adverse events notified at an eye bank in Southern India.

Methods: Retrospective chart review of tissues utilized from Jan 2013 to Dec 2021. During this period 26,271 donor corneas were utilized for optical keratoplasty (PK, EK and ALK). The adverse events reported within first 11.4 weeks of optical keratoplasty were analyzed for donor related parameters.

Results: During the 9-year period, a total of 39 recipients had post keratoplasty infections. Majority (77%) of the adverse events were noted after EK (27 after DSAEK, and 3 after DMEK), 2 after DALK, 7 after PK. The clinical presentation was interface infiltrate in 15 eyes and endophthalmitis in 24 eyes. The organisms isolated were gram negative bacilli in 18, fungus in 3, gram positive in 2, mixed organisms in 4 and microbiology inconclusive in 12 eyes. All the gram-negative infections were due to multi-drug resistant organisms. In all except 6, the donor corneas were harvested from hospital premises. The cause of donor mortality was following polytrauma in 23, cardiorespiratory arrest in 13, organophosphorus poisoning in 2, natural causes in 1. The mean duration of presentation was 6.84 (range 1-80) days. The death to preservation time was 5.16 (1-21) hours. Thirteen corneas were retrieved from mortuary. The death to utilization time was 3.84 (1-8) days.

Conclusions: Majority (82%) of the adverse events were following lamellar surgeries, of which, DSEK was the commonest. Multi-drug resistant gram-negative bacteria dominated majority of the bacterial infections.

CSP14

TOPICAL APPLICATION OF DECELLULARIZED CORNEAL EXTRACELLULAR MATRIX HYDROGELS IN CORNEAL STROMAL WOUNDS PREVENTS OPACIFICATION AND SCARRING

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Purpose: Corneal wounding, due to infection, injury or inflammation, heals by stromal scarring and opacification, which is a significant cause of blindness affecting millions worldwide. There is an unmet clinical need for a biomaterial that can be applied to prevent the development of corneal stromal scarring. This study reports the possible prophylactic potential of biomimetic hydrogels derived from non-transplant grade human cadaveric corneas from eye banks and also from bovine corneas, which are discarded from slaughterhouses.

Methods: A thorough *in-vitro* characterization revealed that both human and bovine hydrogels retained the major extra-cellular matrix components, demonstrated physical, chemical, and environmental stability, and was tested as non-pyrogenic and nonimmunogenic. For *in-vivo* validation, the hydrogels from both sources were topically applied to the surgically induced cornea wounds in rabbits and compared with collagen and sham controls.

Results: Our *in-vivo* study revealed that, while the control group developed corneal opacification, the prophylactic application of hydrogels derived from both bovine and human sources could effectively prevent corneal scarring and opacification, which was evaluated objectively using *in-vivo* imaging. Moreover, the results indicate that the hydrogels promote early re-epithelialization, stromal regeneration, curvature and transparency, indistinguishable from a healthy cornea.

Conclusions: These findings suggest that the application of decellularized corneal matrix hydrogel could be a new promising suture-free therapeutic approach in the clinic as a minimally invasive and easily performable procedure to prevent scarring followed by traumatic injuries in the cornea.

CSP15

QUALITY OF LIFE AMONG PATIENTS WITH GLAUCOMA AND THE IMPACT OF LOW VISION SERVICES

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Purpose: Loss of visual function in glaucoma subjects can impact their Quality of Life (QoL) and low vision interventions are essentially prescribed to assist them. This study aimed to evaluate the effect of glaucoma on the QoL, the prevailing pattern of low vision care, and the effectiveness of such intervention on the QoL.

Methods: Glaucoma subjects underwent a comprehensive low vision examination followed by the administration of a glaucoma specific Quality of Life (GQL-15) questionnaire. The questionnaire consists of four domains (1. Central/near vision, 2. peripheral vision, 3. glare/dark adaptation, and 4. mobility). This was followed by the provision of appropriate low vision services. After one month, the QoL scores were re-assessed and the pre and post QoL scores were analyzed.

Results: A total of 60 glaucoma subjects were included and their median (IQR) age was 55 (30) years. The median (IQR) QoL score was 51 (17). QoL scores worsen with the increasing severity of visual field defects ($r=-0.6$, $p=0.04$). Optical devices (41%), contrast enhancement (67%), and mobility training (75%) were the predominant low vision interventions advised. The post QoL score significantly different among the domains central& near vision ($P<0.001$), peripheral vision ($p=0.03$), glare/dark adaptation ($p=0.01$) except mobility ($p=0.31$).

Conclusions: The low vision intervention improved the QoL among glaucoma subjects concerning their central and peripheral vision. There was no difference with regard to mobility. In addition to the self-reported QoL assessment, an objective estimation of vision-specific ability to perform activities of daily living might be beneficial.

CSP16

ASSESSING DIURNAL VARIATION OF OCULAR BLOOD FLOW IN HEALTHY ADULTS USING OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY

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Purpose: Microvasculature in the retina is evaluated by Optical Coherence Tomography Angiography (OCTA). This study aimed to assess the diurnal variation of ocular blood flow in healthy adults using OCTA

Methods: In a pilot study (n=15 healthy adults), diurnal variation of ocular blood flow using OCTA was assessed with a minimum of 3 readings at an interval of 2 hours from the initial reading at 8:00 AM. The scan protocols of 3X3, 6X6, and Optic Nerve Head (ONH) were done every t+wo-hour interval using OCTA. Clinical parameters such as vessel density (VD) in mm/mm2 and perfusion density (PD) in % were analyzed.

Results: The median (IQR) age for healthy adults was 24(2) years. The mean difference ± SD in the 3X3 scan was Vessel Density (mm/mm^2): center (1.45±0.65), inner (1.41±0.61), and full (2.60±4.87); and Perfusion Density (%) was: center (2.95±1.38), inner (3.68±4.14), and full (3.93±2.64). In the 6X6 scan VD (mm/mm^2): center (2.07±1.41), inner (1.30±0.89), outer (0.83±0.47), and full (0.85±0.52), and PD (%): center (5.06±3.25), inner (3.44±2.44), outer (3.19±4.92), and full (29.89±107.93). In ONH scans PD (%): (1.00±0.90) and flux index (0.03±0.02) were measured. Statistical analysis showed that there was no significant difference between the minimum and maximum values of all parameters in 3x3, 6x6, and ONH scans (Friedman Test, p>0.05).

Conclusions: This study revealed that diurnal variation in ocular blood flow was not present in healthy young adults. Diurnal variation can be further explored in newly diagnosed glaucoma cases using OCTA.

CSP17

EFFECT OF ETHNIC DIVERSITY ON THE SACCADIC REACTION TIME BETWEEN INDIAN AND DUTCH HEALTHY CONTROLS AND GLAUCOMA PATIENTS

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Purpose: Eye Movement Perimetry (EMP) determines the decline in Visual Field (VF) responsiveness associated with glaucoma on the basis of Saccadic Reaction Time (SRT) delays. This study aimed to evaluate the effect of ethnic diversity on SRT behaviour and its impact on glaucoma classification accuracies.

Methods: 215 participants (healthy controls and glaucoma patients) from Indian and Dutch ethnicities underwent a customised EMP protocol. Participants were instructed to look at a fixation target and respond to a peripheral visual stimulus (at four intensity levels) with Saccadic Eye Movements (SEM) that were quantified using an eye tracker (Tobii, Sweden). The gaze patterns were systematically inspected and from the reliably 'seen' responses the SRTs were computed. A Generalised Linear Mixed Model (GLMM) analysis was used to determine the influence of ethnicity, age, and stimulus characteristics on SRT. Receiver Operating Characteristic (ROC) analysis was used to compare the classification accuracies of the SRT-based algorithm.

Results: The GLMM revealed a statistically significant interaction between SRT and the tested factors. At the intermediate and farthest eccentricity, the Indian cohort, aged ≥ 60 years exhibited significantly delayed SRTs compared to their Dutch counterparts ($p < 0.001$). The ROC analysis showed promising and statistically comparable Area Under the Curve (AUC) values for glaucoma classification within both cohorts.

Conclusions: The mean SRTs could be a reliable index to discriminate between healthy controls and glaucoma patients. However, we suggest using an ethnic-specific normative database adjusted for the other influential factors to evaluate the location-wise SRT delay and corresponding VF defect.

CSP18

AN EXPLORATORY STUDY ON VISUAL SEARCH TIME IN GLAUCOMA: AN EYETRACKING BASED APPROACH

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Purpose: Glaucomatous Visual Field (VF) loss affects daily life activities including Visual Search (VS). This study aimed to quantify and compare Visual Search Time (VST) in glaucoma subjects with their age-matched healthy controls.

Methods: Study participants underwent a comprehensive ophthalmic evaluation including standard automated perimetry. Based on VF status of the better eye, glaucoma subjects were grouped as normal, mild, moderate, and severe. This was followed by a computer-based binocular VS experiment that involved 20 real-life scenes (testing duration: ~6 minutes per participant). Participants were instructed to identify specified targets from the sequentially projected scenes and their eye movement patterns were recorded using an infrared eye tracker (Tobii Pro X3-120). Total VST (seconds) was defined as the time taken to identify targets from all 20 search tasks. Differences in the total VST between healthy controls and different glaucoma severities were analysed.

Results: Study participants included 28 glaucoma subjects and 30 healthy controls whose median age (IQR) was 53.5 (15.0) and 51.0 (13.5) years respectively. Participants with glaucoma exhibited statistically significant ($p = 0.009$, U test) longer total VST [Median (IQR): 103.9 (102.3) s] compared to their age-matched controls [Median (IQR): 61.6 (64.6) s]. Glaucoma subjects with severe VF loss exhibited ~7 times longer total VST than healthy controls [OR: 6.87 (95% CI: 1.10-42.79), p=0.39].

Conclusions: Increase in the VF loss severity contributes predominantly to the longer Visual Search Time in glaucoma. Considering the brief testing duration, usability of real-life search behavior for screening glaucomatous VF loss could be explored.

CSP19

NON-CONTACT WIDEFIELD NEONATAL RETINAL IMAGING FOR RETINOPATHY OF PREMATURITY USING THE CLARUS 700 HIGH RESOLUTION TRUE COLOUR REFLECTANCE IMAGING

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Purpose: To illustrate the role of non-contact widefield retinal imaging (NC-WFI) of retinopathy of prematurity (ROP) using the Clarus 700 high resolution true colour reflectance imaging.

Methods: All babies were examined by the vitreoretinal faculty in a tertiary eye care centre from a period of March 2021 to November 2021 using the indirect ophthalmoscope after pupillary dilatation. ROP grading was done according to the revised ICROP (2005) classification. NC-WFI was then performed using the Clarus 700 high resolution true colour reflectance imaging (Carl Zeiss Meditec, Dublin, CA) in the retina diagnostic set up of a tertiary eye care centre.

Results: A total of 22 babies (44 eyes) underwent NC-WFI from March 2021 to November 2021. 13 unique cases of retinopathy of prematurity with images captured on Clarus 700 and the clinical summary is described.

Conclusions: Clarus is a non-contact wide field imaging (NC-WFI) system that can capture high resolution and true colour images (images of the fundus appear similar colour to direct observation by ophthalmoscopy) helping in more accurate diagnosis and grading of the severity of ROP. This is for the first-time true colour images are captured in retinopathy of prematurity. This is a novel imaging technique to have in our armamentarium.

CSP20

DO PSYCHOPHYSICAL ROD/CONE FLICKER THRESHOLDS CORRELATE WITH FULL-FIELD ERG PARAMETERS?

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Purpose: Cone and rod-enhanced stimuli (custom built by choosing specific spatiotemporal properties) produced relatively large photoreceptor-specific deficits in inherited retinal disease where a particular photoreceptor class is more affected than the other. This study aims to explore whether there is an association between the objective (electroretinography- ERG) and subjective (flicker modulation thresholds-FMT) photoreceptor-specific measurements.

Methods: Twenty-five patients (76% male, n=19; overall mean age: 25.8 ± 14.17 years) diagnosed with inherited retinal diseases (cone-dominated disease, n=14; rod-dominated disease, n=11), based on patient's history, fundus appearance and ERG findings participated in this study. Participants > 10 years of age and visual acuity of at least 20/160 were included. Full-field ERG was performed as per the ISCEV protocol. The rod/cone FMTs were measured using the Flicker-plus module of the Advanced Vision and Optometric testing (AVOT) setup. The subjective FMTs at five different locations in central 5^{o} of the visual field were obtained using interleaved 2-down 1-up adaptive staircases.

Results: The central cone FMTs were significantly correlated with photopic 3.0 a-wave amplitudes (Pearson, r = -0.44, p = 0.03) and also photopic flicker a-wave amplitudes (r = - 0.46, p = 0.02). However, scotopic 0.01 a-wave amplitudes (r = -0.3, p = 0.15) and scotopic 3.0 a-wave amplitudes (r = -0.2, p = 0.34) had no significant correlation with rod/cone FMT.

Conclusions: Cone flicker sensitivity increase with an increase in the ERG amplitudes. These results help in better understanding of pathogenesis and potentially allow better counselling of patients regarding prognosis and disease progression in future.

CSP21

HISTOPATHOLOGY, IMMUNOHISTOCHEMISTRY AND MOLECULAR BIOLOGY IN EVISCERATED AND ENUCLEATED SPECIMEN OF END STAGE OCULAR INFLAMMATORY DISORDERS

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Purpose: To describe the histopathology (HPE), immunohistochemistry (IHC) and molecular biology correlations in various end stage ocular inflammatory pathologies.

Methods: Retrospective chart analysis of 18 eviscerated or enucleated globes secondary to intractable ocular inflammation over a period of 10 years was conducted in a tertiary eye care centre.

Results: In Vogt-Koyanagi-Harada syndrome (1 case) and Sympathetic Ophthalmia (9 cases), predominant T-cell infiltration of choroid was noted. CD3 as well as CD20 positivity was observed in VKH specimen. In 3 cases tubercular (TB) panuveitis, mycobacterial tuberculosis (MTB) genome was detected by nested and real time polymerase chain reaction (PCR). Acid fast bacilli (AFB) was seen within retinal pigment epithelial cells in 1 case of TB panuveitis. Two eyes of Eales' disease showed chronic non granulomatous inflammation around blood vessels of the retina. IHC showed CD 8 positive T cells. PCR showed mycobacterium tuberculosis (MTB) DNA from the paraffin sections. One eye with pars planitis showed acellular tissue with chronic granulomatous inflammation on HPE. IHC showed both CD 3 and CD 20 positivity. HPE in acute retinal necrosis showed chronic non granulomatous inflammation in the retina with occluded retinal blood vessels and herpes virus inclusion bodies, with nested PCR positive for Varicella zoster virus and CD3 positivity on IHC. MTB DNA was found in one case of sclerouveitis

Conclusions: HPE, IHC and molecular analysis of enucleated globes and eviscerated specimens can give an insight to etiopathogenesis of several uveitis and sclerouveitis cases, which in turn can help develop efficient therapies.

CSP22

STRUCTURE-FUNCTION CORRELATION OF MESOPIC AND SCOTOPIC PERIMETRY IN EARLY AGE-RELATED MACULAR DEGENERATION - A PILOT STUDY

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Purpose: Previous works suggest that mesopic (background (BG) on) and scotopic (BG off) perimetry techniques in age-related macular degeneration (AMD) are good indicators for analysing AMD progression. Here, we studied the structure-function (SF) correlation for mesopic and scotopic perimetry in early AMD.

Methods: Ten eyes of five participants with mean age: 66.2 (SD: 6.3) with early AMD were recruited. Normative data for scotopic and mesopic perimetry were collected from 10 age-matched participants with mean age: 57.60 (4.3). Participants performed scotopic (BG: 0 cd/m2, dark adapted for 20 min), following mesopic perimetry (BG: 10 cd/m2) in Octopus 900 perimeter controlled by the Open Perimetric Interface (OPI). The total deviation was computed by subtracting the raw mesopic and scotopic sensitivities for AMD from that of the age-matched normative data. The SF correlation was performed by correlating mean sensitivity (MS) between of the scotopic and mesopic perimetry and average macular thickness (MT).

Results: The MS of scotopic perimetry was greater (-1.01 dB) than mesopic perimetry (3.68 dB) ($p < 0.05$). A significant trend of poor scotopic sensitivity was proportional to increased retinal thickness in AMD and vice versa in the healthy retina was observed. A significant negative correlation between MS and average MT was found in both scotopic and mesopic perimetry. However, the correlation was stronger for mesopic (Spearman, $\rho = -0.83$) compared to scotopic ($\rho = -0.60$).

Conclusions: MS showed a better correlation with average MT in mesopic perimetry compared to scotopic suggesting mesopic perimetry might be a better functional indicator for early AMD.

CSP23

RETINOPATHY OF PREMATURITY IN ZONE I POSTERIOR (ZONE HALF): NEONATAL PROFILE, CLINICAL CHARACTERISTICS, AND OUTCOMES

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Purpose: To report the neonatal profile, clinical characteristics, and outcomes of retinopathy of prematurity (ROP) in Zone I posterior.

Methods: The babies included in this study were screened from the various neonatal centres with different levels of care. Those with Zone 1 posterior disease were identified and were included in the study.

Results: From January 2011 to December 2021, Zone I posterior disease was identified in 130 eyes (67 infants). The mean gestational age and birth weight were 29.3 weeks (±2.2 weeks) and 1217.3grams (±381.9 grams), respectively. All babies had received unblended oxygen. Forty babies had prolonged hospitalization. Weight gain was poor in 34, negligible in 13 babies and not known in the rest. At presentation, the ROP status was aggressive, threshold, hybrid, stage 4, and atypical in 78, 20, 11, 15, and 6 eyes, respectively. Atypical observations included bleb-like detachment (6 eyes), candle wax-like preretinal deposits (23 eyes), and large arteriovenous shunts (9 eyes). Primary treatment included intravitreal anti- VEGF in 119 eyes and laser in 11 eyes. Among those with follow-up for more than 6 months, the recurrence was seen in 48.3% (n=29) of eyes with anti-VEGF; with additional laser treatment, the outcome was favourable in 90.5 % (n=.116.) of eyes.

Conclusions: Zone 1 posterior ROP has a distinct profile, with several atypical characteristics distinct from ROP in other zones. Primary anti-VEGF treatment is beneficial but inadequate; most babies need additional laser or surgery. Improved neonatal care, earlier screening, and a combination of intravitreal anti-VEGF and laser are recommended.

CSP24

RETINAL DETACHMENT IN PROLIFERATIVE VITREORETINOPATHY (PVR) PATIENTS

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Purpose: Proliferative vitreoretinopathy (PVR) is associated with aberrant proliferation, migration, and deposition of extracellular matrix protein (ECM). The purpose of this study is to show the morphological and elucidate the molecular changes associated with PVR in an in vitro model.

Methods: Vitreous and sub-retinal fluids of patients with a clinical diagnosis of PVR and macular hole were collected as test and control, respectively. The ARPE 19 (retinal pigment epithelial) cell line was subjected to various treatments with vitreous, cultured media (DMEM+10% FBS), and medium without any growth factors (DMEM). By examining morphological patterns of ARPE -19 cells at 6 and 22 hours, vitreous was graded. Additionally, a scratch assay was performed to study wound healing following retinal injury. By using quantitative PCR, the expression of fibronectin, collagen, laminin, proliferation indicators, and inflammatory cytokines were studied. Their expressions were adjusted for fold changes using the corresponding housekeeping genes.

Results: Following treatment with various grades of vitreous from PVR and macular hole controls, crests and troughs were visible at various time intervals indicating an epiretinal membranelike structure. In different time series, morphological changes illustrating epithelial mesenchymal transition (EMT) were observed. Wound healing and faster cell migration were observed in vitreous treated cells compared to other controls, suggesting the presence of growth factors which attracts RPE cells and in turn 'pulling up' of the retina. qPCR confirmed the gene expression of proliferation and extracellular matrix markers.

Conclusion: To reiterate, retinal fibrosis is influenced by ECM elements, pro-inflammatory factors, and proliferation indicators and its restriction may prevent the progression of PVR.

CSP25

COMPARISON OF CORNEAL ENDOTHELIAL CELLS AND POWER PARAMETERS BETWEEN HIV POSITIVE PATIENTS ON ART AND NORMAL PATIENTS WITH AGE RELATED MACULAR DEGENERATION

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Purpose: To compare the corneal endothelial cell density (ECD), coefficient of variation (CV) (difference in cell size), hexagonality of endothelial cells, corneal flat and steep meridian, axis, astigmatism between HIV+patients on ART and normal patients with age related macular degeneration.

Methods: Cohorts of HIV+ (Group A; < 60year) and HIV- patients (Group B; >60 year) presenting with age related maculopathy. Patients underwent detailed ophthalmic evaluation of corneal endothelium using specular microscopy and power examination using Pentacam. 72 eyes of 36 patients were included in the study.

Results: 42 eyes of 21 HIV+ patients and 30 eyes of 15 HIV- patients were included in the study. The median and Inter Quartile Range (IQR) age of HIV+ patients 47 (19) years and HIV- subject was 65 (5) years. ECD, CV and hexagonality, corneal thickness, volume, flat and steep meridian, axis, astigmatism did not show any significant difference between HIV+ patients and HIV- patients. Similarity of values between HIV- patients and HIV+ patients suggest significantly accelerated aging. Among corneal parameters, corneal endothelial cell density was positively correlated with CD4/CD8 T cell count (r=0.51; p value=0.01) and the duration of the HIV (r=0.43; p value=0.04). Corneal power parameters did not correlate with CD4/CD8 T cell count.

Conclusions: Early aging occur in eyes of HIV+ patients despite successful anti-retroviral treatment. These changes were similar patients older than 60 years with age related maculopathy.

CSP26

EFFECT OF HIGH MYOPIA AND MACULAR PIGMENT OPTICAL DENSITY STUDY

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Purpose: To evaluate relationship between axial length, diet and Macular pigment optical density (MPOD) values in high myopia.

Methods: This is a prospective ongoing cross-sectional study including healthy participants with myopia, high myopia and emmetropia. The current analysis presents preliminary data of 17 eyes. Ocular biometry, optical coherence tomography angiography, macular pigment eye (MPeye) and Visucam 500 (MPOD module) was performed for each participant. Diet consumed by the participants was recorded using a previously developed food frequency questionnaire (FFQ) using Indian food composition table (IFCT)-2017 that specifically judges the intake of macular pigments.

Results: Mean age was 25 +/- 3.4 yrs (20-33) with a male: female ratio of 4:12. Refractive errors such as myopia (9 eyes), emmetropia (4 eyes), high myopia (3 eyes) and unilateral myopia (1) were selected. There was a significant difference (C.I: 3.7 – 5.4, $p<0.05$) between MP-eye (4.7 ± 1.7) and mean MPOD (0.09 ± 0.02) scores using paired samples test. These preliminary results are promising and form the basis of our larger ongoing evaluation. MPOD may have a causal relationship and may serve as a preventive therapy for high myopia.

Conclusions: These preliminary results are promising and form the basis of our larger ongoing evaluation. MPOD may have a causal relationship and may serve as a preventive therapy for high myopia.

CSP27

COMPARISON OF FULL FIELD FLASH ELECTRORETINOGRAM BETWEEN TABLETOP AND HANDHELD DEVICE BY CONTACT LENS ELECTRODE

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Purpose: To compare each waveform amplitude on full field flash electroretinogram (FERG) between tabletop and handheld device by Burian Allen (B-A) contact lens electrode.

Methods: A retrospective study conducted at L V Prasad Eye Institute. International society for clinical electrophysiology of vision (ISCEV) guided standard reference was followed for each test protocol of FERG procedure on healthy individuals. Dry eyes, intolerant to rigid contact lens or insufficient palpebral aperture height were excluded from the study. Both tabletop (Metrovision) and handheld (LKC) systems were used on a same day using B-A electrode. Ten recordings were averaged for each test protocol and noise level of < 2uv was taken for comparison. All the tests were done monocularly.

Results: 50 eyes of 25 healthy individuals of mean age of 25.63 years (SD + 4.96) were recruited in the study. All biphasic wave amplitudes from each scotopic and photopic phase showed statistically significant test result between the two systems except photopic 3.0 flicker response (P=0.06). Amplitude difference was more distinguishable in scotopic phase and predominantly more obvious for b waves (scotopic 0.01, difference of around 190uV). There was no noticeable difference seen on implicit time. Time difference between tabletop and handheld was around six minutes.

Conclusions: Noise level with B-A electrode is much less. Although both the systems are good at picking up wave responses using contact lens electrode, yet tabletop system gives better test results and handheld takes less chair time.

CSP28

EFFICACY OF INTRAVITREAL DEXAMETHASONE IMPLANT IN CHRONIC, ATYPICAL AND RECURRENT CENTRAL SEROUS CHORIORETINOPATHY: A PILOT STUDY

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Purpose: To report the treatment efficacy of intravitreal dexamethasone implant in chronic, atypical and recurrent central serous chorioretinopathy (CSC).

Methods: Eligible subjects with non-resolving and recurrent CSC with poorly defined leaks on fluorescein angiography and complex CSC morphology on multimodal imaging received a single dexamethasone implant monotherapy. In bilateral disease, the contralateral eye was used as control. The outcome measures assessed at the primary efficacy endpoint of 6 and 12 weeks were changes in visual acuity, complete resolution of intra and subretinal fluid (SRF). The incidence of secondary glaucoma was noted.

Results: Six eligible middle-aged males (mean age 46.5□10.8 years) with a mean duration of symptoms of 4.5± 2.5 years were enrolled. Secondary choroidal neovascularisation was ruled out on multimodal imaging. Majority (83.3%) had received prior treatment – macular laser (66.6%), and/ or oral mineralocorticoid antagonist (50%). With a single injection of dexamethasone implant, complete resolution of intraretinal and SRF was noted in 66.6% (n=4) eyes. Significant reduction of SRF height (174.17±85.72 µm to 21.67± 33.71 µm; p=0.028) and central subfield thickness (346.67±139.19 µm to 180± 46.98 µm; p=0.003) at 6 and 12 weeks was noted. There was no statistically significant improvement in vision (p=0.109) and sub-foveal choroidal thickness (p=0.207). Secondary glaucoma in 33% of eyes was managed by topical anti-glaucoma medication.

Conclusions: Although corticosteroids are known to induce CSC, in chronic disease, the retinal para inflammation may play a role. Dexamethasone implants may be used as a rescue treatment for chronic, atypical, and recurrent CSC.

CSP29

RADIATION TREATMENT FOR DIFFUSE CHOROIDAL HEAMANGIOMA IN STURGE–WEBER SYNDROME

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Purpose: We aim to investigate the role of external beam radiotherapy (EBRT) and plaque brachytherapy in treatment of diffuse choroidal haemangioma using multimodal imaging and assess long-term anatomical and functional outcomes.

Methods: Retrospective chart review of Sturge-Weber syndrome (SWS) patients treated for exudative diffuse choroidal haemangioma. Visual acuity, B-scan tumor thickness, intraocular pressure, and retina status were analysed before and after treatment.

Results: Three cases aged 18M, 11/F and 28/M diagnosed to have SWS with choroidal haemangioma and exudative retinal detachment including the macula were included. The average follow-up time was six months. In case 1, 2 and 3 the maximum tumor thickness and intraocular pressure (IOP) at presentation was 4.9, 4.5 and 5.8 mm and 10, 15 and 12 mm of HG respectively. Case 1 and 2 had diffuse choroidal haemangioma and were subsequently treated with EBRT (20Gy in 10 fractions). Case 3 had a nodular variant of choroidal haemangioma and was treated with Ru-106 plaque with dose of 40Gy over a duration of 73 hours. The retina was reattached at the last visit for all three cases. The maximum tumor thickness and IOP at last follow-up was 3.6, 3.2 and 3.7 mm and 09, 10 and 10 mm of HG respectively. Visual acuity improved for two patients and remained stable in one among three eyes.

Conclusions: Radiation treatment using EBRT and plaque brachytherapy is a safe and effective modality in treating diffuse choroidal haemangioma associated with SWS with good anatomical and functional outcomes.

CSP30

CAN OPTICAL BIOPSY SURROGATE HISTOPATHOLOGY FOR OCULAR CYSTICERCOSIS?

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Purpose: a) To identify commonly reported optical coherence tomography (OCT) features of ocular cysticercosis b) To validate OCT markers of cysticercosis with observer variation.
Methods: A comprehensive literature review was done for available OCT images of ocular cysticercosis. Relevant OCT images were systematically reviewed to ascertain diagnostic and prognostic features of ocular parasite. Common OCT features were enlisted and evaluated by 3 observers. Triple masking was performed, and observer variation was determined.
Results: Hyper reflective cyst wall (85.7%), hyper reflective scolex (85.7%) and hypo reflective clear cyst cavity (92.9%) are most consistent diagnostic features with minimal observer variation. There is a very high observer variation for prognostic tissue markers.
Conclusions: OCT features of cysticercosis can be used as a surrogate of histopathology. This obviates the need for conventional biopsy, and such cases may be appropriately managed with in vivo cyst lysis.

SUBRETINAL SEEDING IN RETINOBLASTOMA: CLINICAL PRESENTATION AND TREATMENT OUTCOMES

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Purpose: To describe the clinical features and treatment outcomes of subretinal seeds (SRS) in eyes with primary intraocular retinoblastoma (RB).

Methods: Descriptive analysis of SRS in 50 eyes (47 patients) with primary RB.

Results: M:F ratio was 26:21. The mean age was 19 months (2- 72 months). At presentation, the SRS involved ≥ two quadrants in 88% of eyes located in inferior (36%) and temporal quadrant (30%). Majority of seeds appeared yellowish-grey (66%), round or oval in shape (48%) with a mean size of 1.1 mm (0.1-6 mm). Associated features noted were subretinal fluid (50 eyes, 100%), total retinal detachment (25 eyes, 50%) and vitreous seeds (20 eyes, 40%). Of 50 eyes, 46 (92%) eyes were treated with intravenous chemotherapy (IVC), 2 (4%) with primary enucleation and 2 (4%) with intra-arterial chemotherapy. Adjunctive focal treatment included transpupillary thermotherapy in 18 eyes, cryotherapy in 4 eyes and secondary enucleation in 5 eyes. Local tumor control was achieved in 38 eyes (76%) with 28 eyes (56%) showing type 3 regression pattern, while SRS completely regressed in 23 (46%) eyes, partially in 17 (34%) and worsened in 2 (4%) eyes. Over a mean follow-up period of 30 months (range, 3-68 months), SRS recurrence weas noted in 20 eyes (47%), the globe salvage was achieved in 39 (78%) eyes, and 2 patient (4.2%) died.

Conclusions: Primary SRS does poses therapeutic challenge in terms of its location, size and associated features. SRS responds moderately to IVC with one-half cases showing recurrence and one-fifth needing enucleation.

CSP32

OUTCOME OF TRANSCUTANEOUS RETROBULBAR AMPHOTERICIN-B IN MANAGEMENT OF ORBITAL MUCORMYCOSIS

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WITHDRAWN

CSP33

VIRTUAL REALITY VISUAL FIELDS IN NEURO-OPHTHALMOLOGY - AN ADDITIONAL TOOL IN THE ARMAMENTARIUM

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Purpose: The purpose of our study was to compare the interpretation of Virtual Reality (VR) based perimetry tests by two blinded trained Neuro-ophthalmologists among themselves and as compared to standard automated perimetry performed using Humphrey visual fields (HVF) neuro-ophthalmological conditions.

Methods: We retrospectively reviewed visual fields of patients with various neuro-ophthalmological conditions seen between July 2020 and December 2020. These were analyzed by two fellowship trained Neuro-ophthalmologists, blinded to the clinical findings. The Neuro-opthhalmologists were provided only visual fields. Their interpretations were used to compare presence and type of visual field defect on OM fields alone and as compared to HVF using percent agreement. Data was also collected regarding qualitative observations regarding various field defects

Results: 157 eyes of 97 patients met the study criteria. Percent agreement was used to compare inter-rater reliability and to compare agreement between the gold standard (HVF) and observations by the 2 examiners. The inter-rater reliability was 78% between the 2 examiners for the VR perimetry, it was 83.5% when their observations were compared with the gold standard. However, the patterns of visual fields defects appeared similar.

Conclusions: VR based perimetry showed good agreement among examiners and as compared to gold standard HVF In Neuro-Ophthalmology. This might be a safe alternative especially in patients uncooperative or physically patients. However larger studies with larger data set and constant refinements might help improve the utility of the device.

CSP34

EFFECT OF AGE IN THE INCIDENCE AND AETIOLOGY OF INFECTIOUS ENDOPHTHALMITIS

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Purpose: To review the incidence, aetiology of endophthalmitis over eleven years in different age group.

Methods: Medical records of all patients with suspected endophthalmitis from 2011-2021 were reviewed. After vitrectomy, vitreous was used for microbiological workup and based on age of the patients, data were pooled and analysed.

Results: Of the total 5610 patients included in the study, 1610 patients were culture-positive comprising 1391 bacteria (86.39%) and 219 fungal (13.6%). In culture-proven bacterial endophthalmitis, 67% were gram-positive (932/1610) and 32.9% were gram-negative (459/1610). *Streptococcus pneumoniae* (6.5%) was the most prevalent organism in age group 10-20 years (y), while *Staphylococcus epidermidis* (2.44% and 3.81%) was the most prevalent in the age group 21- 40y and 41- 60y. *Pseudomonas aeruginosa* (3.37%) was the most abundant organism in the age group >60y. Whereas, *Aspergillus flavus* (13.24%) was found to be the leading fungal pathogen in all the age group. Overall, the antibiotic resistant pattern increased with age. In case of gram-positive bacteria, antibiotics such as Vancomycin resistance increased from 0-20y (19%) to age group >60y (34%) ($p < 0.05$). Similarly in case of gram-negative bacteria resistance for ciprofloxacin (CIP) and Ceftazidime (CFZ) increased from younger (CIP = 18%; CFZ = 16%) to the older age group (CIP = 42%; CFZ = 46%) ($p<0.05$).

Conclusions: Age is one of the key biological variables. Our retrospective-observational study is important because it can provide specific clues and help clarify the factors that influence infectious disease trends and to locate people at high-risk with greater accuracy.

CSP35

FLUROQUINOLONE RESISTANCE OF STAPHYLOCOCCUS EPIDERMIDIS ISOLATED FROM VARIOUS OCULAR SAMPLES IN A TERTIARY CARE HOSPITAL

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Purpose: *Staphylococcus epidermidis* (*S. epidermidis*) is a frequent cause of ocular infections including endophthalmitis and keratitis. Fluoroquinolones still remain as the drug of choice due to its safety, longer stability, and broad spectrum of activity. However, indiscriminate usage of this drug has led to increase in drug resistance. This study aims to analyse mutations within quinolone resistance determining region (QRDR) of *Staphylococcus epidermidis*.

Methods: 40 isolates of *Staphylococcus epidermidis* (20 Fluoroquinolone sensitive and 20 sensitive) from various ocular samples obtained for a period of 4 months were included. Identification was done by standard microbiological techniques. Antibiotic Susceptibility pattern was performed by Kirby Bauer disk diffusion method. PCR was standardised and performed to detect the QRDR genes (*gyrA, gyrB, parC and parE* genes). PCR based DNA sequencing was done to detect mutations in *gyrA, gyrB, parC* and *parE* in the QRDR region from 2 fluoroquinolone-resistant *S. epidermidis* isolates.

Results: Out of 40 samples, 22(55%) were methicillin resistant and 18(45%) were methicillin sensitive. The major of the isolates contains *gyrA* (39, 97.5%) gene, followed by *pare* (22, 55%) gene, *parC* (21, 52.5%) and *gyr B* 15 (37.5%). Among 40, only 2 isolates were sequenced for *gyrA* mutation. Around 29-point mutations were detected in *gyrA* gene in both the isolates.

Conclusions: This pilot study demonstrated the presence of mutations in the QRDR genes. Frequent usage of fluoroquinolone must be limited to prevent the emergence of further resistance.

CSP36

DEVELOPMENT OF LOOP-MEDIATED ISOTHERMAL AMPLIFICATION (LAMP) ASSAY FOR THE DETECTION OF *ACANTHAMOEBA SPP.*

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Purpose: Acanthamoeba keratitis (AK), is a rare, vision threatening infection caused by *Acanthamoeba castellani*. Management of this disease is based on accurate diagnosis which is easily misdiagnosed due to the similarity of its clinical symptoms with other fungal infections. Loop-mediated isothermal amplification (LAMP) is a recently developed molecular method that relies on strand-displacement amplification of DNA performed by the Bst DNA polymerase. The main advantage of LAMP is its ability to amplify DNA sequences under isothermal conditions, thereby eliminating the need for a thermal cycler. In the present study, we constructed a LAMP primer and developed a LAMP assay to detect Acanthamoeba DNA.

Methods: LAMP primers were designed using Primer Explorer V4 software. A set of two outer and two inner primers that recognize six distinct regions on the target site (Acanthamoeba 18S rRNA gene) were used. The LAMP reaction was performed using in-house prepared reaction mixtures consisting of Bst DNA polymerase. The reaction mixture was incubated in a water bath in multiple sets at 60-65°C for 30-90 mins. Detection was done by adding 1µLsyber green to each tube. Green fluorescence in UV light observation indicated positive reaction. In addition, the LAMP products were visualized on 1.5% agarose gel electrophoresis.

Results: Acanthamoeba DNA was significantly amplified at 65°C for 90 minutes. No products were detected in the negative samples.

Conclusions: We developed a LAMP assay for Acanthamoeba detection which is a simple and highly effective. Therefore, LAMP is worth considering as a laboratory test method to aid in acanthamoeba diagnosis.

CSP37

TEMPORAL TRENDS IN MICROBIOLOGICAL SPECTRUM OF INFECTIOUS NONVIRAL CONJUNCTIVITIS

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Purpose: To determine trends in the microbial spectrum and antibacterial susceptibility pattern of non-viral conjunctivitis over 16 years.

Methods: Microbiology records were reviewed for all the clinically and culture proven infectious conjunctivitis patients from 2006-2021. For microbiological workup, conjunctival swab and conjunctival scraping samples were collected, followed by the data for antibiotic susceptibility were pooled from medical records and $\chi 2$-test was performed.

Results: Of the 1835 patients, 938 (51.11 %) were culture positive and 897 (49%) were culture negative. Of the total culture proven conjunctivitis cases, 899/938 were bacteria (96%), and 39/938 were fungi (4%). Among these bacterial isolates 72.04% were gram positive organisms (644) while 28% were gram negative organism (250). The predominant gram-positive pathogens isolated were, *Staphylococcus* species (S. epidermidis n=92, S. aureus n=100) followed by *Streptococcus pneumoniae* in 108 cases*. Aspergillus spp*. Was the most frequently isolated fungi (49%) and *Hemophilus influenzae* was the most frequently isolated gram-negative bacteria (27.2%). The susceptibility of gram-positive bacteria to cefazoline increased from 90.46% to 98% ($p=0.0188$) and to gatifloxacin decreased from 81% to 41% ($p<0.0001$). A similar decrease in susceptibility was also significant for gram negative organisms with gatifloxacin ($p=0.028$).

Conclusions: Reports of increasing resistance of ocular isolates to mainstay antibiotics are a concern, and these data can assist health care practitioners in making informed choices regarding the treatment of ocular infections with ophthalmic antibiotics.

CSP38

A PILOT STUDY ON THE VARIABILITY IN SACCADIC REACTION TIME DISTRIBUTIONS: IMPLICATIONS FOR EYE-MOVEMENT PERIMETRY

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Purpose: Saccadic Reaction Time (SRT) is a marker for assessing the severity of Visual Field Defects (VFDs) in glaucoma. To improve the detection of (localized) VFD progression, it is necessary to sample individual target locations multiple times to account for the SRT variability. As a first step, we assessed location-wise SRT distributions as a function of stimulus intensity.

Methods: Healthy subjects (n = 6) underwent 20 series of Eye Movement Perimetry (EMP) measurements (BulbiCAM, Trondheim). Visual stimuli at suprathreshold and subthreshold intensity levels were subsequently shown at 60 locations. Subjects were instructed to look at a fixation target and initiate eye movements towards randomly appearing peripheral stimuli. SRTs were determined from the reliably 'seen' locations. Bootstrapping analysis was applied to three random test locations (corresponding to eccentricities 9, 15, and 27 degrees) to obtain the SRT distributions for both stimulus intensities.

Results: The median (interquartile range) SRT estimated from 6999 reliable responses for suprathreshold, and subthreshold stimuli were 290 (261-330) and 381 (330-453) ms respectively. Additionally, bootstrapped SRT distribution showed an increased variability for subthreshold stimuli in comparison to the suprathreshold stimuli. All the subjects showed a reduction in SRT variability with increasing repetitions specifically for the subthreshold stimuli ($p < 0.001$, Kruskal Wallis).

Conclusions: This study shows that multiple testing of each target location seems necessary to account for the SRT variability and its reliable estimation. This variability should be further explored for all locations in healthy and glaucoma subjects.

CONFLICTING ACCOMMODATION AND VERGENCE DEMANDS MAY DETERMINE THE ABILITY TO FREE-FUSE STEREOGRAMS FOR 3D DEPTH PERCEPTION

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Purpose: We previously demonstrated that a minority of visually healthy, emmetropic, pre-presbyopic adults can perceive 3D depth in free-fusion stereograms (FFS). Task difficulty was associated with an inability to achieve a simultaneously clear and single vision, suggesting challenges in resolving the conflicting accommodative and vergence demands. This study tested the hypotheses that a) artificial resolution of this conflict by pharmacological cycloplegia and b) reducing the conflict magnitude will improve task performance.

Methods: All FFS used in the experiments had a disparity of 250arc seconds and the task was to identify shape in FFS. In twain experiments, the vergence and accommodation responses while free fusing were recorded at 50fps by photorefractor after pupil dilation with 10%Phenylephrine HCl drops. First and second experiments were tested in 5 and 4 subjects (21-30 years) who had previously demonstrated difficulty in the free-fusion task, respectively, by cyclopleging both eyes with 1% cyclopentolate eye drops and by reducing the conflict magnitude to one-half and one-third of its original magnitude (1.79MA).

Results: Pre- and post-cycloplegia vergence responses were similar (mean±1SD: 1.94±0.41MA vs. 1.54±0.28MA,p=0.18),and accommodative response was expectedly smaller post-cycloplegia (0.10±0.10D)than pre-cycloplegia (2.23±0.84D).Correct identification of shape through free-fusion [median (IQR):100%(87.50-100)] increased significantly post-cycloplegia than pre-cycloplegia,[0%(0-18.75)](p=0.008).Task performance and relative changes in accommodative and v with reduction in conflict magnitude (correct response: p=0.15,Vergence response: p=0.484,Accommodative response: p=0.96).

Conclusions: Complete resolution of the conflict between vergence and accommodation, as achieved through cycloplegia, may be required to reach control level task performance in those who are unsuccessful. Range of reduction in conflict magnitude tested here may not be enough to improve task performance.

CSP40

CONSTRUCTION AND VALIDATION OF PORTABLE PROJECTABLE HESS CHART

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Purpose: Hess-charts, used for ocular deviation measurements, are expensive or not easily portable devices. We constructed and tested projectable-portable (PP), cost-effective Hess-chart for clinical use.

Methods: Based on shadowing principle, the dimensions of PP-Hess-chart was computed and printed on a transparent sheet that was affixed to the anterior side of a wooden-box with inbuilt light circuit. PP-Hess-chart was projected at 50cm from the eye and had similar dimensions and illuminance profile (8 lux difference, p=0.3320) as Standard (ST)-Hess-Chart. Normal (n=52) and participants with ocular deviations (n=18) underwent both Hess-charting in random order of testing.

Results: Among normals, PP and ST-Hess-charts had a good correlation in centroid positions and area for inner (rcent=0.951, rarea =0.882, p=<0.0001) and outer-polygons (rcent=0.962, rarea=0.832, p=<0.0001). Similarly, subjects with ocular deviations also showed good correlation in centroid positions and area for inner (rcent=0.994, rarea=0.984, p=< 0.0001) and outer-polygons (rcent=0.987, rarea=0.993, p= <0.0001). Compared to the ST-Hess-chart, PP-Hess-chart had a sensitivity and specificity of 100% for horizontal ocular deviations and a sensitivity and specificity of 83% and 100% for vertical ocular deviations. The constructed PP-Hess-chart was 60% less expensive than ST-Hess-chart.

Conclusions: The projectable-portable-Hess-chart has good sensitivity and specificity in measuring ocular deviations and can be used as a reliable and cost-effective clinical tool for evaluating ocular deviation in an eye care setup.

CSP41

INVESTIGATION OF BLINK RATE USING EYELINK EYE TRACKER

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Purpose: An abnormal blink rate can indicate a variety of diseases and health issues. However, the absence of a gold standard for blink rate measurement prevents optometrists and ophthalmologists from utilizing blink rate tests in their normal practice even when screening for Dry Eye Disease. This study aimed to investigate if the EyeLink Eye Tracker (SR Research) would accurately measure blink rate while participants were reading off of a computer screen.

Methods: Normally sighted individuals (age >18 years) were recruited. SPEED questionnaire was administered to screen for dry eye disease symptoms. Subjects read a novel (lexile measure 790L, high school level) for three minutes and took a two-minute break. This task was repeated thrice. Blinks during reading were counted live manually and was extracted from Eyelink recording.

Results: Fifteen participants [Mean age ± SD (years): 28.2±4.1; 8 females] enrolled. The difference between manual blink rate (9.49±6.2 blinks/minute) and blink rate computed from EyeLink eye tracker (10.01±6.3 blinks/minute) turned out to be statistically significant [$t(14)=2.53$, $p=0.024$]. However, the value (mean difference is less than half a blink) may not be clinically meaningful. A positive correlation was observed between SPEED questionnaire score and blink rate ($p=0.017$; Pearson Correlation = 0.606), with more symptomatic participants tending to blink more.

Conclusions: The Eyelink eye tracker can be used to measure blink rate accurately while an individual is doing a reading task on a computer monitor. This offers an objective measure of this parameter in a real-world task.

CSP42

ASSESSMENT OF READING PERFORMANCE WITH INTERNATIONAL READING SPEED TEXT (IREST) AMONG ADULTS WITH CONVERGENCE INSUFFICIENCY

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Purpose: Reading performance may be affected by the symptoms of frequent loss of place, intermittent diplopia, or other associated symptoms of convergence insufficiency. The aim of this report was to understand the reading performance among visually normal young adults with convergence insufficiency.

Methods: Participants aged between 18 and 35 years old with convergence insufficiency were identified. Text number two of International Reading Speed Text (IReST) was then administered at 40 cm distance under ambient illumination over best corrected visual acuity for reading speed assessment. Silent reading and finger tracing were not encouraged during the test. The time taken to complete the text was calculated with a stopwatch. The examiner counted the errors during reading.

Results: The mean (SD) age of eleven participants was 26.4 (±3.47) years, with ten females. The mean spherical equivalent of refractive error in the right and left eyes was -0.43 (±2.53) and -0.50 (±2.69) dioptres, respectively. Distance and near heterophoria were -2 (±3.9) and -8 (±4.7) prism dioptre. The remote breakpoint of near convergence was 9.9 (±4.7) cm. The Vergence facility was 8.9 (±3.1) cycles per minute. The mean reading speed in words per minute was 157.42 (±42.47), characters per minute was 640.87(±173.10), and syllables per minute was 205.12 (±55.23).

Conclusions: This report describes the reading performance among visually normal young adults with convergence insufficiency. The standard reading performance in the English language proposed by the IReST study group was higher compared to the present report.

CSP43

‘MYLYT’ WEARABLE LIGHT TRACKING DEVICE: DEVELOPMENT AND VALIDATION FOR FUTURE MYOPIA RESEARCH

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Purpose: We have developed a clip-on light tracker (MyLyt) for estimating light exposure in real-time that helps myopia research to understand several parameters related to light exposure level in children and adults. This study aimed to validate and investigate the feasibility of using MyLyt in children and adults.

Methods: The study was conducted in two phases. Phase 1 involved validation against a factory-calibrated digital lux meter in three different conditions - controlled environmental setup, outdoors, and indoors. Phase 2 involved a feasibility study where MyLyt was used in a natural world setting by 21 adults and 8 children. Participants were asked to log their real-time movements in an ‘activity diary’ correlated with the lux levels measured by the tracker.

Results: A strong positive correlation and non-significant difference in the recorded mean illuminance levels were observed during intra-test (Inter class correlation: 1.00, P=0.99 respectively), inter-test (0.91-1.00, P>0.15) and inter-device (0.91-1.00, P>0.56) validation, in all the three testing conditions (P>0.49), except indoor location. While the lux levels measured by MyLyt was significantly higher than that of lux meter (P<0.01) in the indoor locations, the differences were minimal and clinically insignificant. Phase 2 validation showed an expected illuminance level against their corresponding location with high sensitivity (97.8%) and specificity (99%) to accurately differentiate between outdoor and indoor locations.

Conclusions: MyLyt tracker shows good repeatability, correlation, and limited variation in data recording amongst trackers and comparison, to a digital lux meter in diverse environments. It can accurately differentiate between outdoor and indoor locations.

CSP44

COMPARISONS OF HETEROPHORIA AND ACCOMMODATIVE CONVERGENCE PER ACCOMMODATION RATIO AMONG ADULT ANISOMYOPES AFTER OFFICE BASED VERGENCE AND ACCOMMODATION THERAPY

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Purpose: Assessing the effectiveness of office-based vision therapy to optimize heterophoria status and accommodative convergence per accommodation ratio among anisomyopes.

Methods: A five years data of adult anisomyopes were reviewed from a tertiary eye care hospital of southern India. Data with minimum five hours of office based vergence and accommodation therapy was included in the list. Dataset were sub grouped based on the hours of therapy completed.

Results: Five hours of vergence and accommodation therapy were completed by a total of 33 individuals with a mean age of 24 (4.41) years of 17 (51.5%) were female participants, and 28 participants with a mean age of 22.7 (4.69) years among 14 (50%) were female participants were completed ten hours of sessions. The mean distance and near heterophoria were -3.9(6.04) and -4.4(6.24) prism dioptre at pre and 3.7(6.15) and -3.9(6.76) prism dioptre at post five sessions of therapy. Of participants completed with ten hours of therapy sessions were mean distance and near heterophoria -6.8 (7.65) and -7.6(8.55) prism dioptre, at pre and -6.0 (8.09) and -5.6(6.99) prism dioptre at post sessions respectively. However, at the end of five sessions (p=0.46) and ten sessions (p=0.18) of therapy, there was no statistically significant difference observed in accommodating convergence to accommodation ratio.

Conclusion: More hours of vergence and accommodation therapy can be structured to improve heterophoria status and the accommodative convergence per accommodation ratio among anisomyopia.

CSP45

PERCEPTION OF SUPRATHRESHOLD CONTRAST IN KERATOCONUS

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Purpose: Threshold contrast performance is significantly reduced in keratoconus. However, suprathreshold performance in this condition remains largely unknown. This study assessed the same using the contrast constancy paradigm. The study hypothesized that suprathreshold performance for keratoconus will show deficiencies that may be predicted from contrast sensitivity function (CSF).

Methods: Apparent contrast matches were determined at 10% and 50% stimulus contrast in 12 eyes of 12 patients with keratoconus (20-32 years) and 12 age-similar controls using an adaptive staircase procedure with eight reversals. Contrast matches were determined between a “reference” Gabor grating, with spatial frequency corresponding to the peak of the subject’s CSF, and “test” gratings with frequencies at one-third, one-half, twice and thrice that of the standard grating.

Results: For lower frequencies, perceived contrast at suprathreshold was comparable to the performance at threshold ($p=0.3$). However, perceived contrast was significantly different at higher frequencies ($p<0.001$). The difference between the performance at threshold and suprathreshold was prominent for 50% suprathreshold contrast. The severity of keratoconus was not associated with suprathreshold contrast perception (Pearson’s correlation coefficient $r=0.19$; $p=0.15$). The performance at suprathreshold level was similar between the two cohorts ($p=0.38$).

Conclusions: The invariability of contrast perception across the high spatial frequencies could be a result of adaptation in gain function of their respective channels at suprathreshold. Whereas, the loss in perception at lower frequencies is due to stimulation of similar frequency channels. The comparable suprathreshold performance across spatial frequencies for both keratoconics and controls may indicate a greater magnitude of adaptation for keratoconics.

CSP46

MOTION PARALLAX IS A CALIBRATED MONOCULAR CUE FOR COMPUTING 3D SHAPE

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Purpose: Binocular retinal disparity and monocular motion parallax can be used to derive is reported, little is known about motion parallax. The study aims to map the operating range of motion parallax to perceive depth and determine the ability to vary relative speed to perceive 3D shape.

Methods: A pilot of four subjects (24-42 years; 2:2 males: females) monocularly viewed random-dot stimuli displayed on a computer monitor from 2 meters in which a triangular bar of 3 deg breadth was induced in depth by varying dot motion speed differentially along the horizontal axis. The operating range of motion parallax was derived by the subjects by setting the minimum and maximum target speed for perception of depth. Veridicality of this cue to signal 3D shape change was determined by setting the dot speed such that the height of the perceived triangle was one-half the base size, equal to the base size, and double the base size.

Results: The average (±1SD) minimum and maximum dot speed required to detect 3D shape was 5.03 ± 1.87°/sec and 74.70 ± 6.46°/sec, respectively, resulting in an operating range of about 70°/sec. Depth modulation systematically increased with the depth/height criteria (half the base size: 26.10 ± 13.11°/sec; equal to base size: 37.16 ± 12.78°/sec; double the base size: 54.96 ± 7.76°/sec).

Conclusion: Motion parallax is approximately linearly calibrated monocular cue for computing 3D shape, with a well-defined operating range.

CSP47

INFLUENCE OF DIFFERENT VISUAL ENVIRONMENTS ON NEAR-WORK INDUCED AXIAL ELONGATION

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Purpose: Near-work is considered a risk factor for early-onset or progression of myopia. Thus, we investigated the effect of near-work performed in different visual environments which are known to inhibit or trigger myopia.

Methods: A total of 46 young adults (age range 18-32 years) participated in the experiment. Twenty-two individuals performed a reading task for 15-minutes at a distance of 20 cm in natural outdoor bright light (~40,000 lux) and indoor light (~70 lux). Twenty-four individuals performed the same reading task in an unclutter and cluttered environment indoors. Pre- and post-task ocular biometry measurements were performed for each session using Lenstar LS 900.

Results: A significant increase in axial length (AL) was found from baseline for reading tasks in both outdoor (12.27 ± 3.35 µm, p=0.001) and indoor environments (mean ± SEM; 11.9 ± 3.13 µm, p=0.001). No significant difference in AL was observed between these two environments (p>0.05). Similarly, AL increased significantly from baseline to post-reading task, irrespective of the absence of clutter (17.92 ± 3.51 µm, p<0.001) or the presence of a cluttered environment (19.17 ± 2.94 µm, p<0.001). No significant difference was noted in AL when compared between these two tasks (p>0.05) Vitreous chamber depth increased significantly after performing reading tasks in all visual environments (p<0.001). The majority of participants (~70–80%) showed the trend of increasing in axial length regardless of the visual environment.

Conclusion: Irrespective of various visual environments (outdoor vs. indoor; unclutter vs. clutter), reading tasks always lead to greater changes in axial length.

CSP48

THE VISUAL SYSTEM MAY USE A MINIMUM DEFOCUS STRATEGY TO OPTIMIZE SPATIAL RESOLUTION IN THE PRESENCE OF TIMEVARYING RETINAL DEFOCUS

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Purpose: Human observers may use a minimal defocus strategy to optimize visual resolution with temporally-varying defocus. This conjecture was tested by hypothesizing that visual acuity loss with static defoci may be fully recovered with added temporal fluctuations of equal or greater magnitude and with at least one zerodefocus point within the stimulus presentation epoch.

Methods: Sloan letter acuity was simulated using a template-matching model (Goswami and Bharadwaj, 2022) for varying combinations of baseline myopia and 4Hz temporal sinusoidal fluctuations of similar magnitudes (0.50D, 1D and 2D). Visual acuity with decision criteria based on minimum defocus or average defocus within the 300ms stimulus presentation epoch was evaluated. The experiment was replicated in two cyclopleged adults by stimulating the temporal defocus pattern using an electrically focus tunable lens.

Results: Simulated acuities deteriorated with increasing myopia (Mean±1SD: -0.03±0.03logMAR, 0.07±0.05logMAR, 0.61±0.03logMAR and 0.91±0.04logMAR for 0D, 0.5D, 1D and 2D defoci, respectively) ($p<0.01$). Acuities improved with added temporal fluctuations and reached no defocus level for all combinations meeting the aforesaid criteria [e.g., visual acuity for 2D myopia combined with 2D fluctuations (-0.06±0.03logMAR) was significantly different from baseline myopia ($P<0.001$) but similar to no defocus condition ($p=0.05$)]. Empirical data trends were similar to simulation results.

Conclusions: These trends support the conjecture that the visual system optimizes spatial resolution by using a minimum defocus strategy in the presence of time-varying defocus. Visual acuity loss with static defocus may be effectively restored with the addition of temporal defocus fluctuations.

CSP49

NOVEL BIOMETRY-BASED TECHNIQUE FOR DETERMINING THE ANTERIOR SCLERAL THICKNESS

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Purpose: Considering the potential role of anterior scleral thickness (AST) in myopiogenesis and myopia progression, we aimed to validate the biometry-based novel technique (optical low coherence reflectometry, OLCR) against a high-resolution Swept Source Optical Coherence Tomography (SS-OCT) for estimating the AST.

Methods: The right eye's AST was measured for all participants (n=62) at four ocular meridians (superior, inferior, nasal, and temporal) with an OLCR-based non-contact biometer (Lenstar-LS 900) followed by a SS-OCT (Topcon-3 DRI Triton Plus). The AST measurements were derived via manual imaging analysis using the inbuilt calliper tools of both instruments. The correlation and agreement between two instruments for AST measurements were assessed using Pearson's correlation and Bland-Altman analysis, respectively.

Results: The AST measurements from the biometer and OCT strongly correlated to each other at all meridians ($r = 0.82$, $p < 0.01$). Bland-Altman analysis indicated good agreement between two instruments for AST measures with the mean difference ± 95% CI of 3 micrometres (µm) ± -2 to 8 micrometres ($p = 0.23$ for all meridians).

Conclusions: The OLCR-based non-contact biometer exhibits a strong correlation and good agreement with OCT in determining AST. Hence both these methods can be used interchangeably for determining AST at the specified measured locations. This has a high potential for its application in the field of myopia research and practice.

CSP50

CHARACTERISTICS OF VISUAL IMPAIRMENT AND THE IMPACT OF LOW VISION ASSESSMENT IN LOW VISION CLINIC IN AHMEDABAD

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Purpose: 1) To describe the characteristics of patients with visual impairment and low vision evaluation, 2) To study its impact on their functional needs

Methods: A retrospective analysis of the records of 96 patients from low vision clinic Ahmedabad over the period of January 2022 to July 2022 was performed. Accumulate information included age, gender, clinical diagnosis, Consanguinity, family history of ocular disease, and type of low vision aid prescribed and its impact on patient's functional needs.

Result: Mean age was 44.35 years (range 5–80). Most participants were in the 20-60 yeas age group (48.94%). 53.19 percent the participants were the offspring of consanguineous marriages. The main cause of visual impairment was albinism, followed by diabetic retinopathy, retinitis pigmentosa and macular degeneration. The majority of low vision aids were prescribed for near distance tasks reading spectacles were the most prescribed visual aid. 93.62 percent of patients reported functional improvement and retained their visual aids upon follow-up.

Conclusions: Albinism was the main cause of visual impairment. We report a consanguinity rate of 53.19%. At follow-up, the vast majority of patients reported functional improvement and continued to use their visual aids. Raise awareness of low vision services, incorporate them into a multidisciplinary approach, and improve referral protocols. It is important to seek emerging research to cure hereditary retinal illnesses as well as family counselling regarding consanguineous marriages.

CSP51

READING SPEED IN ANISOMETROPIC AMBLYOPIA: AN OBSERVATIONAL STUDY

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Purpose: To compare the reading speed and oculomotor functions in anisometropic amblyopes (AA) and age matched controls.

Methods: Anisometropic amblyopes (AA) with age group of 7-17 years and age matched controls were included in the study. Subjects were referred to amblyopia review clinic after a comprehensive eye examination by a Pediatric ophthalmologist. Binocular reading speed was assessed using ReadAlyzer and Monocular tests were assessed using MN (Minnesota) Read chart with stop watch (words per minute [wpm]).

Results: Sixteen anisometropic amblyopes and 29 age matched controls were recruited in this study with the mean (SD) age of 11.31 (±3.68) and 10.61 (±2.24) years respectively. The median [IQR] binocular reading speed of controls was 103 (80 to 119) wpm when compared to anisometropic amblyopia with 68.50 (58.25 to 96.75) wpm. Similarly, the median [IQR] monocular reading speed of amblyopic eye was 80.5 [59 to 94] wpm in comparison of non-amblyopic eyes 100 [88 to 132.75] wpm. Further, the oculomotor functions including fixations/100 words, regression/100 words and comprehension were reduced in amblyopes than age matched controls (Mann Whitney U test; $p<0.05$).

Conclusions: Monocular and binocular reading speed in anisometropic amblyopes showed a decrease than age matched controls along with increased number of fixations and regressions.

CSP52

EFFECTS OF MORNING AND EVENING SHORT-TERM EXPOSURE TO BLUE LIGHT ON OCULAR BIOMETRY IN HUMANS

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Purpose: Short-term exposure to blue light is known to alter ocular axial length. We aimed to investigate how blue light exposure influences axial length in morning and evening time of the day, and how swiftly it alters axial length.

Methods: Total twenty-three participants were exposed to blue light for 60-minute at two different time of the day: morning (between 9.00 to 11.00 am), and evening (5.00 to 7.00 pm). In both the morning and evening session, baseline axial length was measured using non-contact biometer (Lenstar LS-900) under white light condition and in every 10 minutes during 60-minutes of exposure to blue light. The morning and evening sessions conducted on the same or subsequent day to the first session.

Results: Blue light exposure for 60 minutes resulted in significant reduction in axial length from baseline in morning (-6.0 ± 2.7 µm, p=0.04), and evening (-10.9 ± 3.4 µm, p=0.004). However, the difference between the two sessions for 60 minutes did not achieve significance (p=0.21). During evening, significant change in axial length in response to blue light exposure occurred at 30-minute (-6.8 ± 2.9, p = 0.04). The rate of reduction in axial length was faster during evening than morning (slope ß, morning exposure = -0.104 versus evening exposure = -0.182, p =0.04).

Conclusions: Both morning and evening exposure led to similar reduction in axial in response to blue light exposure. Axial length responded relatively quicker in response to blue light in evening than in morning. The effect of blue light therapy in myopia control needs to be explored.

CSP53

DOES NUTRITION HAVE ASSOCIATION WITH MYOPIA DEVELOPMENT AND PROGRESSION?

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Purpose: Often parents ask eye care practitioners if changing food habits will control myopia progression in their children. Each of the existing studies in human population assessed diverse nutrients and dietary elements for their association with myopia making it difficult to comprehend if nutrition as whole has any relation with myopia. Therefore, we systematically reviewed the outcomes of the studies that previously investigated the association between nutrition and myopia.

Methods: Embase, Medline and PubMed were searched by two independent authors to identify cross-sectional, prospective, or interventional studies that assessed the association of nutrition with myopia. The data from the included studies were extracted and qualitative analysis was performed.

Results: Thirty-two articles were included in the review. Out of 29 non-interventional studies, 1 study showed positive association of nutrition with myopia, while 7 studies found negative association. Remaining studies did not find association of myopia with most of the nutrients and dietary elements. Majority of the studies that showed significant association of nutrients and dietary elements with the increased risk of myopia have minimal effects (Odds ratio: 0.55 to 1.07) with wider or overlapping confidence intervals, implicating weaker association. Two out of the three dietary interventional trials included in the review had borderline effect (<0.25 D) in controlling the myopia progression.

Conclusions: The current evidence through this review indicates no association between nutrition and myopia. However, nutrition being a difficult entity to measure, further trials with robust methodology must be conducted to understand its role in myopia.

CSP54

MONOCULAR AND BINOCULAR LUMINANCE-MODULATED FLICKER THRESHOLD SHOW RETINAL-LOCATION SPECIFIC LOSSES IN BRANCH RETINAL VEIN OCCLUSION

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Purpose: Interocular variations in monocular detection capabilities (flicker modulation thresholds; FMTs) tend to have negative impact on the binocular perception of luminance-modulated flicker. This study determined if variations in monocular FMTs in corresponding regions of two retinas exhibit similar loss in binocular detection of flicker.

Methods: Monocular and binocular photopic FMTs were measured in 9 cases with unilateral BRVO (49+6yrs) and 5 age-similar controls. Flicker-plus test (City Occupational Ltd, UK) was used to measure FMTs at central vision and parafoveally at 12° supero-nasal, super-temporal, infero-nasal and inferotemporal eccentricities using 30‘diameter sinusoidally flickering (15 Hz) stimuli. The thresholds were measured using adaptive staircase method. Average of two runs were considered as the threshold. Affected and the unaffected zone in BRVO was demarcated using OCT retinal swept source (Topcon) for determining the FMTs at a targeted zone.

Results: Threshold variation noted across retina clearly showed a structure-function correlation, in addition the unaffected region of the same eye showed poor sensitivity in comparison to the fellow eye. FMTs were higher in affected regions (11-86%) than the corresponding unaffected regions in the same eye (fovea: 10-35%; parafovea:11-33%), across regions in the fellow eye (fovea: 3-7%; parafovea: 6-15%) and in controls (fovea: 2-5%; parafovea:9-12%). Binocular FMTs in affected region were similar to monocular FMTs of the corresponding regions in the unaffected eye (4-12%)

Conclusions: Monocular and binocular flicker detection capabilities may vary regional across the retina, depending on the corresponding interocular differences in monocular thresholds. BRVO may be a useful disease model to study this behavior owing to its unilateral and region-specific retinal manifestation.

CSP55

EVALUATION OF HIGH AND LOW CONTRAST VISUAL ACUITY WITH AND WITHOUT SIMULATED WATER-INDUCED BLUR IN SWIMMERS AND NON-SWIMMERS

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Purpose: Human eyes have difficulty to see clearly underwater. We studied the effect of simulated water-induced blur (SWIB) on high (HCVA) and low (LCVA) contrast visual acuities in swimmers and non-swimmers.

Methods: Forty young participants (swimmers and non-swimmers) with normal or corrected to normal vision participated in the study. A tumbling E stimulus of varying orientation was presented at 100% contrast (HCVA) and 2.5 % contrast (LCVA), using FrACT© on a Display++ monitor, at a distance of 2 meters from the participant. Participants indicated the orientation of the stimulus at each trial and acuity was measured as the smallest recognisable target. SWIB was created using mechanical motor and water sprinkler in a glass tank placed close to the monitor. The measurements were performed with and without SWIB in random order.

Results: The mean logMAR HCVA and LCVA was significantly ($p < 0.001$) reduced with SWIB (- 0.01 ± 0.12 and 0.53 ± 0.14) when compared to without SWIB (-0.06 ± 0.07 and 0.27 ± 0.09) condition in both swimmers and non-swimmers. In both experimental conditions, the mean logMAR HCVA was found to be significantly ($p < 0.001$) better than the LCVA among swimmers and non-swimmers. The visual acuity was significantly better among swimmers than non-swimmers across contrast levels and experimental conditions ($p < 0.001$).

Conclusions: Our results imply that non-swimmers' experience more difficulty in resolving fine spatial vision and recognising high and low contrast targets than the swimmers' in the presence of water-induced blur. The effect of adaptation to SWIB is yet to be studied.

CSP56

IMAGING THE POLARIZATION PROPERTIES OF CORNEA USING DIGITAL PHOTOELASTICITY: A PILOT *IN VITRO* STUDY

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Purpose: The goal of the present study is to understand the morphological features of corneal retardation after collagen cross-linking (CXL), multiple suturing, and punctures in the human cornea.

Methods: Six corneas with multiple sutures (n=2), epi-off accelerated CXL (n=2), and half and full-depth punctures (n=2) were imaged using the polariscope in the transmission mode under white light at 0 and 20 mm of Hg pressure. The birefringence data was acquired using the digital photoelasticity technique.

Results: A continuous fringe band was identified connecting the suture bites of individual sutures. The morphology of this band appeared to be varying from suture to suture. For CXL corneas, one cornea did not exhibit any difference in the retardation behavior before and after the CXL. While the other cornea exhibited similar behavior of the retardation change with pressure in pre- and post-CXL conditions. A distinct butterfly-shaped fringe morphology was observed in one of the corneas with a full puncture.

Conclusions: The continuous fringe band in the cornea with sutures is the result of the interaction between individual sutures. Further, the variation in the morphology of the fringe band between the suture bites could be an implication of unequal tension at the suture bite. The CXL procedure does not create a noticeable change in the average retardation profile of the cornea, depicting its structural-locking effect. The retardation of the punctured cornea depicts a stress concentration profile around the puncture and is pertinent to the fracture properties of the cornea under suturing.

EVALUATING ADHESIVE STRENGTH OF OCULAR BIO ADHESIVES UNDER PHYSIOLOGICAL CONDITIONS

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Purpose: Cornea being the outermost part of eye is prone to accidental damage. These damages are often large enough to self-heal and requires surgical intervention, which can be provided by a donor tissue transplant or a biomimetic implant. In the shortage of cadaveric corneas for transplantation, ocular adhesive biomimetic implants have emerged as a viable alternative, providing additional advantage over surgery (suturing) associated complications. An implant is expected to adhere to host tissue and support cells meanwhile meeting characteristics of native cornea for tissue regeneration. In in-vitro setup, closest possible substitute to cadaveric cornea is skin tissue derived from animal sources, which can be utilized for testing bioadhesive nature of implants. Experimental method optimization is required to establish parallel grounds between the substitute and the tissue of interest, which is usually limited by sensitivity and reliability related questions.

Methods: Pandorum technologies has optimized a method of using porcine skin for quantifying bioadhesive nature of bio-polymeric substitutes for ocular implants under physiological condition. The assembly can be analyzed by tensile (mechanical) testing to determine adhesive strength between the substitute and skin tissue.

Results: Adhesive strength of biopolymeric implants using porcine skin was 28±3.1 kPa and their adhesion with cadaveric cornea tissues was 30.1±4.3 kPa, as reported in literature. The observations suggest that porcine skin can be used for assessing mechanical strength of corneal substitutes and also be extended for screening of ocular adhesives.

Conclusion: The demonstrated similarity between porcine skin and cadaveric human corneas for adhesive strength measurement lowers the burden on eye-banks for corneal tissue requirement for research use. Bio adhesive ocular substitutes screened using porcine skin provides an effective option for replacing the need of cornea for transplant.

CSP58

BIOMECHANICS OF GRAFT HOST JUNCTION IN PENETRATING KERATOPLASTY

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Purpose: To analyse the mechanical properties of graft host junction in penetrating keratoplasty (PK) using experimental techniques.

Methods: A rejected PK graft that survived in patient for 14 years has been extracted from patient along with a small portion of host. This extracted graft is made into two equal parts. While the first half is subjected to series of mechanical tests namely, digital photoelasticity, suture retention tests, and fractography on the remnants of the suture retention tests. Histopathology analysis is done on the second half.

Results: The birefringence pattern in the graft is found to be uniform across the host and donor. Two out three specimens have propagated tear in the graft junction and third specimen has shown a unique tear behaviour. In the graft junction, the defect initiation strength is 0.1 N and the treat initiation strength is 0.4 N. Fractography depicted an interweaving of the collagen fibres in the graft junction. Histopathology revealed the graft host junction and smooth scar on one edge of the specimen. While on the other side no graft junction is found which, substantiates the unique behaviour of the third specimen.

Conclusions: The mechanical properties of the graft junction are evaluated where the strength is characterised by defect initiation strength and the tear initiation strength. The alignment of the host and the donor is analysed using digital photoelasticity.

CSP59

TUNING THE MECHANICAL STRESS RELAXATION PROFILE OF VISCOELASTIC HYDROGEL MATRICES FOR CORNEA TISSUE ENGINEERING

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Purpose: Facile hydrogels that mimic the mechanical and biochemical properties of the tissue is one of the unaddressed challenges in tissue engineering. Presently, the novel hydrogel designs have achieved macroscopic tunability, but they are not close to the dynamic environment of the natural extracellular matrix (ECM). This technological gap can be bridged via a careful understanding of the viscoelastic behavior and stress relaxation (τ1/2) profiles in biodegradable hydrogel matrices. These properties are responsible for cell spreading in 2D and 3D cell cultures, and can be used for mimicking the requirements for providing adequate environment for cell growth. Pandorum's key focus is to develop therapeutic light-induced hydrogel systems for the treatment of corneal blindness. It acts as a sacrificial matrix for accelerating the growth of host tissue to cover the wound site. To ensure optimal cell growth, proliferation, and migration, the origin and significance of viscoelastic properties in engineered hydrogels were identified and fine-tuned.

Methods: The bioengineered hydrogel was designed via photo cross-linking. The biopolymer solution undergoes phase transition (liquid to gel) as they are exposed to light. The prepared hydrogels were further tested for stress relaxation profile using a Rheometer (Anton-Paar, MCR 102). The relaxation profiles were evaluated under a constant strain of 15%.

Results: The photo-crosslinked hydrogels relaxed faster (τ1/2= 23 min) than the gels prepared via conventional covalent crosslinking (τ1/2= 33.5 min). In vitro studies with corneal stromal cell encapsulated gels revealed a more physiological phenotype of cells in faster relaxing gels as compared to the gels showing lesser stress relaxation.

Conclusions: Stress relaxing hydrogels were formulated via a careful modulation of the polymer network and process parameters. Pandorum's bioengineered hydrogel meets the physiochemical properties of the native corneal tissue and also promotes the key cell- ECM interactions responsible for wound healing and restoration of vision.

CSP60

CLINICAL PROFILE AND DEMOGRAPHIC DISTRIBUTION OF OPHTHALMIA NODOSA: AN ELECTRONIC MEDICAL RECORD-DRIVEN BIG DATA ANALYTICS FROM A MUTITIER EYE CARE

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Purpose: To describe the demographics and clinical profile of ophthalmia nodosa in patients presenting to a multi-tier ophthalmology hospital network in India.

Methods: This cross-sectional hospital-based study included 3,082,727 new patients presenting between August 2010 and December 2021. Patients with a clinical diagnosis of ophthalmia nodosa in at least one eye were included as cases. The data were collected using an electronic medical record system.

Results: Overall, 434 (0.014%) patients were diagnosed with ophthalmia nodosa. Most patients were male (71.43%) and had unilateral (97.7%) affliction. The most common age group at presentation was during the third decade of life with 116 (26.73%) patients. The overall prevalence was higher in patients from a higher socioeconomic status (0.015%), presenting from the urban geography (0.019%) and in professionals (0.027%). The setae were identified and removed at presentation in 287 (66.13%) patients. The most common location of the setae was conjunctiva (45.72%), followed by the cornea (39.64%). Most of the eyes had mild or no visual impairment (<20/70) in 355 (79.95%) eyes. The most documented ocular signs were eyelid edema (35.81%), conjunctival congestion (73.87%) and corneal abrasion (29.05%). Less than a tenth required surgical intervention for removal of the setae, corneal foreign body removal was performed in 10 (2.25%) eyes and conjunctival foreign body removal in 4 (0.90%) eyes.

Conclusions: Ophthalmia nodosa more commonly affects males presenting during the third decade of life and is predominantly unilateral. The setae is most commonly lodged in the conjunctiva followed by the cornea, and the majority of the eyes had mild or no visual impairment.

CSP61

ESTABLISHING NORMATIVE INDIAN DATA FOR A NEW MACULAR PIGMENT SCREENING TEST WITH ASSESSMENT OF DIETARY FACTORS

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Purpose: Purpose of the study is to establish normative Indian data for MP-eye test scores by considering physiological-lifestyle associated risk factors with detailed evaluation of dietary factors.

Methods: 484 ocular healthy volunteers (with BCVA ≥20/25) and aged 14-72 enrolled for this cross-sectional study. Study tests were performed according to standard study protocol in the following order: 1) LZ-FFQ (Lutein- Zeaxanthin Food Frequent Questionnaire (nutritive value referenced from IFCT and USDA FDC) mapping dietary intake of macular pigments. 2) MP-eye test as a measure of Macular Pigment Density. 3) BMI was calculated from Height and Weight. 4) Fundus Imaging to assure healthy macular status. 5) Lifestyle and demographic details. Study data was analysed via an unsupervised clustering approach with k-means, PAMK, and model-based clustering. Results: A normative database for MP-scores was developed (mean, median, range, IQR). 4 clusters were developed referencing MP-score value, Cluster-1(n=77) for 0-3, scores, Cluster-2(n=126) for 4 and 5 scores, Cluster-3(n=170) for 6 and 7 scores, and Cluster- 4(n=111) for scoring 8-10 in MP-eye test. Mean Daily Dietary Intake of Lutein and Zeaxanthin was 1.6, 1.8, 1.7, and 1.9 mg with IFCT-LZ-FFQ and 0.8, 0.8, 0.9, and 1.0 mg respectively, in USDA FDC-LZ-FFQ. Age also had a negative relation with these scores on cluster-based analysis.

Conclusions: This study provides normal distribution of the MP-eye score for healthy eyes. There are differences in dietary intake of L-Z and age amongst clusters of MP scores; indicating the need for proactive supplementation/modification of diet in Indians in the perspective of macular degeneration.

CSP62

PROFILE OF POSTERIOR SEGMENT DISORDERS AMONG ADULTS: TAMIL NADU RURAL EYE EXAMINATION STUDY

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Purpose: This study was done to profile the posterior segment disorders from a rural region of Tamil Nadu.

Methods: This rural eye examination was conducted in Tiruvannamalai, a rural district in Tamil Nadu. Villages that were within 50km radius to the secondary centre in Tiruvannamalai were selected. Welfare centres in villages were identified for setting up a transitory clinic for 3 screening days. Comprehensive eye examination including history taking, refraction, acceptance, anterior and posterior segment evaluations with spectacle dispensing was performed for all residents who visited the clinic. All procedures were performed by optometrists and optometry students. Posterior segment evaluation was done using a non mydriatic digital fundus camera. The gradable images were categorised based on the different fundus characteristics using ETDRS classification for DR, and AREDS for ARMD. Data was entered in Microsoft Excel and analysed with 'eyes' as a base unit.

Results: A total of 7518 participants from 46 villages with a mean (SD) age of 51.39(16.36) years were included. Of the available images (13872), 60.59%(9111) were gradable. The prevalence of any posterior segment disorders in this sample was found to be 3.78% (348). DR, ARMD and Glaucomatous changes were found in 0.81% (74), 1.98% (181) and 0.98% (90) respectively. Besides which, abnormal fundus characteristics like Peripapillary atrophy (537,5.89%) and tessellated fundus (480,2.53%) were also found.

Conclusions: To conclude, almost 12% of the rural sample had some abnormal fundus characteristics. Without the comprehensive screening protocol, these participants would have been left undiagnosed. Therefore, screening for posterior segment evaluation should be included as part of all service delivery models.

CSP63

POPULATION BASED STUDY TO INVESTIGATE BARRIERS TO SEEK EYECARE: AKIVIDU VISIUAL IMPAIRMENT STUDY

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Purpose: To report barriers to seek eyecare among aged 40 years and older population in Akividu region in South Indian state of Andhra Pradesh.

Methods: A total of 3000 individuals were enumerated using multi-stage cluster random sampling method from 60 clusters. Three study teams (vision technician, field investigator and field worker) examined all eligible participants using a standard Rapid Assessment of Vision Impairment (RAVI) protocol. Participants with distance vision impairment (presenting visual acuity worse than 6/18 in the better eye) were interviewed using a validated questionnaire to report barriers for not seeking eyecare. If participants gave multiple reasons, reasons were noted as primary, secondary barriers. Primary barrier was grouped as economic and personal barriers. Stata software was used for analysis.

Results: A total of 2587 participants were examined. The mean age of the participants was 55.7±11.4 years (range:40-84 years), 54.4% of them were women and 47.3% of them had no formal education. A total of 359 participants had distance vision impairment (12.8%, 95% CI: 9.1%-11.4%). Personal barriers (94.9%) were major reason for not seeking eyecare services compared to economic barriers (5.0%). Among personal barriers, aware of the problem but can manage (45.7%), old age and no felt need (12%), no one to accompany (12.9%) and fear of losing eyesight/surgery (9%) were major barriers for not seeking eyecare services.

Conclusions: In Akividu region, personal barriers were major barriers for uptake of eye care services. Active behaviour change intervention strategies to increase the uptake of eyecare services are needed.

CSP64

ECTOPIA LENTIS: VISUAL AND REFRACTIVE PROFILES IN A LARGE COHORT OF CHILDREN FROM A TERTIART EYE CARE NETWORK

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Purpose: To study the clinical presentations, visual and refractive profiles of children with congenital ectopia lentis in a large cohort of patients from a tertiary eye care network in India.

Methods: A retrospective review of electronic medical records from December 2012 to December 2020 was conducted. 297 consecutive children ≤18 years of age at presentation were identified and analysed for demographic details, patient distribution, lens subluxation, visual and refractive profiles before and after the interventions.

Results: 594 eyes of 297 (male 56%; n=166) patients were analysed. Mean age at presentation was 8.74 ± 3.89. Best-corrected visual acuity (BCVA) at presentation ranged from 0.3 logMAR to 3.5 logMAR; (Snellen:6/9 – CF) (mean 0.89 ± 0.68). Refractive errors included myopia (range: 0.75 to -30.0D), hyperopia (+1.25 to 16.0 D), astigmatism (+2.00 to -9.0 D). High myopia (n=201;33.83%) and mild astigmatism (n=340;57.23%) were more frequent. Temporal (n=108; 18.18%) subluxation was most common. Lensectomy with limited vitrectomy was performed in 243 eyes of 127 patients (40.90 %). Median preoperative BCVA was 1.0(range:0.3 -3.5 logMAR;20/40-CF). Median postoperative BCVA was 0.5 logMAR (6/18) in the pseudophakic group and 0.6 logMAR (6/24) in the aphakic group. Spherical equivalent in myopic children reduced from -12.06 □ 6.84 D to -1.57D (- 0.25D to -5.5D) in the pseudophakic group and +9.3D (+5.5D to 15.5D) in the aphakic group.

Conclusions: This study is a large cohort of children presenting with ectopia lentis. Following intervention, there was an improvement in the median BCVA and refractive correction. Early detection and timely intervention may benefit children with ectopia lentis.

CSP65

CLINICAL PROFILE AND DEMOGRAPHIC DISTRIBUTION OF HIGH MYOPIA: AN ELECTRONIC MEDICAL RECORD-DRIVEN BIG DATA ANALYTICS FROM A MUTITIER EYE CARE

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Purpose: To describe the clinical profile and demographic distribution of High Myopia in India

Methods: This cross-sectional hospital-based study included 2,834,616 new patients presenting between August 2010 and June 2021. Patients with a clinical diagnosis of High Myopia in at least one eye were included as cases. The data were collected using an electronic medical record system.

Results: Overall, 73274 (2.58%) patients were diagnosed with High Myopia of which 38396(52.40%) were males and 34878(47.60%) were females and had a bilateral affliction of 63323 (86.42%). The prevalence rates were 4.12% in children and 2.35% in adults. The most common age group at presentation was during the third and second decade of life with 23046(31.45%) and 15768(21.52%) patients. The overall prevalence of high myopia was higher in patients from a lower-middle-class socioeconomic status (2.95%) presenting from the urban geography (3.069%) and in students (6.606%). Most of the eyes had mild or no visual impairment (<20/70) in 92644 (67.82%) eyes followed by moderate visual impairment in 19075 (<20/80 – 20/160) (13.96%) eyes. Of the 136597 eyes, the most commonly documented retinal signs were lattice degeneration in 5069 eyes (3.71%), tessellated fundus (2.86%), and CRA (2.31%) followed by posterior staphyloma, myopic macular degeneration, myopic foveoschisis, WWOP, lacquer cracks and retinal break which were present but less common. The most common complication seen was retinal detachment in 1719 eyes (1.26%) followed by CNVM 1142 (0.84%) followed by CME in 64 eyes (0.05%). Retinitis pigmentosa was found to be the most common genetic disorder in around 1280 (1.75%) patients with high (Truncated at 250 words).

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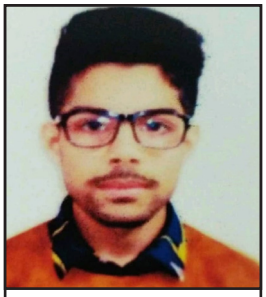
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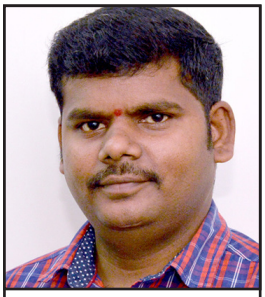

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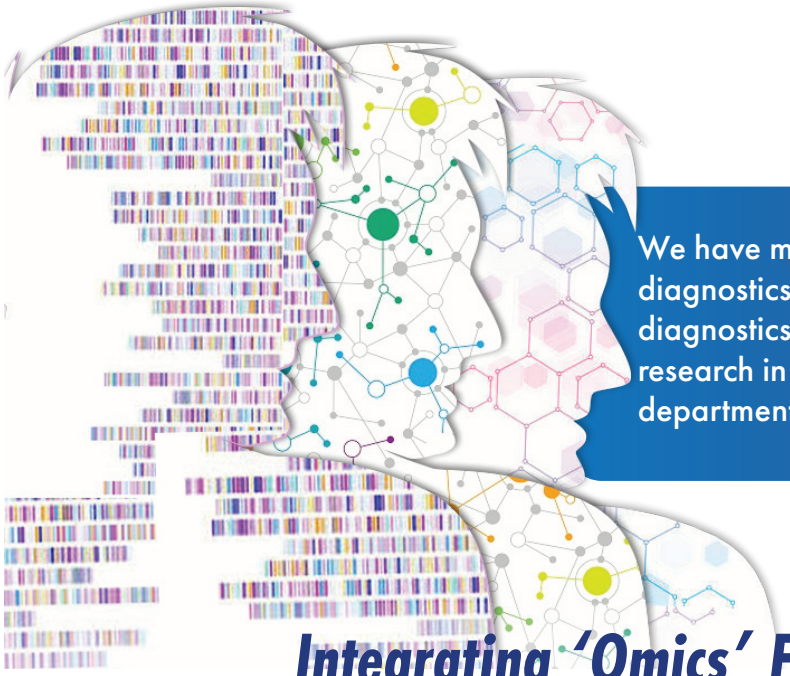

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