

Clinical & Experimental Ophthalmology

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The Royal Australian and New Zealand
College of Ophthalmologists

52nd Annual Scientific Congress

25 February – 1 March 2022

Brisbane Convention & Exhibition Centre,
Brisbane

PROGRAM AND ABSTRACTS

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College of Ophthalmologists



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Reference: 1. Novartis data on file. Novartis Pharmaceuticals Australia Pty Limited ABN 18 004 244 160.
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52nd Annual Scientific Congress

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PROGRAM AND ABSTRACTS



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Reference: 1. CEQUA™ Product Information. 2020 Feb, 2020; Available from: Sun Pharma by calling 1800 726 229.

Clinical & Experimental Ophthalmology



The Royal Australian and New Zealand College of Ophthalmologists
52nd Annual Scientific Congress
25 February – 1 March 2022

Contents

Volume 49 Number 8 February 2022

Committees	783
The Royal Australian and New Zealand College of Ophthalmologists 52nd Annual Scientific Congress	
Past Lecturers	784
Past Lecturers and Briefs For the Named Lectures: RANZCO Annual Scientific Congress	
Scientific Program	789
Invited Speakers	795
Saturday 26 February Speakers	803
Sunday 27 February Speakers	825
Monday 28 February Speakers	847
Tuesday 1 March Speakers	866
Film Abstracts	868
Poster Abstracts	873
Author Index	978

The contents contained herein are correct at the time of printing and may be subject to change.

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References: 1. Sharif-Kashani P *et al.* Comparison of occlusion break responses and vacuum rise times of phacoemulsification systems. *BMC Ophthalmol* 2014;14:96. 2. (Laboratory study comparing Infiniti®, Centurion® with active fluidics and Whitestar Signature). 2. Nicoli CM *et al.* Experimental anterior chamber maintenance in active versus passive phacoemulsification fluidics systems. *J Cataract Refract Surg* 2016;42(1):157-162. (Laboratory study comparing Infiniti® and Centurion® with Active fluidics). 3. Boukhny M *et al.* A novel phacoemulsification system utilizing feedback based IOP target control. ASCRS-ASOA Symposium and Congress: April 25-29, 2014; Boston, MA. (Laboratory study comparing Infiniti®, Centurion® with active fluidics and Whitestar Signature). 4. Crandall AS. Role of Incision leakage in anterior chamber stability in different phacoemulsification systems. 5. Aravena C *et al.* Aqueous volume loss associated with occlusion break surge in phacoemulsifiers from 4 different manufacturers. *J Cataract Refract Surg* 2018; 44:884-888. 6. Thorne A *et al.* Phacoemulsifier occlusion break surge volume reduction. *J Cataract Refract Surg* 2018;44:1491-96. (Laboratory study comparing Infiniti®, Centurion® with active-fluidics, and Centurion® with Active Sentry™).

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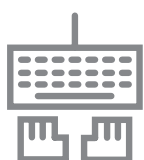
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1. Lemp, M.A., Crews, L.A., Bron, A.J., Foulks, G.N. and Sullivan, B.D., 2012. Distribution of aqueous-deficient and evaporative dry eye in a clinic-based patient cohort: a retrospective study. *Cornea*, 31(5), pp.472-478.

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25 February – 1 March 2022

Brisbane Convention & Exhibition Centre

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Past Lecturers and Briefs For the Named Lectures: RANZCO Annual Scientific Congress

1 | THE NORMAN McALISTER GREGG LECTURE (ESTABLISHED 1958)

The Norman McAlister Gregg Lecture was established by the Council of the Ophthalmological Society of Australia in recognition of the outstanding contribution made to ophthalmology by Sir Norman Gregg. The lecture covers a clinical or basic science topic that has clinical relevance and may cover some facet of work not previously published (both ophthalmologists and non-ophthalmologists can be considered). The presentation shall be for 30 minutes duration and no time for discussion or questions is allowed. The lecture becomes the property of the College. A “Gregg Medal” is presented, together with a certificate, to the lecturer at the conclusion of the lecture.

1961	Sir Lorimer Dodds
1964	Prof Ida Mann
1967	Prof Ramon Castroviejo
1970	Prof Lorenz E. Zimmerman
1973	Prof Gustav Nossal
1975	Prof William F Hoyt
1981	Prof Robert M. Ellsworth
1984	Prof Barrie Jones
1986	Dr Thomas Mandel
1987	Prof Ian Constable
1988	Prof Colin Blakemore
1989	Dr Robert Machemer
1990	Prof Ian Gust
1991	Prof Doug Coster
1992	Prof Stephen Drance
1994	Prof Harry A. Quigley
1995	Prof Richard Larkins
1996	Prof George Waring
1997	Prof Susan Lightman
1998	Prof Richard Collin
1999	Prof Edward Stone
2000	Prof Stuart Fine
2000	Prof Yasuo Tano
2001	Mr John Hungerford
2002	Justice Michael Kirby



2003	Prof Caroline MacEwan
2005	A/Prof David Mackey
2006	Prof David Apple
2007	Prof Jost B. Jonas
2008	Prof Charles McGhee
2009	Mr Geoffrey Rose
2010	Prof Paul Mitchell
2011	Prof Elizabeth Engle
2012	Prof Brenda Gallie
2013	Dr David Chang
2014	Prof Hugh R. Taylor AC
2015	Prof Peter McCluskey
2016	Prof Denis Wakefield AO
2017	Dr Noel Alpins AM
2018	Prof Robyn Guymer AM
2019	Prof Tien Y. Wong
2020	- Congress postponed due to COVID-19
2021	Prof Graham D. Barrett

2 | THE COUNCIL LECTURE (ESTABLISHED 1963)

The Council Lecture was established to honour members (Fellows) engaged in original work, or to establish a means whereby members can deliver an authoritative and distinguished paper on a subject of which the lecturer has particular experience or knowledge. The presentation shall be for 30 minutes duration by an ophthalmologist and discussion will form no part of the proceedings. The lecture becomes the property of the College. The Council Lecture provides an opportunity for Fellows who are not necessarily a member of an academic department to present their work. It generally goes to senior Fellows who have made a contribution to clinical ophthalmology. A certificate is presented to the lecturer at the conclusion of the lecture.

1963	Dr Adrian Lamb
1965	Dr David Waterworth
1965	Dr Kenneth George Howsam (OSA)
1967	Dr Edgar John Donaldson
1967	Dr Reuben Hertzberg
1968	Dr William Deane-Butcher
1969	Dr Thomas a'Beckett Travers (ACO)
1970	Dr Peter Augustine Rogers
1971	Dr Ronald Lowe
1973	Dr Reuben Hertzberg
1975	Dr John Wallis Hornbrook
1979	Dr Shirley Sarks
1980	Dr Courtney Hugh Greer
1981	Dr Brian Gilmore Wilson

1982	Dr James Kirkwood Galbraith
1984	A/Prof Fred C. Hollows
1985	Prof Frank A. Billson
1986	Dr Bruce Crawford
1987	Dr Peter J. Graham
1988	Dr Alex Hunyor
1990	Dr Barry Desmond Coote
1991	Prof Fred Hollows
1992	Dr Frank Taylor
1993	Dr Gordon Wise
1994	Prof Hugh R. Taylor
1995	Dr Bill Gillies
1996	Prof Richard Cooper
1997	Dr David Moran
1998	Dr Mark Harrison
1999	A/Prof David Mackey
2000	A/Prof Peter McCluskey
2001	Dr Jamie La Nauze
2002	Prof Tony Molteno
2003	A/Prof Mark Elder
2004	Dr Alan McNab
2005	Dr Bill Glasson
2006	A/Prof Robyn Guymer
2007	A/Prof Helen Danesh-Meyer
2008	A/Prof Robert Casson
2009	A/Prof Timothy Sullivan
2010	Dr Noel Alpins
2011	Dr Stephen Best
2012	Prof Mark Gillies
2013	A/Prof Julian Rait
2014	A/Prof Mark D. Daniell
2015	A/Prof John Grigg
2016	Prof Gerard Sutton
2017	Prof Jonathan Crowston
2018	Prof Stephanie Watson
2019	A/Prof Penelope Allen
2020	- Congress postponed due to COVID-19
2021	A/Prof Clare L. Fraser



3 | THE DAME IDA MANN MEMORIAL LECTURE (ESTABLISHED 1988)

The Dame Ida Mann Memorial Lecture was established by the Council of the College in recognition of the outstanding contribution made to ophthalmology by Dame Ida Mann. The presentation shall be for 30 minutes duration and is to cover an important topic that is oriented to the basic or novel clinical sciences of ophthalmology with clinical relevance (not confined to Fellows). Questions or discussion will form no part of the proceedings. The lecture becomes the property of the College. A certificate is presented to the lecturer at the conclusion of the lecture.

1988	Prof John D. Pettique
1989	Dr Dorothy Potter
1991	Dr Adam Locket
1992	Dr Mark Florence
1993	Dr Robert Buttery
1995	Prof Trevor Lamb
1996	Prof Val Alder
1997	Prof Ian Constable
1998	A/Prof Denis Stark
1999	Dr Kerry Williams
2000	Prof Charles McGhee
2001	Prof Grant Sutherland
2002	Dr Ian Morgan
2003	Prof Harminder Dua
2004	Dr Stuart Graham
2005	Dr Peter Kaiser
2006	Prof Harry Quigley
2007	Prof Paul McMenamin
2008	Prof John McAvoy
2009	Prof Jonathan Crowston
2010	A/Prof Jamie Craig
2011	Prof Justine Smith
2012	Prof Colin Green
2013	Prof Jan Provis
2014	Prof Minas T. Coroneo
2015	Prof Dao-Yi Yu
2016	Prof Maarten P Mourits
2017	Prof Trevor Sherwin
2018	Dr Russell Van Gelder
2019	Prof John Marshall
2020	- Congress postponed due to COVID-19
2021	Prof Alex Hewitt

4 | THE FRED HOLLOWES LECTURE (ESTABLISHED 1999)

The Fred Hollows Lecture was established to recognise the work Prof Fred Hollows undertook with Indigenous people and in raising the profile of ophthalmology. The presentation shall be for 30 minutes duration and will address a topic of applied public health research with a community focus. Questions or discussion will form no part of the proceedings. The lecture becomes the property of the College. The Fred Hollows Lecture is for Fellows involved in outreach or international ophthalmology. A certificate is presented to the lecturer at the conclusion of the lecture.

1999	Dr William Morgan
2000	A/Prof Paul Mitchell
2001	A/Prof Glen Gole
2002	Prof John Mathews
2003	Dr Ivan Goldberg
2004	Dr Rob Moodie
2005	Prof Ravi Thomas
2006	Prof Minas Coroneo
2007	Prof Lyle Palmer
2008	Prof Hugh R. Taylor AC
2009	Dr Mark Loane
2010	A/Prof Henry Newland
2011	Prof Jill Keefe OAM
2012	Prof Geoffrey Tabin
2013	A/Prof Nitin Verma
2014	Dr Garry Brian
2015	Dr Neil Murray
2016	Dr James Muecke
2017	Dr Geoffrey Cohn OAM
2018	A/Prof Angus Turner
2019	Dr Anasaini Cama
2020	- Congress postponed due to COVID-19
2021	A/Prof Catherine Green AO

SATURDAY 26 FEBRUARY

7:00am - 8:15am	Allergan Hosted Morning Symposium Venue: M1 & 2
7:00am - 8:15am	Zeiss Hosted Morning Symposium Venue: M4
8:30am - 9:00am	RANZCO Update Prof Nitin Verma Venue: Great Hall 1 & 2 Topic: Update on Future of Ophthalmology; A Summary of the Outcomes of the 17 April Future of Ophthalmology Symposia Chair: Prof Nitin Verma
9:00am - 9:30am	RANZCO CONGRESS OPENING LECTURE Dr John E. Taske Venue: Great Hall 1 & 2 Topic: High Stakes Decision Making – An Everest Tale Chair: Dr Robyn Troutbeck
9:30am - 10:00am	THE DAME IDA MANN MEMORIAL LECTURE Prof Alex Hewitt Venue: Great Hall 1 & 2 Topic: The Dawn of Precision Ophthalmology in the Asia Pacific Chair: Prof David Mackey
10:00am - 10:30am	Morning Tea
10:30am - 12:00pm	PLENARY BEST PAPER PRESENTATIONS: Gerard Crock and John Parr Trophies Venue: Great Hall 1 & 2 Chairs: A/Prof James Elder and Prof Alex Hewitt
12:00pm - 1:30pm	Lunch
1:30pm - 3:00pm	CONCURRENT SESSIONS PROFESSIONAL DEVELOPMENT Venue: M1 & 2 SYMPOSIUM – Optimising the Management of Common Corneal Conditions: What Do Corneal Specialists Tell Their Patients? Venue: Great Hall 3 Chair: Prof Stephanie Watson COURSE – ANZGS Symposium 2020 - Survival Tips from the Glaucoma Experts Venue: Great Hall 1 & 2 Chair: Prof Graham Lee Co-Chairs: Dr Ridia Lim and A/Prof Anne Brooks COURSE – Oculoplastic Tips and Pearls for Ophthalmologists Venue: Great Hall 4



Chairs: Dr Jwu Jin Khong and Dr Thomas Hardy

FREE PAPERS – Epidemiology/Genetics

Venue: M4

Chairs: A/Prof Abhishek Sharma and A/Prof Samantha Fraser-Bell

3:00pm - 3:30pm

Afternoon Tea

3:30pm - 5:00pm

CONCURRENT SESSIONS

PROFESSIONAL DEVELOPMENT

Venue: M1 & 2

SYMPOSIUM – Expanding the Surgical Practice of the General Ophthalmologist – Correction of Refractive Error

Venue: Great Hall 3

Chair: Dr Alison Chiu

SYMPOSIUM – Ocular Herpes – Beyond Basics

Venue: Great Hall 1 & 2

Chair: A/Prof Anthony Hall

SYMPOSIUM – Optical Coherence Tomography Angiography in the Management of Retinal Diseases in 2021

Venue: Great Hall 4

Chair: Prof Paul Mitchell AO

FREE PAPERS – Oculoplastic/Ocular Oncology

Venue: M4

Chairs: Dr Brett O'Donnell and Dr Daniel McKay

5:30pm - 6:30pm

Film and Poster Viewing

Venue: Exhibition Hall, Brisbane Convention & Exhibition Centre

6:30pm - 9:30pm

Alcon Hosted Evening Symposium

Venue: tbc

6:30pm - 9:30pm

Novartis Hosted Evening Symposium

Venue: tbc

SUNDAY 27 FEBRUARY

7:00am - 8:15am

Bausch + Lomb Hosted Morning Symposium

Venue: M1 & 2

7:00am - 8:15am

Bayer Hosted Morning Symposium

Venue: M4



8:30am - 9:00am	REFRACTIVE UPDATE LECTURE Dr Damien Gatinel Venue: Great Hall 1 & 2 Topic: Artificial Intelligence: Applications for Pathologies of the Anterior Segment of the Eye Chair: Dr Jacqueline Beltz
9:00am - 9:30am	CATARACT UPDATE LECTURE Dr David Lockington Venue: Great Hall 1 & 2 Topic: Ensuring a Safe Cataract Experience for all Through Embracing the Role of Simulation Chair: Dr Andrea Ang
9:30am - 10:00am	THE NORMAN McALISTER GREGG LECTURE Prof Graham D. Barrett Venue: Great Hall 1 & 2 Topic: When and How to Treat Low Levels of Astigmatism Chair: Prof Gerard Sutton
10:00am - 10:30am	Morning Tea
10:30am - 11:00am	RANZCO PLENARY Venue: Great Hall 1 & 2 Chair: Dr Jesse Gale
11:00am - 12:00pm	ORIA PLENARY Venue: Great Hall 1 & 2 Chair: Prof Stephanie Watson
12:00pm - 1:30pm	Lunch
1:30pm - 3:00pm	CONCURRENT SESSIONS PROFESSIONAL DEVELOPMENT Venue: M1 & 2 SYMPOSIUM – Translating Ideas into Innovation with Real Impact Venue: Great Hall 1 & 2 Chair: Prof Gerard Sutton COURSE – Management Strategies for Common Strabismic Conditions Venue: Great Hall 3 Chairs: A/Prof Geoffrey Lam and Dr Deepa Taranath COURSE – Glaucoma Boot Camp: A Practical Refresher Course Venue: Great Hall 4 Chair: A/Prof Catherine Green AO FREE PAPERS – Retina Venue: M4 Chairs: Dr Mei-Hong Tan and Dr Christine Younan
3:00pm - 3:30pm	Afternoon Tea



3:30pm - 5:00pm

CONCURRENT SESSIONS**PROFESSIONAL DEVELOPMENT****Venue:** M1 & 2**SYMPOSIUM – Improving Refractive Outcomes in Pseudophakic Patients – Secondary Sulcus Piggyback Lenses, IOL Exchange, and Toric Lens Use****Venue:** Great Hall 3**Chair:** Dr Alison Chiu**SYMPOSIUM – Ocular Oncology Symposium: Sunshine State Update****Venue:** Great Hall 1 & 2**Chairs:** A/Prof William Glasson, Dr Sunil Warriar and Dr Lindsay A. McGrath**FREE PAPERS – CPD Audit Rapid Fire****Venue:** Great Hall 4**Panel:** A/Prof Lawrence Lee, Dr Peter Hinchcliffe and John McCoombes**FREE PAPERS – Paediatrics/Strabismus/Uveitis****Venue:** M4**Chairs:** A/Prof Andrea Vincent and Dr Graham Hay-Smith

7:00pm - 11:00pm

Congress Dinner**Venue:** Victoria Park**MONDAY 28 FEBRUARY**

7:00am - 8:15am

Apellis Hosted Morning Symposium**Venue:** M4

8:30am - 9:00am

NEURO-OPHTHALMOLOGY UPDATE LECTURE

Dr Lynn K. Gordon

Venue: Great Hall 1 & 2**Topic:** Neuro-ophthalmic Complications of Immune Checkpoint Inhibitor Therapy for Cancer: Lessons Learned through Case Reports and Big Data**Chair:** A/Prof Celia Chen

9:00am - 9:30am

RETINA UPDATE LECTURE

Anita Agarwal MD

Venue: Great Hall 1 & 2**Topic:** Gene Testing Reveals New Insights into Retinal Dystrophies**Chair:** Prof Adrian Fung

9:30am - 10:00am

THE COUNCIL LECTURE

A/Prof Clare L. Fraser

Venue: Great Hall 1 & 2**Topic:** Seeing Stars, Stones and Snow**Chair:** Prof John Grigg

10:00am - 10:30am

Morning Tea



10:30am - 12:00pm	PLENARY – CLINICAL CONTROVERSIES Venue: Great Hall 1 & 2 Chair: Dr Amy Cohn
12:00pm - 1:30pm	Lunch
1:30pm - 3:00pm	CONCURRENT SESSIONS PROFESSIONAL DEVELOPMENT Venue: M1 & 2 SYMPOSIUM – Retinal Dystrophy: Diagnosis and Treatment Venue: Great Hall 3 Chairs: A/Prof Heather G Mack and A/Prof Andrea Vincent SYMPOSIUM – Old and New Issues in Paediatric Ophthalmology Venue: Great Hall 4 Chair: Dr Michael M. Jones COURSE – A Beginner's Guide to Multifocal Intraocular Lense/Extended Depth of Focus Venue: Great Hall 1 & 2 Co-Chairs: A/Prof Chameen Samarawickrama, Dr Louise Robinson and Dr Bernardo Soares FREE PAPERS – Glaucoma/Neuro-ophthalmology Venue: M4 Chairs: Dr Jennifer Fan Gaskin and Dr Colin Clement
3:00pm - 3:30pm	Afternoon Tea
3:30pm - 5:00pm	CONCURRENT SESSIONS PROFESSIONAL DEVELOPMENT Venue: M1 & 2 SYMPOSIUM – What Happens after you've Diagnosed.... Venue: Great Hall 1 & 2 Chairs: A/Prof Celia Chen, A/Prof Clare L. Fraser and Prof Helen Danesh-Meyer COURSE – What Did I Miss... that I Really Need to Know NOW? Venue: Great Hall 3 Chair: Dr Tim Haymet FREE PAPERS – Cataract/Cornea/Refractive Venue: M4 Chairs: Prof Nigel Morlet and Dr Laurence Sullivan

TUESDAY 1 MARCH

06:30am - 07:45am	ANZGS Morning Symposium Sponsored by Allergan Dr Pradeep Yammanuru Ramulu Topic: The Functional Consequences of Glaucoma and Why they Matter Venue: M4 Chair: Prof Keith Martin
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08:00am - 08:30am	GLAUCOMA UPDATE LECTURE Dr Pradeep Yammanuru Ramulu Venue: M3 Topic: Novel Concepts in Evaluating Functional Damage in Glaucoma Chair: Dr Ridia Lim
08:30am - 10:00am	PLENARY SYMPOSIUM Improving Eye Health for Aboriginal and Torres Strait Islander Peoples – Equity in Everyday Ophthalmic Practice Venue: M3 Chairs: Dr Kristopher Rallah-Baker and Prof Hugh Taylor
10:00am - 10:30am	Morning Tea
10:30am - 11:00am	THE FRED HOLLOWS LECTURE A/Prof Catherine Green AO Venue: M3 Topic: Disruption and Innovation: Challenges and Opportunities in Ophthalmology Chair: Dr Diana Conrad

INVITED SPEAKERS

L01: RANZCO CONGRESS OPENING LECTURE, SATURDAY 26 FEBRUARY 2022

Dr John E. Taske MBBS (Qld), DTM&H (Lond), FFARACS, FANZCA



High Stakes Decision Making – An Everest Tale

Synopsis:

The presentation will tell the author's story of what, up until that time, was Mt Everest's greatest disaster. It will recount the usual travails of an expedition to Everest 25 years ago, including an interesting ophthalmological incident that occurred and the patho-physiology of high altitude acclimatisation. Finally, it will describe the story of the summit attempt and the disaster that occurred, with details of decision making at altitude.

Brief Curriculum Vitae:

Dr John Taske graduated from the University of Queensland in 1964. He volunteered for service with front line units in Vietnam, and served with them from April 1966 to June 1967. His subsequent 16 years military service included 3 years with the SAS and service with the British Army, culminating in four years as Colonel, Commander Field Force Medical Services, before resigning in 1982. He then took up the position of Director of Anaesthesia, Princess Alexandra Hospital, from 1982 to 1987, following which he went into private anaesthetic practice. After six years of climbing/mountaineering, he joined the ill-fated New Zealand 'Adventure Consultants' expedition to Mt Everest in April-June 1996 and was caught, with several other expeditions, in a rogue storm near the summit, on 10 to 12 May 1996.

He retired from anaesthesia in 2017.

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L02: THE DAME IDA MANN MEMORIAL LECTURE, SATURDAY 26 FEBRUARY 2022

Prof Alex Hewitt BMedSci (Hons), MBBS (Hons), MMedSci, PhD, FRANZCO



The Dawn of Precision Ophthalmology in the Asia Pacific

Synopsis:

Heralded as the most significant breakthrough in biology since PCR, the adaptation of the "CRISPR/Cas" system to mammalian cells is set to revolutionise treatments for inherited disease. The CRISPR/Cas system, used by bacteria to counter viral intrusion, can cut or edit DNA at specific sites, and the clinical application of this technology opens the very real prospect of anticipatory cures to well-defined inherited diseases. While ocular blinding conditions will be at the forefront of these, a transformative shift in the Australian biotechnology and healthcare delivery sectors must occur to ensure this becomes reality. Many of the steps for a safe therapeutic pipeline for in vivo CRISPR/Cas therapy, such as accredited mutation detection and patient-specific profiling (e.g. with patient-specific stem cells), are well-established and a clear pathway of how this technology would be incorporated into clinical care has been developed. With ongoing advances and enhanced manufacturing capabilities, the end of blinding monogenic retinal diseases is in sight.

Brief Curriculum Vitae:

Professor Alex Hewitt completed his ophthalmology training at the Royal Victorian Eye and Ear Hospital in Melbourne. In 2012 he was the Novartis Fellow at the Lions Eye Institute in Perth and was awarded a WA Tall Poppy Award from the Australian Institute of Policy and Science. He was also awarded a Peter Doherty Biomedical Fellowship from the Australian National Health and Medical Research Council and is currently supported by a Practitioner Fellowship.

During medical training he completed a BMedSci (Hons) degree investigating the outcomes of cataract surgery for people living in remote areas of the

Northern Territory with Clinical Associate Professor Nitin Verma AM, and in 2001 he completed his undergraduate medical degree at the University of Tasmania. He obtained a PhD investigating the genetics of glaucoma through Flinders University, South Australia, under the supervision of Professors Jamie Craig and David Mackey.

Professor Hewitt has a major interest in translational research – scientific research that helps to make findings from basic science useful for practical applications that enhance human health and well-being.

He has been involved with work relating to the identification of genes and risk variants in glaucoma and myopia, as well as quantitative traits such as central corneal thickness, optic nerve size and the retinal microvascular circulation. This work has resulted in publications in leading journals such as *Nature Genetics*, *Human Molecular Genetics*, *PLoS Genetics* and *Ophthalmology*. To date he has co-authored over 200 peer-reviewed publications.

He has worked with major research projects including the Glaucoma Inheritance Study in Tasmania, the Norfolk Island Eye Study, the Twins Eye Study in Tasmania, and the Australian and New Zealand Registry of Advanced Glaucoma. Professor Hewitt is part of the International Glaucoma Genetics Consortium and the global Consortium for Refractive Error and Myopia. Additionally, he has recently helped establish independent research projects in China, Uganda, Nepal and Indonesia.

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L03: REFRACTIVE UPDATE LECTURE, SUNDAY 27 FEBRUARY 2022

Dr Damien Gatinel MD, PhD



Artificial Intelligence: Applications for Pathologies of the Anterior Segment of the Eye

Synopsis:

The use of artificial intelligence (AI) provides a better understanding of data collected through biometric and imaging techniques. It can increase the accuracy or the effectiveness of solutions intended to

correct certain optical defects of the eye caused by structural alterations responsible for a reduction in the transparency of the ocular media and/or refractive errors.

This work has been mainly applied to the study of corneal topography and imaging, description of the ocular wavefront, ocular biometry and improving the accuracy of the power calculation of intraocular lenses.

We used AI techniques to carry out studies to characterise the alterations observed during the evolution of keratoconus, as well as the spatial distribution of corneal oedema through the use of neural networks to tomographic image analysis.

Using artificial intelligence and the results from the description of the ocular wavefront on a new basis, we were able to estimate the real impact of high degree aberrations on subjective refraction.

From a thick lens paraxial eye model, we established an analytical formula to calculate the position of the principal planes of an implant based on its geometry and the main biometric constants. This work made it possible to train an algorithm to predict the effective position of an implant, taking into account its geometry and establishing an original biometric calculation formula combining principles of paraxial optics and artificial intelligence algorithms applied to an eye model made up of thick lenses.

Brief Curriculum Vitae:

Damien Gatinel, MD, PhD, has been the head of the Anterior and Refractive Surgery Department of the Rothschild Foundation, Paris, since 2007. His research is mainly focused on intraocular lens (IOL) optical design, mathematical modelling of laser refractive surgical procedures, astigmatism correction and the detection of subclinical keratoconus. He holds a PhD in applied mathematics and devised a new classification for ocular optical aberrations. He owns several patents, including the first diffractive trifocal IOL design (e.g. FineVision IOL), for which he was discerned the title of Knight of the Order of the Crown from the Kingdom of Belgium. Dr Gatinel is a board member of the Executive Committee of the International Society of Refractive Surgery and of the Research Committee of the European Society of Cataract and Refractive Surgery. He serves on the Editorial Board of the *Journal of Refractive Surgery*. He has received more than 20 international awards, among which are 14 Best Paper of Session awards won during American Society of Cataract and Refractive Surgery meetings and being the first to win three Best Paper of Session awards during the same ASCRS meeting (2018). Dr Gatinel has published more than 100 articles in peer-reviewed journals and edited three books.

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**L04: CATARACT UPDATE LECTURE,
SUNDAY 27 FEBRUARY 2022**

*Dr David Lockington MB BCH BAO (Hons) FRCOphth
PhD*

**Ensuring a Safe Cataract Experience
for all through Embracing the Role of
Simulation****Synopsis:**

The COVID-19 pandemic has disrupted medical education and surgical opportunities. Surgical simulation has partly filled some of the training gaps, but it should have been central prior to this disruption. In this Cataract Update Lecture, I will look at the historic methods of teaching and training and show why they were inadequate, demonstrated through the perils of the “Beyonce method”. I will then discuss the established and new simulation equipment options and methods. Proactive use of these novel training techniques will ensure that trainees have the knowledge and the experience required to perform surgical tasks safely prior to live surgery. Ensuring competence will improve confidence, which is relevant to the subsequent handling of greater surgical complexity and/or complications. These principles are not unique to new trainees, as the whole surgical team (including consultants) can always benefit from refinement of their skills. Expanding and engaging with ophthalmic simulation offers that opportunity. Embracing this attitude of constant learning and ensuring a better educational culture will result in a safer cataract experience for the trainer, the trainee and the patient (most importantly).

These issues will be discussed and illustrated within a lively and contemporary presentation, with concepts made memorable through surgical videos and tenuous links to popular music culture.

Brief Curriculum Vitae:

Originally from Northern Ireland, Dr David Lockington has been a consultant ophthalmologist at the Tennent Institute of Ophthalmology, Glasgow, Scotland since January 2014, with sub-specialist training in cornea, cataract and anterior segment. Following two years of SHO training in the Northern Ireland ophthalmic

rotation, he moved to Glasgow in 2007 for his Registrar ophthalmology training throughout the West of Scotland. From 2012-13 he undertook a one-year Cornea and Anterior Segment fellowship with Professor Charles McGhee at the University of Auckland in New Zealand, where he remains an honorary clinical senior lecturer.

He has an active interest in research and teaching, achieving over 90 peer-reviewed publications and leading to a recent PhD by publication entitled “First do no harm! Safer management of ophthalmic anterior segment conditions”. Dr Lockington has received nine awards at national and international conferences for his research and multiple oral presentations. He recently graduated from the 2017-19 European Society of Ophthalmology's Leadership Development program as the UK representative, and used these skills to coordinate a renovation project to create a bespoke “Teach and Train simulation Hub” for ophthalmic trainees in Glasgow to promote safer surgical training. He is now the national UK ophthalmology simulation lead for the Royal College of Ophthalmologists.

Dr Lockington is actively involved in cataract and corneal education via organisations such as the European School for Advanced Studies in Ophthalmology, and is a United Kingdom and Ireland Society of Cataract and Refractive Surgeons council member, a Member with Thesis of The Cornea Society and a Fellow of the Royal College of Ophthalmologists.

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**L05: THE NORMAN McALISTER
GREGG LECTURE, SUNDAY
27 FEBRUARY 2022**

Prof Graham D. Barrett FRACO FRACS

**When and How to Treat Low Levels of
Astigmatism****Synopsis:**

There are very few innovations that have had as significant an impact as the introduction of toric intraocular lenses. The ability to accurately predict astigmatic outcomes has improved and the threshold for considering a toric intraocular lens has

reduced. As a result, toric intraocular lenses are required in approximately 80% of cases undergoing cataract surgery if the desired outcome is less than a 0.5 D of residual astigmatism in all patients. A target of less than 0.5 D residual astigmatism in all patients requires accurate biometry, prediction and alignment as well as an understanding of the impact of surgically induced astigmatism. The concept of combining multiple instruments to derive an integrated K value simplifies the interpretation of utilising multiple instruments.

Astigmatic outcome prediction has improved with the availability of toric calculators that consider the impact of the posterior cornea.

Accurate alignment is facilitated by image-guided systems but similar accuracy can be achieved with inexpensive smart phone apps and associated markers.

The centroid value which encompasses both the magnitude and direction of the vector of surgically induced astigmatism is typically in the range of 0.12 D and should be utilised in toric calculators for optimum prediction.

Leaving a patient with significant astigmatism may have been acceptable in an era when extracapsular cataract surgery was widely practised but today, with small incision cataract surgery and phacoemulsification, an attempt to achieve a target of less than 0.5 D in all patients is preferable and could be considered a standard of care.

Brief Curriculum Vitae:

Graham David Barrett is a consultant ophthalmologist at the Lions Eye Institute as well as Sir Charles Gairdner Hospital in Perth, Western Australia and is a clinical professor in the Department of Ophthalmology, University of Western Australia. His special areas of interest include cataract and implant surgery, as well as corneal and keratorefractive surgery.

Professor Barrett has been especially active in the field of small incision cataract surgery and phacoemulsification and has published many papers and is the author of several chapters in text books on related topics. He has produced several videos on cataract and refractive surgery, which have won awards at the annual film festivals for the American and European Societies of Cataract and Refractive Surgery. He is the recipient of the Harold Ridley Medal as well as the Binkhorst Medal.

His special areas of interests include lens prediction formulae, new techniques in cataract surgery and intraocular lens implant surgery, intraocular lens implant design as well as refractive surgical techniques, including

epikeratoplasty, synthetic refractive on-lays and in-lays and keratoscopic devices. He has developed innovative instruments for all cataract surgery as well as phacoemulsification equipment and intraocular implants, which are widely used by surgeons.

Professor Barrett has been on the Editorial Board of the *Journal of Cataract and Refractive Surgery* and *European Journal of Implant and Refractive Surgery* and past international representative for the Asia Pacific Region of the International Society of Refractive Keratoplasty. He is currently a board member of the International Society of Refractive Surgeons, Past President of the International Intraocular Implant Club, Past President of the Asia Pacific Association of Cataract and Refractive Surgeons, Editor of the *EyeWorld Asia Pacific* publication and is also the current and founding President of the Australasian Society of Cataract and Refractive Surgeons.

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L06: NEURO-OPHTHALMOLOGY LECTURE, MONDAY 28 FEBRUARY 2022

Dr Lynn K. Gordon, MD, PhD



Neuro-ophthalmic Complications of Immune Checkpoint Inhibitor Therapy for Cancer: Lessons Learned through Case Reports and Big Data

Synopsis:

Treatment of specific cancers was revolutionised through the use of immune checkpoint blockade (ICI) which unleashes the body's own immune surveillance and mechanisms to kill tumor cells. This innovative treatment strategy induces remission for many patients with treatment-resistant cancers. Unintended consequences of ICI result from disrupting tolerance, therefore creating autoimmune consequences which can affect the eye and central nervous system. Following ICI therapy, case reports and series document dry eye, uveitis and multiple neuro-ophthalmic complications involving the optic nerve, cranial nerves, neuromuscular junction and extraocular muscles. The majority of patients with uveitis or optic nerve disease respond to



discontinuing the ICI or to systemic or local corticosteroid therapy. Clinical improvement is however variable for patients with other types of neuro-ophthalmic sequelae. Case series provide insights about specific disease sequelae but do not help us understand the incidence or prevalence of complications following ICI therapy. Two big data studies provide additional complementary information, one using the IRIS database developed by the American Academy of Ophthalmology, and the other using the Kaiser Permanent Medical Record system. Using big data, cancer patients were identified to have a higher rate of uveitis and neuro-ophthalmic disease, even without the use of ICI. Patients with a prior history of immune-mediated ocular disease, uveitis or other, had a higher rate of recurrent disease following ICI therapy. Coordination of care between ophthalmologists and oncologists is suggested for patients in which ICI therapy is indicated.

Brief Curriculum Vitae:

Lynn K Gordon, MD, PhD is Professor of Ophthalmology and the Vernon O Underwood Family Chair at the Stein Eye Institute at University of California, Los Angeles (UCLA), and the Senior Associate Dean for Equity and Diversity Inclusion at the David Geffen School of Medicine at UCLA. Dr Gordon completed her MD and PhD at Harvard Medical School, followed by residency in ophthalmology and fellowship training in neuro-ophthalmology at UCLA. She is an active clinician scientist and her work has resulted in multiple patents and more than 100 publications, book chapters, and reviews. She serves on the editorial boards for *Ophthalmology Retina*, *Journal of Neuro-ophthalmology* and the *Journal of Ocular Immunology and Inflammation*. Dr Gordon had held leadership positions in several state and national professional organisations including chair of the Council (2018-2019) and membership on the Board of Trustees (2016-2019) of the American Academy of Ophthalmology.

She is passionate about education and teaches and lectures extensively on neuro-ophthalmology topics. In her role as senior associate dean for equity and diversity inclusion she helped develop programs on leadership development for mid-career women at the David Geffen School of Medicine and for the Association for Research in Vision and Ophthalmology. Her greatest passion is helping individuals realise their full career potential.

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L07: RETINA UPDATE LECTURE, MONDAY 28 FEBRUARY 2022

Anita Agarwal MD



Gene Testing Reveals New Insights into Retinal Dystrophies

Synopsis:

With recent access to gene testing, the genotype phenotype correlation picture is evolving. Examples of novel gene mutations causing a particular phenotype, unexpected gene mutations of a known phenotype and extreme phenotype difference within family members will be discussed. Methods of confirming a disease-causing gene defect – Polyphen, SIFT, Muttaster – will be explained.

Clinical examples of variable phenotypes in Peripherin/RDS (PRPH2), mitochondrial mutations and their phenotypic overlap with other non-inherited disorders, heterozygous ABCA4 and other diseases will be presented. Ancillary testing including electrophysiology and multimodal imaging features aid in the process. A reasonable combined clinical and genotyping approach towards arriving at a diagnosis of a given patient in a clinical setting will be summarised.

Brief Curriculum Vitae:

Dr Anita Agarwal is a Vitreo-Retinal Consultant at West Coast Retina, San Francisco and adjunct Professor of Ophthalmology at the Vanderbilt Eye Institute and the Vanderbilt University School of Medicine, Nashville, USA. Dr Agarwal specialises in medical and surgical diseases of the retina and uvea, and has a special interest in uncommon and inherited retinal diseases. She received her medical degree from Kasturba Medical College Mangalore and completed ophthalmology residency and fellowship trainings at the Postgraduate Institute of Medical Education and Research, University of Florida, Vanderbilt University and West Virginia University.

She is the author of the Fifth Edition of the *Gass' Atlas of Macular Disease*, and has co-authored landmark research papers on the genetics of macular degeneration. Her clinical interests include a variety of infectious, inflammatory, degenerative and dystrophic medical retinal disorders and surgical vitreo-retinal disorders. She is a member of the Macula Society and Retina Society and has been recognised as one of America's best doctors, Castle Connolly's top doctors and top ophthalmologists. She is the recipient of the 2014 J. Donald M. Gass Medal awarded by the Macula Society for outstanding contributions in understanding macular diseases and the 2015

Optic (UK) Lecture Medal awarded by the Royal College of Ophthalmology, UK. She has delivered several named lectures and also received honour awards from the American Academy of Ophthalmology and the American Society of Retina Specialists. She serves on the editorial board of several journals – *Ophthalmology*, *Ophthalmology-Retina*, *Retina Cases and Brief Reports*, *American Journal of Ophthalmology Case Reports* and the *Indian Journal of Ophthalmology*.

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L08: THE COUNCIL LECTURE, MONDAY 28 FEBRUARY 2022

A/Prof Clare L. Fraser MBBS (Hons), MMed, FRANZCO



Seeing Stars, Stones and Snow

Synopsis:

Sometimes in neuro-ophthalmology it is the patient who is not quite sure what they are seeing and sometimes it is the doctor.

My neuro-ophthalmic research has always been driven by the curiosities and patient vignettes, particularly those rare conditions that have been overlooked by past research efforts. This lecture will explore recent advances in three areas of neuro-ophthalmology from my own research.

A concussion is often colloquially referred to as “seeing stars” after a head injury. The visual pathways make up 30-50% of the brain substance, and therefore a diffuse brain injury like a concussion will often result in visual symptoms. These can be persistent and difficult for the patient to explain. Research is expanding on the diagnosis and management of acute concussion, post-concussion syndrome and chronic traumatic encephalopathy.

Drusen is the German word for a geode or stone. Optic disc drusen are calcified areas in front of the lamina cribrosa within the disc substance. Drusen can cause difficulty for the ophthalmologist who needs to decide if the patient has papilloedema or true disc swelling. New diagnostic guidelines have been published and there is increasing research into the nature of disc drusen, how they progress and the risks to a patient's vision.

Finally, Visual Snow Syndrome is an increasingly recognised visual phenomenon which now has its own set of diagnostic criteria. While not being dangerous or progressive, it can cause very disabling symptoms for the patient. New research is providing insights into the neurological substrate of this phenomenon and will hopefully lead to better treatment options.

Brief Curriculum Vitae:

A/Prof Clare Fraser is an ophthalmologist specialising in neuro-ophthalmology, strabismus and visual electro-diagnostics. She is a consultant Visiting Medical Officer at both Sydney Eye Hospital and Liverpool Hospital, and is also in private practice in Sydney. At the University of Sydney, she holds the title of Associate Professor of Neuro-ophthalmology.

She completed ophthalmic training at Sydney Eye Hospital in 2006-2009 and went on to further neuro-ophthalmic training at Moorfields Eye Hospital and the National Hospital for Neurology, London, England with Dr Gordon Plant for 18 months. In 2011 she completed a research fellowship at Emory Eye Centre, Atlanta, USA, with Drs Nancy Newman and Valerie Biousse.

A/Prof Fraser is on the RANZCO Board of Directors and is the Vice President of the Neuro-Ophthalmology Society of Australia. She is the chair of the North American Neuro-Ophthalmology Society International Committee and is on the committee for the Neuro-Ophthalmology Virtual Education Library. In 2018 she was chosen for the Asia Pacific Academy of Ophthalmology academic development mentor scheme. She serves on the editorial boards for *Clinical and Experimental Ophthalmology*, *Journal of Neuro-ophthalmology* and *Neuro-ophthalmology*.

A/Prof Fraser has published over 120 articles in peer-reviewed journals and has written several book chapters, including chapters on optic neuritis, pituitary tumours and visual snow. Her research has been awarded with an Ophthalmic Institute of Australia grant and has won several international awards, including the North American Neuro-Ophthalmology Society prize for the best research presentations in 2005, 2006, 2011 and their pilot grant award in 2018. Her work on optic disc drusen won a \$1M European grant in collaboration with the University of Copenhagen.

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L09: GLAUCOMA UPDATE LECTURE, TUESDAY 1 MARCH 2022

Dr Pradeep Yammanuru Ramulu MD, PhD



Novel Concepts in Evaluating Functional Damage in Glaucoma

Synopsis:

Functional testing in glaucoma has heavily relied on testing of the visual field in the central 24-30 degrees. However, glaucoma should be understood as a disease which affects a wide range of visual measures beyond visual field damage, many of which can be useful in understanding the impact of the disease. Of course, visual field damage remains a mainstay for the clinical diagnosis of glaucoma and for assessment of progression. But new concepts are emerging regarding visual field testing. This lecture will present data on the strengths and pitfalls of new algorithms for more rapid field testing and offer evidence-based insights on how to better integrate visual field reliability data into clinical decision making. New emerging technologies to capture visual field testing using novel platforms will also be discussed, as well all the methods to assess the quality of life impact of glaucoma on the individual within the daily flow of clinical care.

Brief Curriculum Vitae:

Using a variety of tools including patient reported outcomes, observation of task performance and real-world behavioral monitoring, Dr Pradeep Ramulu has helped define when, how and why visual impairment results in disability. His current work is focused on the possible protective role of physical activity against eye disease, developing methods to assess/prevent falls in older adults, particularly those with visual impairment, and the use of ocular imaging to identify persons at risk for cognitive impairment.

Dr Ramulu's work has resulted in over 180 peer-reviewed publications, 10 book chapters and two books. Because of his expertise, he has helped various agencies including the Federal Bureau of Investigation to set vision standards for work. He also holds leadership positions in various national and international ophthalmic societies, including Program Chair for the American Glaucoma Society and Chair of the Education Committee for the World Glaucoma Association. He has mentored numerous medical students, MPH students, residents and fellows clinically and in research projects. He twice won the resident teaching award and, in a model that has now become the standard for Wilmer, reorganised glaucoma

teaching by placing lectures online and using in-class time for interactive sessions using game-based learning and small-group interactive case review. On top of caring for his patients' needs, he now serves as Director of the Wilmer Glaucoma service, consisting of 10 faculty and over 20 research, clinical and administrative staff members. Dr Ramulu has received continuous National Institutes of Health funding since 2007 and has received the Secretariat, Achievement and Senior Awards from the American Academy of Ophthalmology and the Pisart Award for Vision Science. He was also named in Newsweek's list of "America's Best Eye Doctors" in 2021.

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L10: THE FRED HOLLOWES LECTURE, TUESDAY 1 MARCH 2022

A/Prof Catherine Green AO, MBChB, FRANZCO, MMedSc, MSurgEd



Disruption and Innovation: Challenges and Opportunities in Ophthalmology

Synopsis:

Two types of innovation, defined as "the use of a new idea or method", have been described. The first, sustaining innovation, makes something bigger or better. The second is disruptive innovation, which disrupts the bigger-and-better cycle, bringing to market a product or service that is more affordable and easier to use, allowing a whole new population of consumers to access a product or service that was historically only accessible to consumers with more money or greater skill. The introduction of affordable intraocular lenses for patients in developing countries, as championed by Professor Fred Hollows, is an example of a disruptive innovation that has had a profound impact on eye health globally. The year 2020 will be remembered for the global disruption caused by a pandemic that that will have ramifications for decades to come. 2020 also marked the culmination of a global initiative for the elimination of avoidable blindness, VISION 2020: The Right to Sight. Despite the global prevalence of blindness falling by 28% in the past 30 years, in 2020, 43.3 million people were blind and 553 million had vision impairment, with evidence of significant inequities. The COVID-19 pandemic has impacted eye health; however, innovations that address

this disruption may present opportunities to improve eye health even after the pandemic is under control.

A systems approach is required, with innovation not only in eye care delivery but in policy, workforce planning and education. Of course, we should promote sustaining innovations, but also be looking for truly transformative (disruptive) innovations that provide opportunities for improving eye health in ways not previously considered.

Brief Curriculum Vitae:

A/Prof Catherine Green is a glaucoma specialist and ophthalmic educator based in Melbourne, and is Head of the Glaucoma Unit at the Royal Victorian Eye and Ear Hospital, the largest specialist glaucoma service in Australia. Throughout her career, A/Prof Green has played an active role in education and training, clinical service improvement and international development.

Her contributions to RANZCO include serving as Chair of two examination boards, a Board Director from 2010-17

and as Dean of Education from 2017-19, as well as a member of several College committees. She is the founder of the RANZCO Leadership Development Program and serves as director of the Leadership Development Programs of both RANZCO and the Asia Pacific Academy of Ophthalmology.

Current international appointments include the Board of Governors of the International Council of Ophthalmology and the Council of the Asia Pacific Academy of Ophthalmology. In 2017, she was recognised as an Officer of the Order of Australia for distinguished service to ophthalmology as a clinician, through executive roles with national and international professional groups, to research and education, and to eye health care programs in the Asia-Pacific.

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7:00am - 8:15am	H01 – Allergan Hosted Morning Symposium Venue: M1 & 2
7:00am - 8:15am	H02 – Zeiss Hosted Morning Symposium Venue: M4
8:30am - 9:00am	P02 – RANZCO Update Title: Update on Future of Ophthalmology: A Summary of the Outcomes of the 17 April Future of Ophthalmology Symposia Prof Nitin Verma Chair: Prof Nitin Verma Venue: Great Hall 1 & 2
9:00am - 9:30am	L01 – RANZCO CONGRESS OPENING LECTURE Title: High Stakes Decision Making – An Everest Tale Dr John E. Taske Synopsis: The presentation will tell the author's story of what, up until that time, was Mt Everest's greatest disaster. It will recount the usual travails of an expedition to Everest 25 years ago, including an interesting ophthalmological incident that occurred and the patho-physiology of high altitude acclimatisation. Finally, it will describe the story of the summit attempt and the disaster that occurred, with details of decision making at altitude. Chair: Dr Robyn Troutbeck Venue: Great Hall 1 & 2
9:30am - 10:00am	L02 – THE DAME IDA MANN MEMORIAL LECTURE Title: The Dawn of Precision Ophthalmology in the Asia Pacific Prof Alex Hewitt Synopsis: Heralded as the most significant breakthrough in biology since PCR, the adaptation of the "CRISPR/Cas" system to mammalian cells is set to revolutionise treatments for inherited disease. The CRISPR/Cas system, used by bacteria to counter viral intrusion, can cut or edit DNA at specific sites, and the clinical application of this technology opens the very real prospect of anticipatory cures to well-defined inherited diseases. While ocular blinding conditions will be at the forefront of these, a transformative shift in the Australian biotechnology and healthcare delivery sectors must occur to ensure this becomes reality. Many of the steps for a safe therapeutic pipeline for in vivo CRISPR/Cas therapy, such as accredited mutation detection and patient-specific profiling (e.g. with patient-specific stem cells), are well-established and a clear pathway of how this technology would be incorporated into clinical care has been developed. With ongoing advances and enhanced manufacturing capabilities, the end of blinding monogenic retinal diseases is in sight. Chair: Prof David Mackey Venue: Great Hall 1 & 2
10:00am - 10:30am	Morning Tea

PLENARY

10:30am - 12:00pm

P03 – BEST PAPER PRESENTATIONS: Gerard Crock and John Parr Trophies**Chairs:** A/Prof James Elder and Prof Alex Hewitt**Venue:** Great Hall 1 & 2

10:30am - 10:43am

Predicting ophthalmic clinic non-attendance using machine learning**Finley Breeze**^{1,2}, Ruhella Hossain², Michael Mayo³, James McKelvie^{1,2}

Email: finleybreeze98@gmail.com

¹University of Auckland, Auckland, New Zealand,²Waikato District Health Board, Hamilton, New Zealand,³University of Waikato, Hamilton, New Zealand

Background: Clinic non-attendance is associated with poorer health outcomes and costs \$29m per annum. Initiatives to improve attendance typically involve expensive and ineffective brute-force strategies.

Purpose: To develop a predictive model for ophthalmic-clinic attendance.

Methods: Nationwide ophthalmology clinic data was aggregated for analysis. Variables included patient age, District Health Board (DHB), ethnicity, clinic appointment type, sex and deprivation quintile. Feature engineering of the training dataset was completed with binary encoding of predictive categorical variables. Age was the only

numerical feature. Logistic regression models were evaluated with performance measures of area under the curve (AUC), sensitivity, specificity and precision. Model weighting was adjusted to account for the highly imbalanced dataset. Ten-fold cross validation was used.

Results: Data included 3.1 million clinic appointments with 5.9% non-attendance rate. Raw data was divided for model training (90%) and testing (10%) to enable a robust validation framework. An overall model sensitivity of 73%, specificity of 69%, AUC of 0.777 and precision of 12.8% was achieved. Precision increased significantly when the model was constrained to DHBs with modest increases in non-attendance rates. A DHB with 9.9% non-attendance achieved precision of up to 22%.

Conclusion: It is possible to use machine learning algorithms to predict clinic non-attendance. The AUC confirms this model enables clinically useful predictions of clinic attendance. The model AUC in the current study outperforms most previously published predictive models of attendance in the literature. This level of discrimination is high enough to be used in advanced scheduling methods and targeted public health interventions.

10:43am - 10:56am

P03 – BEST PAPER PRESENTATIONS: Gerard Crock and John Parr Trophies**Incidence and mortality of ocular melanoma in Aotearoa/New Zealand – Preliminary results of a 20-year retrospective review****Joevy Lim**^{1,2}, Stuti Misra¹, Akilesh Gokul¹, Peter Hadden², Charles N. J. McGhee^{1,2}

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Purpose: To identify the incidence and mortality of ocular melanoma in New Zealand.

Method: Data for all cases of primary ocular melanoma diagnosed from 1 January 2000 to 31 December 2020 were collected retrospectively from the New Zealand

Cancer Registry and Auckland District Health Board clinical records.

Results: A total of 1085 cases of ocular melanoma were identified. 72.7% involved the choroid, followed by 12.6% ciliary body, 7.0% conjunctival, 3.0% iris and 4.7% were of other, multiple or unspecified sites. The crude annual incidence of ocular melanoma was 12.4 cases/million. Fifty-one percent were female. The median age at diagnosis was 65.08 years (interquartile range [IQR] 55.06-74.7). Ninety-five percent were New Zealand European, followed by 4% Māori and Pacific Island, and 1% Asian. Notably, 45% of patients were deceased (all-cause) at a median follow-up of 5.18 years (IQR 2.28-9.65). The median age at death was 75.2 years (IQR 65.9-84.1) and the median time to death from diagnosis was 3.3 years (IQR 1.8 to 6.3). 74.4% (N = 791) of cases were histologically confirmed – at initial



presentation, 56% had localised disease, 6% had invasion of adjacent tissue, 4% had distant metastases and 35% were not known.

Conclusions: New Zealand has one of the highest documented incidences of ocular melanoma and the proportion

of ciliary body melanoma is approximately twice as high when compared to international studies. Systemic prognosis is guarded with an overall mortality of 45%. Further research is required to identify the role of ultraviolet light in the development of ocular melanoma in New Zealand.

10:56am - 11:09am

P03 – BEST PAPER PRESENTATIONS: Gerard Crock and John Parr Trophies

Development of a deep learning algorithm for provision of a South Western Sydney diabetes retinal screening service

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Purpose: Diabetic retinopathy (DR) is highly prevalent in the multi-ethnic and low socioeconomic population of South Western Sydney. This is a significant public health burden, demanding efficient and cost-effective diabetes retinal screening. The multi-centre South Western Eye and Diabetes Deep Learning Algorithm study, supported by an Ophthalmic Research Institute of Australia grant, aims to develop

and validate a novel deep learning algorithm, capable of grading DR, for a new diabetes retinal screening service. This abstract evaluates the performance of the Diabetic retinopathy OCT Open source Artificial Intelligence (Doctor AI[®]SK) program.

Methods: Doctor AI analyses fundus photographs and optical coherence tomography (OCT) images simultaneously to grade diabetic retinopathy. It was trained with over 50,000 fundus photographs and 8000 OCT scans, using a combination of Australasian and publicly available datasets. As a screening tool, the algorithm's operating point was optimised for sensitivity and negative predictive value, and its performance reevaluated. Clinical validation is being undertaken in the recruited population at each study site.

Results: For the detection of diabetic macula oedema from OCT images, Doctor AI achieved a 96.8% sensitivity, 98.1% specificity and 97.5% accuracy. Area under the receiver operating characteristic curve was 0.996. For the diagnosis of DR from fundus photographs, Doctor AI achieved a 90.4% sensitivity, 96.8% specificity and 88.9% accuracy. Preliminary clinical validation revealed an accuracy of 89% and 85% for the OCT and fundus photograph modules of the algorithm, respectively.

Conclusion: Doctor AI is a unique deep learning algorithm capable of diagnosing DR and diabetic macula oedema with high sensitivity and accuracy.

11:09am - 11:22am

P03 – BEST PAPER PRESENTATIONS: Gerard Crock and John Parr Trophies

A multi-centre prospective trial of THEIA[™] to detect diabetic retinopathy and diabetic macular oedema in the New Zealand screening program

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Purpose: THEIA is an artificial intelligence that is designed in New Zealand, to detect diabetic retinopathy and diabetic macular edema from fundus images. A multi-centre prospective clinical trial was designed and commenced to validate the efficacy of THEIA.

Methods: Nine hundred and two consented patients were recruited from either an urban large eye hospital, or a semi-rural optometrist led screening provider, as they were attending their appointment as part of New Zealand

Diabetic Screening program. These clinics used a variety of retinal cameras and a range of operators. The de-identified images were then graded independently by three senior retinal specialists, then converted to referable/non-referable and healthy/mild/more than mild/vision threatening categories. Separately, the images were also analysed by THEIA.

Results: Compared to the “ground truth”, THEIA achieved 100% sensitivity and [95.35-97.44%] specificity, and negative predictive value of 100%. This means that THEIA did not miss any patients with “more than mild” or “vision threatening” disease. The level of agreement between the clinicians and the aggregated results was

k-value: 0.9881, 0.9557 and 0.9175, and the level of agreement between THEIA and the aggregated results was k-value: 0.9771.

Conclusion: THEIA proved to be as accurate as experienced retinal specialists, when diagnosing more than mild or vision threatening diabetic retinopathy, and demonstrated to have comparable level agreement to the “ground truth”, although with a tendency to slightly over-grade the patients. Implementation of THEIA as an assistive clinical decision making tool within a diabetic screening services could lead to more capacity and consistency in delivery of the care.

11:22am - 11:35am

P03 – BEST PAPER PRESENTATIONS: Gerard Crock and John Parr Trophies

Myopia incidence and progression between 20 and 28 years old

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Purpose: This study documented the 8-year incidence and progression of myopia in a community-based sample of young adults. Additionally, we determined if known risk factors of childhood myopia (e.g. reduce time spent outdoors, higher education) are also predictive of development or progression of myopia during young adulthood.

Methods: Gen2 participants of the Raine Study underwent measurements of their axial length and post-mydriatic autorefraction at ages 20 (baseline) and 28 years. Participants without myopia or high myopia at baseline were included in the 8-year incidence analysis (n = 526, 51% male and n = 698, 50% males, respectively), while all participants who had complete data at both visits were included in the progression analysis (n = 729, 49% male). Those with prior refractive or corneal surgery were excluded.

Results: Myopia and high myopia prevalence at baseline were 25.8% and 1.4% respectively. The 8-year incidence of myopia and high myopia were 14.1% (95% confidence interval = 11.5-17.4%; n = 76) and 0.7% (95% confidence interval = 0.3-1.7%; n = 5), increasing myopia prevalence at age 28 years to 33.2% and 1.5%, respectively. There was a myopic shift (≥ 0.50 D) in at least one eye in 38.1% of participants. Spherical equivalent and axial length changed by -0.03D/year and +0.02 mm/year, respectively (both $p < 0.001$). Parental myopia, East Asian ethnicity (versus Caucasians), and less time outdoors were significant risk factors for incident myopia and myopia progression.

Conclusions: Myopia progression and axial elongation continues during the third decade of life. Confirmed risk factors of childhood myopia appear to have continued influence in the adult eye.



11:35am - 11:48am

P03 – BEST PAPER PRESENTATIONS: Gerard Crock and John Parr Trophies

Home monitoring of visual field for glaucoma patients using tablet device: 12 month outcomes**George Kong**^{1,2,3}, Selwyn Prea^{1,3}, Algis Vingrys^{2,3}

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¹Royal Victorian Eye and Ear Hospital, Melbourne, Australia, ²Centre for Eye Research Australia, Melbourne, Australia, ³University of Melbourne, Melbourne, Australia**Purpose:** To determine patient compliance and performance of in-home visual field testing using a tablet device over a 12-month period.**Methods:** We recruited participants with stable glaucoma in at least one eye. All cases had 3-5 reliable Humphrey Field Analyser (HFA 24-2) outcomes that encompassed the follow up period of home testing. Test subjects were trained on the use of the Melbourne Rapid Fields-glaucoma (MRF-g) iPad application, guided by audio instructions. Volunteers were tasked with weekly testing for 12-months. At study completion, retention and compliance to weekly testing (7±1 days) was determined.

The concordance of In-home MRF-g and In-clinic HFA trend was considered against clinical diagnosis.

Results: Forty-seven participants (n = 85 eyes) with a mean age of 64 ± 17.1 years were enrolled. Compliance to weekly testing in this group was 73%. In-home results showed high degree of correlation with HFA results (R = 0.85 for mean deviation). There is fair (76%) agreement between trend analysis using In-home results and HFA result (Kappa = 0.21). Two cases had glaucoma progression during the 12-month period, both of which was detected by in-home testing (89% agreement, Kappa = 0.40).**Conclusions:** Glaucoma participants showed good level of adherence to home monitoring of their visual field over 12-months. The larger number of visual field tests available using in-home MRF-g allowed detection of glaucoma progression in a relatively short period of time.**Acknowledgements:** This study was supported by funding from Glaucoma Australia Quinlivan Research Grant, Royal Victorian Eye and Ear Early Career Research Grant and Perpetual Research Grant.

12:00pm - 1:30pm

Lunch

1:30pm - 3:00pm

CONCURRENT SESSIONS**S01 – PROFESSIONAL DEVELOPMENT****Venue:** M1 & 2

1:30pm - 3:00pm

S02 – SYMPOSIUM**Chair:** Prof Stephanie Watson**Venue:** Great Hall 3**Title:** Optimising the Management of Common Corneal Conditions: What do Corneal Specialists Tell their Patients?

stephanie.watson@sydney.edu.au

Synopsis: Patients suffering corneal and external disease typically suffer with poor vision and ocular discomfort. This symposium will provide the comprehensive ophthalmologist with an update on the management of common corneal conditions to improve patients' vision and comfort. Expert presenters will communicate best practice by addressing the answers to questions commonly asked by patients with corneal disease. At the end of the symposium it is expected that the comprehensive ophthalmologist will be able to select optimal management strategies and communicate to patients the essentials of their condition/management. Social media is now in use as a way of communicating to patients. How to educate patients on corneal conditions using social media will also be presented using the SydEyePodcast as an example.**Speakers and Topics:**

Dr Elsie Chan – What treatment do I need for my corneal infection?

Prof Stephanie Watson – Will my keratoconus progress and do I need cross-linking?

Dr Maria Cabrera-Aguas – How can social media help me communicate with my patients about their corneal condition?

Dr Tanya Trinh – Which corneal transplant procedure should I have?

Dr Andrew Apel – After my corneal transplant what treatments will I need?

Prof Richard Mills – Should I drop or chop my OSSN?

Panel discussion and Q & A

1:30pm - 3:00pm

S03 – SYMPOSIUM

Title: ANZGS Symposium 2020 - Survival Tips from the Glaucoma Experts

eye@cityeye.com.au

Chair: Prof Graham Lee

Co-Chairs: Dr Ridia Lim and A/Prof Anne Brooks

Venue: Great Hall 1 & 2

Synopsis: Glaucoma management is fraught with pitfalls. Patients can be prescribed the best medications available, but just don't take them. We have the best diagnostic tools at our fingertips, however still need interpretation to arrive at the diagnosis. Sometimes the medications are not adequate and the patient is not keen for surgery, we turn to other modalities such as SLT. When conservative measures have failed and trabeculectomy is the next step, your first chance is the best chance to achieve long-term pressure control. At the end of the day, visual preservation is our goal.

The aim of this symposium is to learn the approach to glaucoma management from experts in the field.

Speakers and Topics:

Prof Ivan Goldberg - How do I optimise medication compliance?

Prof Helen Danesh-Meyer - How to avoid the pitfalls of OCT

A/Prof Frank Howes - How do I make SLT work?

Dr Ridia Lim - When do I refer patients for glaucoma surgery?

Prof Graham Lee - How do I avoid blinding patients in high risk eyes

1:30pm - 3:00pm

S04 – COURSE

Chairs: Dr Jwu Jin Khong and Dr Thomas Hardy

Venue: Great Hall 4

Title: Oculoplastic Tips and Pearls for Ophthalmologists

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Background: Proficiency in basic oculoplastic procedures and surgeries requires sound assessment of lid and lacrimal conditions, a clear understanding of periocular anatomy, and experienced surgical approach and techniques. There are a variety of ways to achieve correction of lids and lacrimal disorders but the basic principles of assessment and surgical repair are universal. The prevailing goals for excellent oculoplastics surgery are to restore function and to achieve an aesthetically pleasing outcome.

Aim: To discuss assessment and principles of management for common eyelid and lacrimal conditions, including selective aspect of lid and lacrimal assessment and management with case illustration, advances in treatment, surgical technique demonstration and tips and pearls.

Panel: Dr Freny Kalapesi, Dr Geoff Wilczek, Dr Jenny Danks, Dr Alicia Au, Dr Olivia Macvie, Dr Lucy Goold, Dr James Slattery, Dr Thomas Hardy

Speakers and Topics:

Dr Alicia Au – Involutional ectropion

- a. How to tighten the lid. Tips for 'premium' lateral canthoplasty
- b. How to manage the punctum

Dr Freny Kalapesi and Dr Jenny Danks – Ptosis

- a. Systematic guide to ptosis evaluation
- b. Involutional ptosis - surgical approaches, complication prevention

Dr James Slattery and Dr Thomas Hardy – Dermatochalasis and upper blepharoplasty

- a. Pre-op check assessment including Medicare eligibility
- b. Various techniques: management of skin, orbicularis, orbital fat, skin crease
- c. Avoiding complications: ptosis, lagophthalmos, scarring

Dr Lucy Goold, Dr Geoff Wilczek and Dr Olivia MacVie – Watery eyes

- a. When epiphora is no longer responding to ocular lubricants - approach to evaluation



- b. Approach to the watery eye with patent nasolacrimal duct: functional nasolacrimal duct obstruction
- c. Approach to paediatric lacrimal disorders: evaluation, timing and options of intervention

1:30pm - 3:00pm

S05 – FREE PAPERS – Epidemiology/Genetics**Chairs:** A/Prof Abhishek Sharma and A/Prof Samantha Fraser-Bell**Venue:** M4

1:30pm - 1:37pm

Sport-related eye trauma study: Five-year audit of sport-related ocular injuries at a tertiary eye hospital in Australia (2015-2020)

Gizem Ashraf^{1,2,3}, Janan Arslan^{1,2}, Carmel Crock^{2,4},
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³Monash Health, Melbourne, Australia, ⁴Royal Victorian Eye and Ear Hospital, Melbourne, Australia,

⁵Alfred Hospital, Melbourne, Australia

Aim: To examine outcomes of sport-related ocular injuries in an Australian tertiary eye hospital setting.

Methods: Retrospective audit from the Royal Victorian Eye and Ear Hospital from 2015-2020. Patient demographics, diagnosis, injury causation, visual acuity (VA), intra-ocular pressure, and management were recorded.

Results: A total of 1793 individuals (mean age 28.7 years; 80.4% males and 19.6% females) were included. The top three injury-causing sports were soccer (n = 327, 18.2%), Australian Rules Football (AFL) (n = 306, 17.1%) and basketball (n = 215, 12.0%). The top three injury mechanisms

were projectile (n = 976, 54.4%), incidental body contact (n = 506, 28.2%) and sporting equipment (n = 104, 5.8%). The most frequent diagnosis was traumatic hyphaema (n = 725). Best documented VA was $\geq 6/12$ at baseline in 84.8% and at follow-up in 95.0% of cases.

Multivariate logistic regression showed that the greatest risk of globe rupture was associated with martial arts (odds ratio [OR] 16.2); orbital blow-out fracture with skiing (OR 14.4); hyphaema with squash (OR 4.2); and retinal tears with foam dart projectiles (OR 5.6) – p < 0.05 for all.

Topical steroids were the most common non-surgical treatment (n = 693, 38.7%). CT orbits and facial bones were the most common investigation (n = 184, 10.3%). The mean baseline intra-ocular pressure in the injured eye was 16.1 mmHg; n = 103 (5.7%) cases required topical anti-ocular hypertensive medication. Twenty-seven (1.5%) individuals were admitted to hospital and n = 26 (1.5%) required surgery. AFL contributed the most surgical cases (n = 5, 19.2%).

Conclusion: The top three ocular injury causing sports were soccer, AFL, and basketball. The most frequent injury was traumatic hyphaema. Projectiles posed the greatest risk.

1:37pm - 1:44pm

S05 – FREE PAPERS – Epidemiology/Genetics

Diabetic retinopathy outcomes in pregnant women with type 1 and type 2 diabetes in metropolitan Melbourne

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Purpose: Diabetic retinopathy (DR) may deteriorate during pregnancy. Prior studies mainly studied women with type 1 diabetes (T1DM). This prospective study reports DR prevalence, progression rate, and associated risk factors in pregnant women with T1DM and type 2 diabetes (T2DM).

Methods: Prospective cohort study of 147 pregnant women with T1DM or T2DM from two obstetrics hospitals in Melbourne (2017-2019). At least two eye examinations were scheduled (in early and late pregnancy). DR severity was graded from two-field retinal photographs. Progression was defined as worsening of DR severity, development of diabetic macular oedema, or the need for panretinal photocoagulation.

Results: Overall, 130 (88.4%) women had at least one eye examination. Mean age was 33.7 years (range 19-47); 62 women (47.7%) had T1DM. DR prevalence per 100 eyes was 20.8 (95% confidence interval [CI] 16.3-26.1), with T1DM and higher HbA1c in early pregnancy being significant risk factors. Of 144 eyes (72 women) with ≥ 2 eye examinations, 9.7% (95% CI 5.8-15.8) progressed. Elevated systolic blood pressure (RR 10.36, 95% CI 3.14-34.12) and pre-existing DR in either eye (RR 5.07, 95% CI 1.90-13.49) in early pregnancy increased the risk of progression. Sight-threatening progression (STprog) was observed in 5 women (3 developed diabetic macular oedema; 2 developed PDR).

Conclusions: The prevalence of DR in pregnant women was similar to the non-pregnant diabetic population in Australia. However, nearly 1 in 10 eyes had DR progression in pregnancy; almost half of these developing sight-threatening disease. STprog was found to be more commonly due to the development of diabetic macular oedema than PDR, an under-investigated condition in previous studies.

1:44pm -1:51pm

S05 – FREE PAPERS – Epidemiology/Genetics

Ophthalmic surgery in New Zealand: Analysis of 410,099 surgical procedures and nationwide population-based surgical intervention rates from 2009-2018

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Purpose: Surgical intervention rates (SIR) provide a proxy measure of disease burden, service availability and evolution of the relative risk-benefit ratio of surgery. This study assessed trends in ophthalmic surgery and calculated SIRs for all major classes of commonly performed government- and private-funded ophthalmic procedures in New Zealand (NZ).

Methods: Retrospective population-based study from 2009-2018 of all ophthalmic surgical procedures performed in NZ. National and regional datasets from NZ Ministry of Health, private medical insurer, private hospital, NZ National Eye Bank, intraocular lens manufacturers and surgical equipment distributors were analysed. Total numbers and SIRs/100,000-population/

year were calculated for all major ophthalmic procedures.

Results: There were 410,099 ophthalmic procedures completed with a 25.3% increase over 10 years. Procedures were mostly government-funded (51%, n = 210,830). Over 80% of patients were 65+ years with a 30.1% increase in this group. Cataract surgery (78%, n = 318,564) had the highest mean SIR (703/100,000/year) and increased by 23%. Vitrectomy surgery had the second highest mean SIR (67/100,000/year) and increased by 34%. Keratoplasty surgery (SIR = 4/100,000/year) increased by 40% and showed bimodal age distribution. Remaining categories included conjunctival lesion-biopsy (SIR = 38/100,000/year), glaucoma (SIR = 33/100,000/year), strabismus (SIR = 20/100,000/year) and dacryocystorhinostomy (SIR = 10/100,000/year) surgeries. The national population increased by 31% between 2006-2018.

Conclusion: This is the first comprehensive summary of all major NZ ophthalmic surgical procedures. The national population increase was less than the increase in vitrectomy and keratoplasty surgery numbers and more than the increase in cataract surgery numbers. It is essential that ophthalmologist supply and funding for surgery is scaled appropriately to meet increasing demand.



1:51pm - 1:58pm

S05 – FREE PAPERS – Epidemiology/Genetics

Vulnerability of Melbourne ophthalmology practices to ransomware attack by email impersonation

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Purpose: Devastating crypto-ransomware attacks are becoming increasingly commonplace, with resultant loss of patient records, costing the practice considerable time, money and stress. Most attacks now occur via targeted 'spear-phishing' emails designed to trick the recipient. Cybersecurity measures can be undertaken to mitigate the risk, but are often inadequately implemented.

Methods: We conducted a cross-sectional survey of Melbourne ophthalmology practice websites, assessing for common vulnerabilities in website design, including email addresses and clerical staff listings. Email system design was evaluated for Sender Policy Framework, DKIM, DMARC, and back-end system settings. Each practice's website and email set-up was classified on a five-point scale from excellent to very poor.

Results: Sixty-seven ophthalmology practices were surveyed. No practice was rated excellent. Five (7%), 29 (43%), 31 (46%) and 2 (<1%) were rated good, fair, poor, and very poor respectively. Only six practices used a mail filtering service. More than 25% (17/67) of practices had no Sender Policy Framework record; less than 25% (15/67) were set to reject all spoofed email from their own domain (HardFail). 45 listed an email address online, and 15 listed details of non-medical staff.

Conclusions: Ophthalmology practices are extremely vulnerable to crypto-ransomware attacks via targeted spear-phishing; it is important to improve security in this area.

1:58pm - 2:05pm

S05 – FREE PAPERS – Epidemiology/Genetics

Kimberley region ophthalmology 2019-21: Service changes with a new regional Eye Hub at Lions Outback Vision

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Purpose: To evaluate specialist eye care in the Kimberley region after introduction of the Lions Outback Vision Kimberley Hub. The regionally based service commenced in 2020 and was established in new premises with retinal surgical services since March 2021. Kimberley region serves a population of 34,364 people including 14,299 Aboriginal people (41.6%).

Methods: Ophthalmology activity in the Kimberley was compared between 2019-2021 sampling the first six-months of the year with a retrospective audit of an electronic medical records database. Population-based needs were determined with a service delivery planning

calculator at Indigenous Eye Health Unit, University of Melbourne.

Results: In the first six-months of 2021, there were 731 ophthalmology attendances in the Kimberley region. This compares to 310 in Jan-Jun 2020 and 662 in Jan-Jun 2019. Highest rate of telehealth consultations was during first 6 months of 2020 (19.2%) compared to 2019 (4.0%) and 2021 (6.5%). Of 102 cataracts surgeries, 50 were for Aboriginal patients in first half of 2021 compared to 26 in 2020 and 32 in 2019. Reduction in the failure to attendance rates in 2021 (21.3%) compared to 2019 (29.1%).

Conclusion: A regionally-based service has resulted in an uplift in specialist eye care in the Kimberley region. COVID-19 impacted the initial services in 2020 but in 2021 there has been an increase in cataract surgeries to 74% of population-based needs for 2021 (Jan-Jun). Introduction of retinal services has resulted in eleven pars-plana vitrectomies for diabetic eye disease. This audit serves as a baseline for further monitoring of service delivery in the region.

2:05pm - 2:12pm

S05 – FREE PAPERS – Epidemiology/Genetics

Ophthalmic clinic care in New Zealand: A nationwide analysis of 3,015,623 clinic appointments from 2009-2018 and workforce provision

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¹Waikato District Health Board, Hamilton, New Zealand,

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Purpose: To evaluate disparities in the distribution of public-funded ophthalmic workforce provision and clinic appointment attendances in New Zealand.

Method: Retrospective population-based study from 2009-2018 of all patients in New Zealand attending a public-funded ophthalmology clinic appointment. National and regional datasets were obtained from the New Zealand Ministry of Health. National full-time-equivalent (FTE) employment data for ophthalmic workforce was obtained from every ophthalmology department in 2017. Rates of first-specialist assessments (FSA)

and follow-up appointment attendances/100,000-population/year were calculated. Potential disparities of care were assessed using the adjusted FSA attendance rate per consultant standardised FTE (FSA/FTE rate).

Results: There were 3,015,623 public-funded clinic attendances across New Zealand with a 26% increase between 2009-2018. Clinic types were 18% FSAs (n = 529,676), 58% follow-ups (n = 1,751,455), 7% orthoptist (n = 212,577), 7% diabetes screening (n = 212,276), 5% procedures (n = 165,047), 5% nurse-led (n = 138,694) and 0.2% optometrist (n = 5898). The average FSA attendance rate was 1100/100,000-population/year and follow-up rate was 3639/100,000-population/year. National consultant FTE/100,000-population was 1.54 in 2017 and the average national FSA/FTE rate was 860/100,000-population/year.

Conclusion: This study analysed national trends in clinic attendances and distribution of ophthalmic workforce within the New Zealand public healthcare system. Understanding the workforce composition and service utilisation is vital for future workforce and funding planning.

2:12pm - 2:19pm

S05 – FREE PAPERS – Epidemiology/Genetics

The phenotypic spectrum of ADAMTSL4-associated ectopia lentis: Additional cases, complications and review of the literature

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Purpose: To clinically evaluate four individuals of ADAMTSL4-associated ectopia lentis from three non-consanguineous families in Australia, and to summarise the ocular and systemic phenotypic spectrum in a total of 96 reported cases.

Method: We performed a cross-sectional case series study with a literature review. The literature was last reviewed on 14 June.

Results: Four individuals from three families were identified with biallelic variants in ADAMTSL4. The phenotypic spectrum across 92 cases sourced from the literature and four from this case series was highly variable. The ocular phenotype included ectopia lentis (96/96, 100.0%), ectopia lentis et pupillae (19/96, 19.8%), iris transillumination (13/96, 13.5%), iridodonesis (12/96, 12.5%), persistent pupillary membrane (12/96, 12.5%), early onset cataract or lens opacities (12/96, 12.5%), poor pupillary dilatation (11/96, 11.5%) and spherophakia (11/96, 11.5%). Anterior segment features other than ectopia lentis and early-onset cataract appeared to be exclusively associated with biallelic loss of function variants. Differential diagnostic features



included deep anterior chambers, increased central corneal thicknesses and normal corneal curvature have been reported. The prevalence of retinal detachment post-lensectomy was 15.0% while the prevalence of aphakic glaucoma at 5-years post-lensectomy was 2.5%. Pupillary block glaucoma had a prevalence of 1.0%. No systemic features were reported in the majority of cases (74/96, 74.0%).

Conclusion: This study summarised and expanded the clinical phenotype of ADAMTSL4-associated ectopia lentis. Clinicians should be aware of the varied ocular phenotype and the risks of retinal detachment, ocular hypertension, and glaucoma in the diagnosis and management of this condition. Systemic features were atypical.

2:19pm - 2:26pm

S05 – FREE PAPERS – Epidemiology/Genetics

Human stem cell-derived retinal organoids for variant classification and genetic therapy testing in the inherited retinal degenerations

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Purpose: Administration of RPE65 gene therapy, voretigene neparvovec-rzyl (Luxturna™), requires presence of pathological, biallelic variants in RPE65. Demonstration of pathogenic variants will also be required for other inherited retinal degeneration (IRD) genetic therapies. Human induced pluripotent stem cells (iPSCs) differentiated to retinal pigmented epithelium (RPE) or

retinal organoids provide a valuable resource to investigate genetic variants and test novel therapies. We used these to determine the clinical significance of variants of unknown significance in RPE65 and a ciliopathy gene, and to establish biomarkers in the organoids for investigation of novel genetic therapies.

Method: iPSCs were generated from peripheral blood. Gene expression studies were performed to confirm pluripotency and subsequent differentiation to RPE and retinal organoids. CRISPR/Cas9 genome editing was used to introduce the novel variants to normal iPSCs where required and AAV clinical grade cassettes prepared for therapy investigations. RNA from iPSC-RPE or retinal organoids was used to investigate splicing aberrations, and immunohistochemical studies investigated protein localisation.

Results: In the RPE65 siblings, carrier parent iPSC-RPE RNA demonstrated exon skipping and a predicted mutant RPE65 allele of only 22 amino acids. In the ciliopathy case, CRISPR/Cas9 mutant lines showed aberrant rhodopsin expression in retinal organoids, and multiprotein mislocalisation at the photoreceptor transitional zone.

Conclusion: These findings will facilitate the reclassification of the variants to pathogenic. In the RPE65 family this will lead to eligibility for Luxturna for two affected siblings, and for the ciliopathy case, future therapy suitability. Biomarkers have been established for investigation of novel genetic therapies in the retinal organoid system.

2:26pm - 2:33pm

S05 – FREE PAPERS – Epidemiology/Genetics

Sibling discordance in symptom onset and atrophy growth rates in Stargardt disease using ultra-widefield fundus autofluorescence

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Purpose: To investigate the concordance in symptom onset, atrophy size and growth rate using ultra-widefield fundus autofluorescence between sibling pairs with Stargardt disease due to identical ABCA4 variants.

Method: Sex, age at symptom onset and best corrected visual acuity (BCVA) were recorded. The boundaries of definitely decreased autofluorescence (DDAF) on ultra-widefield fundus autofluorescence were outlined at baseline and follow-up. BCVA and DDAF area growth rate (AGR) were determined at age-matched time-points for sibling pair comparisons.

Results: From 100 unrelated Stargardt disease cases, 39 siblings from 19 families were examined at a median age of 39 years and followed for a median duration of 4.3 years. There were equal numbers of same-sex and mixed-sex sibling pairs. Discordance in age of symptom onset >5 years was found in 5/20 pairs (4 mixed-sex, 1 female-female). In all mixed-sex sibling pairs the female had an earlier onset. Discordance in age-matched BCVA > 10 ETDRS letters and DDAF area >5 mm² occurred in 8/13 and 6/13 pairs, respectively. The median (range) DDAF AGR was 1.2 (0.1-4.8) and 1.7 (0.1-4.3) mm² per year in the right and left eye, respectively. The median (range) absolute inter-sibling difference in DDAF area were 0.7 (0.2-1.5) and 0.4 (0.1-1.3) mm² per year in right and left eye, respectively.

Conclusion: A quarter of sibling pairshad significant inter-sibling differences in age at symptom onset with females in the mixed-sex pairings at greater risk of earlier onset. Large differences in BCVA, DDAF area and AGR remained after adjustment for age indicating significant inter-sibling differences in disease progression.

2:33pm - 2:40pm

S05 – FREE PAPERS – Epidemiology/Genetics

Gender differences in surgical case volume among the Royal Australian and New Zealand College of Ophthalmology trainees

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Purpose: The number of females in ophthalmology has steadily increased over recent decades. This study aimed to evaluate whether there is a difference in procedural volume and cataract surgery between male and female trainees in the Royal Australian and New Zealand College of Ophthalmologists (RANZCO).

Method: A longitudinal retrospective review of de-identified surgical RANZCO trainee logbook data from 2008 to 2020 was undertaken. Data from 241 trainee logbooks were analysed for: location of training, gender, date of training commencement, maternity/paternity leave status, number of surgeries observed, assisted,

supervised and unsupervised. Surgical cases were grouped as: 1) all surgical cases; 2) complete cataract cases; and 3) partial cataract cases.

Results: Among 241 trainees (40.7% females), 197,263 procedures were performed. Total surgical volume was 21.1% lower at 4 years for females (median 665.5 vs 843.5; $p = 0.036$). Completed cataract surgery was 21.5% lower at 18 months (median 87.5 vs 111.5; $p = 0.022$) and 41.7% lower at 4 years (median 216 vs 369; $p < 0.001$). Interrupted training was taken by 31 trainees and was significantly more common in females (30.6% vs 0.7%; $p < 0.001$). However, linear regression analysis did not identify parental leave or duration as significant for completed cataracts ($p = 0.206$).

Conclusion: Female trainees will have completed 41.7% less cataracts at the end of their training compared to male counterparts. There is widening of the gap of both total surgical cases and complete cataract cases between years 1 to 4 of training. The current data demonstrates that female and male RANZCO trainees are not receiving equivalent operating experiences.



2:40pm - 2:47pm

S05 – FREE PAPERS – Epidemiology/Genetics

Virtual reality and its use in ophthalmology teaching

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Purpose: We developed a time-efficient, engaging way of teaching Ophthalmology to medical students utilising virtual reality (VR) technology. VR technology enables immersive, high-level simulation and allows for empathy based-learning, both of which enhance student engagement, satisfaction and thus learning outcomes.

Method: A novel VR program was developed for the undergraduate medical course to enable the study of ophthalmology through guided and self-experiential exploration of visual impairments. The program utilises filters superimposed on 'real world' visual scenes to allow students to experience visual changes resulting from various ocular and neuro-ophthalmic conditions. The program

was accessed in class-time, using the students' own smartphones, and University-provided virtual reality goggles. The pedagogical application of this novel teaching method was carefully designed using evidence based data and clinical ophthalmological expertise. This is one of the first examples of VR immersion with specific learning outcomes used for large-scale teaching in Australia.

Results: We surveyed 80 respondents, 50 female and 30 male. Understanding of the topic was rated as 3.83 ± 1.74 before and 7.29 ± 1.15 after the lecture from a scale of 0-10. Assessment through the virtual presence questionnaire (Witmer *et al.* 2005) showed strengths and challenges of using the technology. Results show both increased student engagement and increased learning efficiency. The tutorial received positive feedback in relation to student motivation and satisfaction with scores of 5.14 ± 0.86 and 5.15 ± 1.04 respectively from a scale of 0-6.

Conclusion: VR technology allows for self-experiential and empathy-based learning which is known to engage and motivate students for further self-guided studies and increases learning efficiency.

2:47pm - 2:54pm

S05 – FREE PAPERS – Epidemiology/Genetics

Is obstructive sleep apnea associated with age-related macular degeneration?

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Obstructive sleep apnea (OSA) is prevalent in the age-group of patients likely to develop age-related macular degeneration (AMD). We hypothesise that OSA-induced nocturnal hypoxia disrupts choroidal oxygenation potentially leading to AMD or its progression.

Purpose: To investigate the association between OSA risk and AMD, while considering disease severity.

Methods: Participants with AMD and normal controls were graded using the Beckman classification criteria based on colour fundus photography or clinical fundus examination. All participants were prospectively assessed for moderate-to-severe OSA risk using the Epworth Sleepiness Scale and the STOP-BANG questionnaire (SBQ). OSA risk was calculated using a binary risk scale based on Epworth Sleepiness Scale and SBQ scores and an ordinal risk scale based only on SBQ scores.

Results: Of 288 participants, 144 had AMD and 144 were normal controls. Using a binary risk scale, participants with AMD were found to be 9.19 times more likely to have high risk of moderate-to-severe OSA when compared to controls (odds ratio 9.19 95% confidence interval: 4.25-19.82; $p < 0.001$). Similarly, using an ordinal risk scale, participants with AMD were 5.90 times more likely to have high risk of moderate-to-severe OSA than low/intermediate risk of moderate-to-severe OSA when compared to

controls (odds ratio 5.90 95% confidence interval: 3.10-11.36; $p < 0.001$). There was no statistically significant difference in risk of moderate-to-severe OSA between participants with intermediate AMD and late AMD.

Conclusion: We found a strong association between high risk of moderate-to-severe OSA and AMD, supporting the hypothesis that there is a physiological link between these two diseases, where nocturnal hypoxia may be a novel risk factor for AMD.

3:00pm - 3:30pm

Afternoon Tea

3:30pm - 5:00pm

CONCURRENT SESSIONS

3:30pm - 5:00pm

S06 - PROFESSIONAL DEVELOPMENT

Venue: M1 & 2

3:30pm - 5:00pm

S07 - SYMPOSIUM

Title: Expanding the Surgical Practice of the General Ophthalmologist – Correction of Refractive Error
dr.alisonchiu@gmail.com

Chair: Dr Alison Chiu

Venue: Great Hall 3

Synopsis: This symposium aims to inform the general ophthalmologist with up to date, accessible techniques for surgical correction of refractive error, predominantly for phakic patients, with some techniques are also applicable to pseudophakic patients. We aim to present information on surgical techniques – including corneal laser (LASIK, SMILE, PRK), phakic IOLs (implantable contact lenses, ICL), and refractive lens exchange (RLE), and their pros and cons. We will cover patient selection, realistic expectations and outcomes, common and significant complications, surgical technique and surgical pearls including case studies.

For general ophthalmologists this area is of increasing interest due to a rising prevalence of myopia around the developed world, and patient populations are becoming more informed and educated regarding their options, as well as having high expectations with their outcomes from refractive and/or cataract surgery. Myopia is now the most common eye disorder in the world, and surgical refractive management of such is likely to become a larger part of our patient population. We will provide an update regarding the latest guidelines on preventing myopia progression, and explain why this is important for the ophthalmologist in considering surgical correction. Attendees will gain an understanding of the indications and options for surgical treatment of any patient with refractive error, whether for referral or for developing your own refractive practice.

Speakers and Topics

Dr Frank Howes – What surgical refractive procedures are available, how they're performed, pros and cons
Dr Abi Tenen – How do you choose the best procedure for each patient, who should not have refractive surgery (ie suitability criteria)?

Dr Dean Corbett – What are honest and real expectations from all modern modalities of refractive surgery

Dr Caroline Catt – Update on treatments for myopia progression: the current evidence

Dr Alison Chiu – Extreme measures: Treatment of the patient with high refractive error (ICL, laser, RLE, suitability criteria)

Dr Damien Gatinel – What can go wrong with refractive surgery and how bad can it get? Complications and best prevention the dreaded ectasia – SCORE analyser for laser surgeons. Secrets for success.

Dr John Males – Case studies: interesting case studies focus SMILE

A/Prof Grant Snibson – Case studies: interesting case studies focus ICLs

3:30pm - 5:00pm

S08 - SYMPOSIUM

Title: Ocular Herpes – Beyond Basics
mei-ling@lei.org.au

Chair: A/Prof Anthony Hall

Venue: Great Hall 1 & 2

Synopsis: As the holy grail to cure herpes infections remain elusive, we must equip ourselves with the ability to recognise and treat the ephemeral manifestations of herpetic eye infections. Keeping abreast with what is new and how to mitigate severe complications of these infections is always useful. The aging population is also susceptible to a recrudescence of the varicella-zoster virus. Knowing its epidemiology, role of vaccines, and ocular complications will help us better serve our patients.

Speakers and Topics:

Prof Stephanie Watson – Herpes keratitis in 2020: Getting the treatment right!



Dr Joanne L. Sims – The effect of the zoster vaccine on herpetic eye disease
 Dr Rachel L. Niederer – Clinical sequelae of herpes zoster ophthalmicus
 A/Prof Mei-Ling Tay-Kearney – CMV - playing havoc in the eye

3:30pm - 5:00pm

S09 - COURSE**Chair:** Prof Paul Mitchell AO**Venue:** Great Hall 4**Title:** Optical Coherence Tomography Angiography in the Management of Retinal Disease in 2021

paul.mitchell@sydney.edu.au

Synopsis: Optical coherence tomography (OCT) angiography is now a very common addition to standard spectral domain-OCT technology, at a modest additional investment. While many different platforms exist, swept-source technology permits wider fields and many other new advances are being introduced. The overriding advantage of this imaging - it is non-invasive and can be repeated regularly.

The most useful applications include the identification of choroidal neovascularisation, to confirm “wet” age-related macular degeneration, display of fine detail of the central and peripheral capillary bed in diabetic retinopathy, particularly patterns of capillary bed non-perfusion, and similar demonstration of capillary bed damage in retinal vein occlusion.

This course will provide practical guidance in the interpretation of OCT angiography signs to interpret retinal disease, using extensive series of cases showing comparative imaging (colour photography, OCT, fluorescein angiography (FA) and OCT angiography).

Speakers and Topics:

Dr Noor Ali – OCT angiography (OCTa) principles, platforms and technology. This introduction will cover the principles of interpreting OCTa, including selection of segmentation, projection and other sources of artifacts, plus the different platforms available.

Prof Paul Mitchell AO – OCT angiography in macular degeneration. This major component will ask: How frequently discrete choroidal neovascular (CNV) membranes are visible on OCTa in treated neovascular AMD patients, examine the comparison between different imaging modalities, the OCTa characteristics of different CNV types, what are confounding lesions that affect OCTa imaging of CNV, how do OCTa CNV patterns evolve over time and with anti-VEGF, presence of subclinical CNV lesions in fellow or first eyes, and whether or when to commence treatment, and if no CNV is repeatedly shown on OCTa, whether we can suspend or stop anti-VEGF.

Prof Gerald Liew – OCT angiography in diabetic retinopathy (DR). This presentation will ask: How well does wide-field (wf) OCTa image the capillary bed vs FA in DR, does widefield optical (OCTa (wfOCTAa) have an incremental role in monitoring DR, what information can OCTa provide on macular perfusion (examining the deep capillary bed), can OCTa contribute to managing DME with anti-VEGF, can wfOCTa assist in managing DR during pregnancy, can wfOCTa provide useful assistance in managing proliferative DR, and likely future directions

Dr Cheryl Au – OCT angiography in retinal vein occlusion. This presentation will examine wfOCTa in branch, central and hemispherical retinal vein occlusion. It will particularly examine the role of OCTa in identifying likely contributing factors to patients who need very chronic anti-VEGF therapy, identifying foveal avascular zone and deep macular capillary bed damage.

3:30pm - 5:00pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology**Chairs:** Dr Brett O'Donnell and Dr Daniel McKay**Venue:** M4

3:30pm - 3:37pm

Ocular factors predicting requirement for protective eyelid reanimation

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Purpose: Currently there is no agreed grading tool for the ocular sequelae of facial nerve palsy. The House

Brackman Scale only considers lagophthalmos and may not be adequate to assess ocular morbidity from facial nerve palsy. Our aim was to create a scoring system to help quantify ocular morbidity from facial nerve palsy, to aid in decision making regarding the need for eyelid reanimation.

Method: The notes of all patients who attended the specialist facial palsy clinic in Manchester UK between March 2002 and October 2017 were reviewed, totalling 606 patients. Retrospective multivariate analysis identified clinical predictors for patients that required eyelid reanimation. β coefficients generated in the multivariate analysis helped formulate a probability equation for requiring eyelid reanimation and a scoring system to quantify ocular morbidity.

Results: The House Brackman Scale, corneal lagophthalmos and loss of corneal sensation all proved independent predictive factors for patients requiring eyelid reanimation. Validation studies conducted through our patient population proves the probability equation and scoring system are accurate and repeatable. The area under the receiver operating characteristic curve for the multivariate prediction model was 0.769 (0.726, 0.811). A score of 5 points out of a possible 8 was the best cut off score to recommend eyelid reanimation, giving a sensitivity of 0.750 and a specificity of 0.671.

Conclusion: We have demonstrated that corneal lagophthalmos, corneal sensation and the House Brackman Scale are important in predicting the need for eyelid reanimation. The scoring system provides an important clinical decision making tool for other ophthalmologists.

3:37pm - 3:44pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology

Syringing has limited sensitivity and specificity in nasolacrimal duct drainage impairment

Yinon Shapira, Valerie Juniat, Carmelo Macri, Dinesh Selva

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Purpose: To elucidate the role of the lacrimal syringing (LS) in the assessment of nasolacrimal duct (NLD) stenosis and in functional NLD delay.

Methods: Retrospective review of consecutive adult patients with epiphora attending a tertiary lacrimal clinic from August 2007 to January 2021. Following LS, patients were investigated with dacryocystography (DCG) and dacryoscintigraphy (DSG). Cases with evidence of canalicular obstruction/stenosis on syringing and/or DCG or presac delay on DSG were excluded. Patients with other identifiable causes of epiphora were excluded.

The sensitivity and specificity of LS were evaluated using the combined findings on DCG and DSG.

Results: Both DCG and DSG were available for 235 symptomatic lacrimal systems (156 patients; mean age 65.5 ± 16.1 years, 60.3% females). One-third of cases that had both normal DCG and DSG were noted to have some degree of reflux on LS (specificity = 66.7%). 27.2% of lacrimal systems with both abnormal DCG and DSG were fully patent on LS (sensitivity = 72.8%). The sensitivities were considerably lower for NLD stenosis (i.e. stenosis on DCG and delay on DSG) and for functional NLD delay (i.e. normal DCG and delay on DSG), of which 43.5% and 57.4% had full patency on syringing, respectively.

Conclusions: Based on the combined findings of DCG and DSG, full patency on syringing was not reliable for ruling out NLD stenosis or functional delay. In a patient with epiphora where we have excluded other causes and punctocanicular pathology, strong consideration should be given to further investigation in the context of negative syringing.

3:44pm - 3:51pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology

Magnetic resonance imaging based normative orbital measurements in an Australian population

Khizar Rana^{1,2}, Valerie Juniat^{1,2}, Sandy Patel³, Dinesh Selva^{1,2}

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²*South Australian Institute of Ophthalmology, Adelaide, Australia,* ³*Department of Medical Imaging, Royal Adelaide Hospital, Adelaide, Australia*



Purpose: To determine the normal diameters of orbital structures on high resolution magnetic resonance imaging (MRI) sequences and correlate with patient demographics in an Australian cohort.

Method: Retrospective review of patients who underwent 3T T1-weighted fat suppressed contrast enhanced MRI orbits. The maximum extraocular muscle and superior ophthalmic vein (SOV) diameters on the normal orbits were recorded. Patients with bilateral disease or poor scan quality were excluded.

Results: A total of 213 orbits from 138 patients were included. The mean age of participants was 58 years (20-94 years) and 65 (47.1%) were male. Normal measurements (mean \pm SD) were as follows: medial rectus 4.14

\pm 0.52 mm; inferior rectus 4.63 \pm 0.72 mm; lateral rectus (LR) 3.90 \pm 0.69 mm; superior muscle group 4.49 \pm 0.71 mm; superior oblique 3.03 \pm 0.68 mm and the SOV 1.78 \pm 0.68 mm. Males had significantly larger mean diameters of the LR ($p < 0.01$) and inferior rectus ($p = 0.03$). Significant correlation was found between age and medial rectus ($r = -0.21$, $p < 0.05$) and LR ($r = 0.25$, $p < 0.01$) diameters.

Conclusion: Contrast enhanced MRI is the preferred imaging modality for evaluating pathological conditions affecting the orbit including infections, neoplasms and vascular malformations. This 3T-MRI data may help in diagnosing pathologic enlargement of the extraocular muscles and SOV on a contrast enhanced MRI sequence.

3:51pm - 3:58pm

S10 - FREE PAPERS - Oculoplastic/Ocular Oncology

Comparative evaluation of peribulbar triamcinolone acetonide and intravenous methylprednisolone in thyroid eye disease

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Purpose: To compare the efficacy and safety of Intravenous Methylprednisolone (IVMP) and peribulbar Triamcinolone Acetonide (p-TA) in the treatment of active thyroid eye disease.

Method: Randomised controlled trial. Twenty adult patients (34 eyes) with moderate-severe active thyroid eye disease were randomised into two equal groups over a period of one year. Group A received four doses of two-weekly p-TA injection and Group B received IVMP, 500 mg weekly for six weeks followed by 250 mg weekly for another six weeks. Change in Clinical Activity Score,

extraocular muscle thickness on computed tomography, diplopia, lid retraction, ocular motility and exophthalmos were assessed at six-months post-treatment.

Results: Mean Clinical Activity Score of 4.9 ± 0.88 and 5 ± 1.15 decreased to 2.1 ± 1.29 and 1.7 ± 1.06 in Group A ($p = 0.005$), and B ($p = 0.005$) respectively. The difference between groups was statistically not significant ($p = 0.348$). EOM thickness decreased in both groups post-intervention, Group A (mean decrease in inferior rectus [IR] 0.69 ± 0.69 , $p = 0.004$; superior rectus [SR] 1.49 ± 1.34 , $p = 0.002$; medial rectus [MR] 0.88 ± 0.54 , $p = 0.0003$) and Group B (mean decrease in IR, 1.21 ± 0.61 , $p = 0.003$; SR 1.1 ± 0.86 , $p = 0.005$; MR 1.14 ± 0.7 , $p = 0.003$). The intergroup difference for IR, SR and MR ($p = 0.065$, 0.84 and 0.38 respectively) was not significant. Improvement in diplopia, exophthalmos, ocular motility and lid retraction was observed in both groups. Side effects such as gastritis ($n = 1$), pedal edema ($n = 1$) and amenorrhea ($n = 1$) were seen in group B whereas none were observed in Group A.

Conclusion: p-TA injections are as efficacious as IVMP with a better safety profile.

3:58pm - 4:05pm

S10 - FREE PAPERS - Oculoplastic/Ocular Oncology

Algorithm for intra-operative margin control techniques in the management of periocular Bowen's disease

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Purpose: To discuss the choice of margin control techniques for periocular Bowen's disease, including the 'Calamari Ring' method of intra-operative margin control.

Methods: A retrospective study was conducted on patients records of a single surgeon from 1996 to 2020. Cases of periocular Bowen's disease were identified, with methods of margin control including the 'Calamari Ring' method, Mohs micrographic surgery, 'en face' frozen section and overnight paraffin. Main outcome measured the rate of recurrence of periocular Bowen's disease.

Results: A total of 91 cases of Bowen's disease were included in this study. The lesions were found more often on the right side (54%), at the central lower lid region (48%), with a mean diameter of 9.99 mm (range 2.5-50). Seventy-four cases (81%) were primary lesions and the remainder recurrent or residual. The margin control

techniques included 'Calamari ring' (46%), Mohs micrographic surgery (29%), 'en face' frozen section (5%), overnight paraffin (4%) and no intra-operative margin control (15%). The median follow up was 18 months (range 0-200). There was recorded recurrence in three cases (3%) overall. In the subset of 'Calamari ring' method, there was one case of recurrence out of 42 total cases (2%).

Conclusions: The method of choice for margin control needs to be considered based on the location, size and characteristics of the lesion. The 'Calamari Ring' method of managing periocular Bowen's disease demonstrated low recurrence rates comparable to Mohs micrographic surgery and 'en face' frozen section.

4:05pm - 4:12pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology

Bilateral lacrimal gland enlargement: Clinical features and outcomes

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Purpose: Patients with bilateral lacrimal gland disease are a unique subset of patients where there is a paucity of literature. This presentation often represents systemic disease or malignancy and can cause diagnostic difficulties. We aim to discuss the diagnoses and features of bilateral lacrimal gland disease.

Method: Retrospective multi-centre case series involving 115 patients with bilateral lacrimal gland disease from 1995 to 2020.

Results: One hundred and fifteen patients were included. Their ages ranged from 9 to 85 (mean 47.3 years) with a female predominance (73, 63.5%). The most common category of diagnosis was inflammatory (69, 60%) followed by lymphoproliferative (23, 20%), structural (17, 14.8%) and other conditions (6, 5.2%). The five most common specific diagnoses were IgG4 related disease (20, 17.4%) and idiopathic orbital inflammatory disease (20, 17.4%), lymphoma (16, 13.9%), lacrimal gland prolapse (13, 11.3%) and sarcoidosis (11, 9.6%). Corticosteroid treatment was used most commonly (29, 25.2%) followed by observation (25, 21.7%). At last follow up, the majority of patients had complete resolution, significant improvement with mild residual disease or stable disease without further progression (104, 90.4%).

Conclusion: Bilateral lacrimal disease may be due to a range of aetiologies, most of which are systemic. The most common are inflammatory and lymphoproliferative conditions. Due to the wide range of aetiologies of bilateral lacrimal gland disease, it is extremely difficult to accurately determine a cause based on clinical findings alone, highlighting the vital role of lacrimal gland biopsy in patients presenting with bilateral lacrimal gland disease.

4:12pm - 4:19pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology

Thirty years of experience with orbital and ocular adnexal T-cell lymphoma

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Purpose: T-cell lymphomas involving the orbit and ocular adnexa are exceedingly rare if compared to the more



common B-cell malignancies, representing 1-3% of orbital lymphomas. The vast majority of these tumours are secondary to peripheral T-cell lymphomas already present elsewhere in the body but reports of primary T-cell malignancies affecting the orbital tissues have confirmed its previously doubted existence. Our experience with both primary and secondary cases over a 30-year period may better characterise these aggressive tumours.

Methods: This is a retrospective observational study of patients diagnosed with primary or secondary T-cell lymphoma of the orbital and/or ocular adnexa over a period of 30 years. Primary outcome measures were age at diagnosis, affected site, type of T-cell lymphoma, treatment type, disease free survival and disease related death.

Results: Of the 14 patients included in the study, six were women and eight were men of which three were children. Mean age at diagnosis was 44. The most common affected site was the orbit followed by the lacrimal sac, nasolacrimal duct, extraocular muscles and eyelids. Three cases were identified as primary orbital peripheral T-cell lymphoma. Of the secondary T-cell lymphomas the majority were associated with cutaneous primaries. Other types included anaplastic large cell and extranodal natural killer nasal variants. Mean disease free survival was 57.2 months and eight (57%) patients died of lymphoma related causes.

Conclusion: This is the largest case series of orbital and ocular adnexal primary and secondary T-cell lymphoma described in the literature.

4:19pm - 4:26pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology

IgG4-related disease and lymphoma in the ocular adnexa

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Purpose: IgG4-related disease (RD) is a chronic fibro-inflammatory disease forming masses in multiple sites including the orbit. Chronic inflammatory diseases increase the risk of development of lymphoma. We describe our series of ocular adnexal lymphoma occurring in the context of IgG4-RD.

Methods: A retrospective review of the histopathology database was used to identify patients matching the criteria of IgG4-RD and lymphoid hyperplasia or lymphoma from 2014 to the present time. Patient demographics, disease location and outcomes were recorded.

Results: Extra-nodal marginal zone mucosal-associated lymphoid tissue -type lymphoma was found in 12 patients. There was an equal sex distribution with mean age 52.3 years (SD 13.7). Diagnosis was based on five lacrimal gland, six orbital and one infraorbital nerve biopsies. A preceding histological diagnosis of IgG4-RD occurred in eight patients of which three had a history of reactive lymphoid hyperplasia (mean duration 18 months prior to development of lymphoma). Preceding submandibular and lacrimal gland disease diagnosed as Sjogren's disease occurred in one patient. IgG-4 secreting lymphoma occurred in four patients. Serum IgG4 was raised in five patients. Extra-ocular organ involvement occurred in one patient. All patients underwent treatment as directed by their haematologist with good outcomes.

Conclusion: IgG4 RD lymphoma is usually extra-nodal marginal zone mucosal-associated lymphoid tissue type and can occur in the setting of pre-existing fibro-inflammatory disease or de novo IgG-4 secreting lymphoma which can appear clinically indistinguishable. Serum IgG4 does not differentiate neoplastic from IgG4-RD. Outcome from IgG-4 related lymphoma of the ocular adnexa is favourable.

4:26pm - 4:33pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology

Orbito-cranial schwannoma – A multicenter experience

Yinon Shapira¹, Valerie Juniat¹, Tarjani Dave², Ahsen Hussain³, Daniel McNeely⁴, Akihide Watanabe⁵, Akiko Yoneda⁵, Peerooz Saeed⁶, Kyung In Woo⁷, Thomas Hardy⁸, Dinesh Selva¹
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Purpose: To describe the features, management approaches and outcomes of orbito-cranial schwannomas.

Methods: Retrospective review of 10 patients with orbito-cranial schwannomas managed in six orbital services over 22 years. Data collected included demographics, presenting features, neuroimaging characteristics,

histology, management approach, complications and outcomes.

Results: Mean age of the patients was 41.4 ± 19.9 years and six (60%) were females. The majority presented with proptosis (90%), limited extraocular motility (80%), eyelid swelling (60%) and optic neuropathy (60%). Most lesions (80%) involved the entire anterior-posterior span of the orbit, with both intra- and extraconal involvement. All tumours involved the orbital apex, the superior orbital fissure and extended at least to the cavernous sinus. Surgical resection was performed for all. Seven (70%) were completely or subtotally resected combining an intracapsular approach by an orbital-neurosurgical collaboration, with no recurrence on post-operative follow-up (6-186 months). Three underwent tumour debulking. Of these, two remained stable on follow-up (6-34 months) and one showed progression of the residual tumour over nine years (cellular schwannoma on histology) necessitating stereotactic radiotherapy (SRT) for local control. Adjuncts to the orbito-cranial resection included peri-operative frozen section ($n = 5$), endoscopic transorbital approach ($n = 2$) and image-guided navigation ($n = 1$). Post-surgical adjuvant SRT was used in three subjects.

Conclusions: The possibility of successful surgical control in complex orbito-cranial schwannomas is highlighted. A combined neurosurgical/orbital approach with consideration of an intracapsular resection is recommended. Recurrence may not occur with subtotal excision and observation may be reasonable. Adjunctive SRT for progression or residual tumour can be considered.

4:33pm - 4:40pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology

Normative measurements of orbital structures on contrast enhanced computed tomography: An Australian study

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Purpose: To determine the normal diameters of the optic nerves sheath (ONSD), extraocular muscles, and normal globe position and correlate with patient demographics in an Australian cohort.

Method: Consecutive patients who underwent contrast enhanced computed tomography orbits between 1 January 2019 to 31 March 2021 were included. Patients with bilateral disease or poor scan quality were excluded.

Results: A total of 127 orbits from 114 patients were included. The mean age of participants was 53 years (19-88 years) and 54 (47.4%) were male. Normal measurements (mean \pm SD) were as follows: medial rectus 4.31 ± 0.54 mm; inferior rectus 4.30 ± 0.53 mm; lateral

rectus (LR) 3.43 ± 0.54 mm; superior muscle group (SMG) 4.30 ± 0.73 mm; superior oblique 2.65 ± 0.44 mm and the ONSD 5.56 ± 0.86 mm. The mean interzygomatic distance was 97.4 ± 4.1 mm and mean globe position was 6.8 ± 2.9 mm. The mean diameters of the SMG, LR, superior oblique, ONSD and interzygomatic distance were significantly larger in males than females ($p < 0.05$). Significant positive correlation was found between age and LR ($r = 0.34$, $p < 0.01$), ONSD

($r = 0.24$, $p < 0.01$) and SMG ($r = 0.32$, $p < 0.01$) diameters.

Conclusion: Contrast enhanced computed tomography imaging is commonly used for evaluating orbital pathology. The normative orbital structures may vary with respect to age and gender. This data may assist in diagnosing enlargement of the extraocular muscles and optic nerve as well as aiding in the evaluation of exophthalmos.

4:40pm - 4:47pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology

Ocular surface squamous neoplasia in New Zealand: An 11 year review of incidence in the Waikato region

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Purpose: Ocular surface squamous neoplasia (OSSN) is a relatively rare disease with a low mortality and highly variable incidence. Limited epidemiological data exists on OSSN rates in New Zealand (NZ). This study assessed the incidence, demographics and histological grade of histology-confirmed OSSN in NZ's Waikato region, home to approximately 10% of the population of NZ.

Method: Non-interventional cohort study of Waikato's public and private sector patients conducted in two phases. Phase 1 was a retrospective audit of all conjunctival biopsy histology reports from 2010 to 2019. Phase

2 was a prospective re-audit in 2020 where all excised lesions were sent for histology. Outcome measures included incidence of histology-confirmed OSSN and histological grade.

Results: There were 577 conjunctival biopsies with histology performed from 2010-2020. One hundred and one lesions (18%) involving 98 patients (17%) reported positive for OSSN. Patients with OSSN had a mean age of 69.1 years (SD = 12.4), were predominantly male (70%) and of NZ-European ethnicity (83%). Conjunctival intra-epithelial neoplasia-1 (28%) was the most frequent diagnosis. Three patients (4%) had recurrent lesions requiring repeat biopsy. The peak annual OSSN incidence rate was 4.29/100,000 population in 2020.

Conclusion: This is the largest study to investigate OSSN incidence in NZ and recruited all public and private sector operating surgeons. The incidence rate of OSSN in the Waikato region is one of the highest rates reported in the literature. Routine histological analysis of all conjunctival specimens is important to accurately identify, diagnose and treat OSSN.

4:47pm - 4:54pm

S10 – FREE PAPERS – Oculoplastic/Ocular Oncology

A review of ocular surface squamous neoplasia at an Australian quaternary referral centre

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Purpose: To explore the epidemiology, diagnostic methods, clinical management and outcomes of patients with ocular surface squamous neoplasia (OSSN).

Methods: A single centre retrospective analysis of all cases of OSSN from 2009-2019 that were diagnosed and/or management at Sydney Eye Hospital.

Results: One hundred and thirty-four cases of OSSN from 128 patients were identified, with 109 cases representing first presentations of OSSN. One hundred and two patients (79.7%) were male, the average age at diagnosis was 66 years old (range 23-98 years old) and the vast majority of patients were Caucasian (84.3%). The most commonly affected sites were the temporal and nasal limbi. Furthermore, 31.3% of lesions were found in association with pterygia. The most common initial management for new OSSN presentations was excisional biopsy (71.2%), and was

performed with cryotherapy in 78% of cases. Of these cases, clear margins were only obtained in 16.5% and the recurrence rate was 28.3%. Adjuvant chemotherapy was used in 81.8% of cases, for which interferon- α 2b was the most favoured, used either alone (22%) or in combination with retinoic acid (33%). In cases treated initially with primary chemotherapeutics agents, interferon- α 2b was again favoured in 81.0% of cases. Of all 134 cases, radiation

therapy was used in six cases (4.5%), and enucleation/exenteration was required in 11 cases (8.2%).

Conclusions: There has not been a significant shift in the reported demographic of OSSN patients in Eastern Australia over the past several decades. Furthermore, although variable, the management approaches reported at this centre are largely in keeping with recommendations from the current literature.

5:30pm - 6:30pm

Film and Poster Viewing Session

Venue: Exhibition Hall

6:30pm - 9:30pm

H03 – Alcon Hosted Evening Symposium

6:30pm - 9:30pm

H04 – Novartis Hosted Evening Symposium

7:00am - 8:15am **H05 – Bausch + Lomb Hosted Morning Symposium****Venue:** M1 & 27:00am - 8:15am **H06 – Bayer Hosted Morning Symposium****Venue:** M48:30am - 9:00am **L03 – REFRACTIVE UPDATE LECTURE****Chair:** Dr Jacqueline Beltz**Venue:** Great Hall 1 & 2**Title:** Artificial Intelligence: Applications for Pathologies of the Anterior Segment of the Eye

Dr Damien Gatinel

Synopsis: The use of artificial intelligence (AI) provides a better understanding of data collected through biometric and imaging techniques. It can increase the accuracy or the effectiveness of solutions intended to correct certain optical defects of the eye caused by structural alterations responsible for a reduction in the transparency of the ocular media and/or refractive errors.

This work has been mainly applied to the study of corneal topography and imaging, description of the ocular wavefront, ocular biometry and improving the accuracy of the power calculation of intraocular lenses. We used AI techniques to carry out studies to characterise the alterations observed during the evolution of keratoconus, as well as the spatial distribution of corneal oedema through the use of neural networks to tomographic image analysis. Using artificial intelligence and the results from the description of the ocular wavefront on a new basis, we were able to estimate the real impact of high degree aberrations on subjective refraction. From a thick lens paraxial eye model, we established an analytical formula to calculate the position of the principal planes of an implant based on its geometry and the main biometric constants.

This work made it possible to train an algorithm to predict the effective position of an implant, taking into account its geometry and establishing an original biometric calculation formula combining principles of paraxial optics and artificial intelligence algorithms applied to an eye model made up of thick lenses.

9:00am - 9:30am **L04 – CATARACT UPDATE LECTURE****Chair:** Dr Andrea Ang**Venue:** Great Hall 1 & 2**Title:** Ensuring a Safe Cataract Experience for all through Embracing the Role of Simulation

Dr David Lockington

Synopsis: The COVID-19 pandemic has disrupted medical education and surgical opportunities. Surgical simulation has partly filled some of the training gaps, but it should have been central prior to this disruption. In this Cataract Update Lecture, I will look at the historic methods of teaching and training and show why they were inadequate, demonstrated through the perils of the “Beyonce method”. I will then discuss the established and new simulation equipment options and methods. Proactive use of these novel training techniques will ensure that trainees have the knowledge and the experience required to perform surgical tasks safely prior to live surgery. Ensuring competence will improve confidence, which is relevant to the subsequent handling of greater surgical complexity and/or complications. These principles are not unique to new trainees, as the whole surgical team (including consultants) can always benefit from refinement of their skills. Expanding and engaging with ophthalmic simulation offers that opportunity. Embracing this attitude of constant learning and ensuring a better educational culture will result in a safer cataract experience for the trainer, the trainee and the patient (most importantly).

These issues will be discussed and illustrated within a lively and contemporary presentation, with concepts made memorable through surgical videos and tenuous links to popular music culture.

9:30am - 10:00am **L05 – THE NORMAN McALISTER GREGG LECTURE**

Chair: Prof Gerard Sutton

Venue: Great Hall 1 & 2

Title: When and How to Treat Low Levels of Astigmatism

Prof Graham D. Barrett

Synopsis: There are very few innovations that have had as significant an impact as the introduction of toric intraocular lenses. The ability to accurately predict astigmatic outcomes has improved and the threshold for considering a toric intraocular lens has reduced. As a result, toric intraocular lenses are required in approximately 80% of cases undergoing cataract surgery if the desired outcome is less than a 0.5 D of residual astigmatism in all patients. A target of less than 0.5 D residual astigmatism in all patients requires accurate biometry, prediction and alignment as well as an understanding of the impact of surgically induced astigmatism.

The concept of combining multiple instruments to derive an integrated K value simplifies the interpretation of utilising multiple instruments.

Astigmatic outcome prediction has improved with the availability of toric calculators that consider the impact of the posterior cornea.

Accurate alignment is facilitated by image-guided systems but similar accuracy can be achieved with inexpensive smart phone apps and associated markers.

The centroid value which encompasses both the magnitude and direction of the vector of surgically induced astigmatism is typically in the range of 0.12 D and should be utilised in toric calculators for optimum prediction.

Leaving a patient with significant astigmatism may have been acceptable in an era when extracapsular cataract surgery was widely practised but today with small incision cataract surgery and phacoemulsification an attempt to achieve a target of less than 0.5 D in all patients is preferable and could be considered a standard of care.

10:00am - 10:30am **Morning Tea**

10:30am - 11:00am **P05 – RANZCO PLENARY**

Chair: Dr Jesse Gale

Venue: Great Hall 1 & 2

Title: A Sustainable Future

Dr Jesse Gale and Dr Cassandra Theil

11:00am - 12:00pm **P06 – ORIA PLENARY**

Venue: Great Hall 1 & 2

12:00pm - 1:30pm **Lunch**

**CONCURRENT SESSIONS**

1:30pm - 3:00pm

S11 – PROFESSIONAL DEVELOPMENT**Venue:** M1 & 2

1:30pm - 3:00pm

S12 – SYMPOSIUM**Chair:** Prof Gerard Sutton**Venue:** Great Hall 1 & 2**Title:** Translating Ideas into Innovation with Real Impact

gerard.sutton@vei.com.au

Panel: Prof Graham D. Barrett, Prof Minas Coroneo, Dr Jacqueline Beltz, Prof Gerard Sutton, Dr Peter Sumich and Dr Jill Hopkins

Synopsis: Innovation is the key to enhancing eyecare. All ophthalmologists will have a novel idea to improve a treatment, surgery or process at some stage. Few will translate those ideas into a real impact. This symposium aims to outline strategies to develop ideas into innovations, the challenges along the pathway up to and including patenting and commercialisation.

The Australian Government has highlighted biotechnology as a focus for research funding and as an important pillar in the development of a future smart economy. Our panel includes two of Australia and the world's most successful ophthalmic innovators, Professor Graham Barrett and Professor Minas Coroneo. We aim to elucidate what have been the key elements in their and other panel member's successful (and less successful) inventions and innovations. Other panel member's will include Dr Jacqui Beltz, an innovator in surgical teaching, Professor Gerard Sutton, Dr Peter Sumich and Dr Jill Hopkins, Senior Vice President of Novartis (world wide). Dr Hopkins has been involved in a number of international ophthalmic start-up companies, as well as the commercialisation of a number of ophthalmic products. She has spearheaded the Google-UK Health, Insight Data Research Programme.

Our goal will be to encourage all ophthalmologists to pursue their ideas and to provide a pathway to explore and develop them. The benefits are many. Thinking as an innovator, rather than as just a service provider, enhances professional satisfaction, provides a focus on quality of care, a questioning disposition to the status quo and most importantly through all these mechanisms it leads to improved patient care.

1:30pm - 3:00pm

S13 – COURSE**Chairs:** A/Prof Geoffrey Lam and Dr Deepa Taranath**Venue:** Great Hall 3**Title:** Management Strategies for Common Strabismic Conditions

geofflam@wasquint.com.au

Panel: A/Prof Shuan Dai, Prof Glen Gole, A/Prof James Elder, Dr Craig Donaldson, Dr Heather Russell

Synopsis: The course is an interactive Q&A session for the general ophthalmologists. The expert panel, with audience involvement, will be discussing management of common strabismic conditions such as:

- Esotropia – including infantile esotropia, accommodative esotropia
- Exotropia – including intermittent exotropia, constant exotropia
- Oblique muscle issues
- Strabismic syndromes – Brown's Syndrome, Duane's Syndrome
- Nerve palsies – third nerve, fourth nerve and sixth nerve palsies
- And others, time permitting

1:30pm - 3:00pm

S14 – COURSE**Chair:** A/Prof Catherine Green AO**Venue:** Great Hall 4**Title:** Glaucoma Boot Camp: A Practical Refresher Course

seagreen@bigpond.com

Panel: Dr Bernardo Soares, Dr Aparna Raniga, Dr Nicholas Toalster, Dr Pradeep Yammanuru Ramulu

Aim: The aims of this course are:

- To provide a practical and case-based refresher for ophthalmologists across all sub-specialties on the diagnosis and management of glaucoma; and
- To showcase presentation formats and tools that promote adult learning and interactivity, for example, the flipped classroom, e-learning, audience polling, quizzes and games, and spaced learning, which participants may consider incorporating into their future teaching.

Presented by a panel of glaucoma specialists, the course will focus on areas in glaucoma practice likely to be encountered by general ophthalmologists and non-glaucoma specialists, aiming to promote more confident clinical decision-making, both in terms of their own continued patient management as well as when to refer to a glaucoma specialist. Using a case-based approach, participants will have the opportunity to refresh their knowledge of the evidence, e.g. the major glaucoma trials, and gain perspectives on the latest developments in glaucoma surgery, including minimally invasive glaucoma surgery and be able to apply this immediately on return to the clinic. Participants will have the opportunity to experience different learning tools and strategies as learners, with resources provided on how access to the various tools provided for later application.

Topics:

- Diagnosis: when and what to treat
- Target intraocular pressure
- Medical management of glaucoma: common pitfalls, maximising adherence, minimising adverse effects, avoiding over-treatment
- Selective laser trabeculoplasty
- Target intraocular pressure and progression
- Update on surgical treatment including minimally invasive glaucoma surgery: Is the trabeculectomy obsolete?

1:30pm - 3:00pm

S15 – FREE PAPERS – Retina

Chairs: Dr Mei-Hong Tan and Dr Christine Younan

1:30pm - 1:37pm

Venue: M4

Safety and efficacy results of ONS-5010, an ophthalmic bevacizumab from the Norse TWO Phase 3 study of monthly intravitreal ONS-5010 in subjects with wet age-related macular degeneration

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Purpose: To present the analysis of a prospective, multi-centre, randomised, masked, controlled clinical effectiveness study that evaluated the safety and efficacy of monthly intravitreal ONS-5010 in subjects with wet age-related macular degeneration (AMD). The importance of an on-label, ophthalmic formulation of bevacizumab will be discussed.

Methods: Wet AMD subjects were randomised (1:1) to receive a monthly intravitreal, 1.25 mg dose of ONS-5010, bevacizumab-vikg, Outlook Therapeutics Inc or three monthly followed by quarterly intravitreal, 0.5 mg dose of ranibizumab (Lucentis®), Genentech Inc and followed for up to 12 months. Eligible subjects had active primary subfoveal choroidal neovascularisation lesions secondary to AMD, who were treatment naïve in the study eye and had best corrected visual acuity of 25 to 67 letters. The primary efficacy endpoint, proportion of subjects gaining ≥ 15 best-corrected visual acuity (BCVA) letters, was assessed at month 11. Safety assessments, assessed through month 12, included evaluation of adverse events and changes.

Results: A total of 228 subjects with wet AMD were enrolled and randomised (1:1) to receive intravitreal injections of ONS-5010 or ranibizumab. The proportion of subjects in each arm, who achieved ≥ 15 BCVA letter change from baseline to month 11 will be presented. Safety results will also be presented.

Conclusion: This Phase 3 study of monthly ONS-5010 met the primary endpoint, difference in proportion of subjects who gained ≥ 15 BCVA letters change from baseline to month 11, compared to ranibizumab. This



study demonstrated an efficacy and safety profile similar to previously reported safety and efficacy results for

bevacizumab in the Comparisons of Age-Related Macular Degeneration Treatments clinical trial.

1:37pm - 1:44pm

S15 – FREE PAPERS – Retina

The archway phase 3 trial of the port delivery system with ranibizumab for neovascular age-related macular degeneration: Data update and surgical learnings

Andrew Chang¹, Giulio Barteselli², Derrick Kaufman², Sneha Makadia², Varun Malhotra², Merce Morral³
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Purpose: The port delivery system (PDS) is an investigational drug delivery system designed for continuous intravitreal ranibizumab release through a surgically implanted, refillable ocular implant. The phase 3 Archway trial evaluated safety and efficacy of PDS for treatment of neovascular age-related macular degeneration.

Methods: Archway (NCT03677934) evaluated noninferiority (NI) and equivalence of PDS with ranibizumab 100 mg/mL with fixed 24-week (W) refill-exchanges (PDS Q24W; n = 248) versus intravitreal ranibizumab 0.5 mg injections every 4W (monthly ranibizumab; n = 167) on the primary endpoint of best-corrected visual acuity

change from baseline averaged over W36/40 (NI margin, -4.5 letters; equivalence margin, ± 4.5 letters). The September 2020 data cut extended results through two complete refill-exchange intervals.

Results: PDS Q24W was non-inferior to monthly ranibizumab at W44/48, with a difference (95% confidence interval) of -0.2 (-1.8, +1.3) letters between arms (equivalence not tested). Over 90% of PDS Q24W patients did not receive supplemental treatment before each refill-exchange procedure. PDS procedures were generally well tolerated, with the ocular safety profile generally unchanged from the primary analysis, and comparable systemic safety findings across arms. The implant insertion procedure has seven key steps: peritomy, implant preparation, scleral dissection, pars plana laser ablation, pars plana incision, implant insertion, and conjunctival and Tenon's capsule closure.

Conclusions: PDS Q24W was non-inferior to monthly ranibizumab, with vision outcomes for the average of W44/48 consistent with the primary analysis. The PDS was generally well tolerated, with a favourable benefit-risk profile. Based on trial learnings, PDS procedures have evolved with a view to supporting optimal patient outcomes.

1:44pm - 1:51pm

S15 – FREE PAPERS – Retina

Intravitreal dexamethasone versus bevacizumab in Aboriginal and Torres Strait Islander patients with diabetic macular oedema, the OASIS study (a randomised control trial)

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Background: Vision loss from diabetic macular oedema (DMO) is disproportionately high among Australian Aboriginal patients. Conventional treatments, including intravitreal bevacizumab 1.25 mg/0.05 mL (Avastin; Genentech, San Francisco, USA), require monthly injections, which are impractical for many Aboriginal patients. The longer acting intravitreal dexamethasone 0.7 mg implant

(DEX-implant; Ozurdex; Allergan, Inc., Irvine, USA) is approved for DMO but has never been assessed in an Aboriginal population. We compare the safety and efficacy of the DEX-implant with intravitreal bevacizumab among Aboriginal patients with DMO.

Methods: Prospective, multicentre, randomised, non-inferiority clinical trial. Aboriginal adults from remote and metropolitan Western Australia with DMO randomised to DEX-implant three monthly, or intravitreal bevacizumab monthly. The primary outcome was the change in best corrected visual acuity at 12 months.

Results: The final endpoint was analysed for 24 DEX-implant and 28 bevacizumab eyes. At 12 months, best-corrected visual acuity improved by 0.09 LogMAR (almost two Snellen lines) in the DEX-implant group and

worsened by 0.06 LogMAR (one Snellen line) in the bevacizumab group. When combined with cataract surgery, the upper bound of the two-sided 90% confidence interval for the DEX-implant was 0.07 LogMAR, which met non-inferiority criteria. There were eight incidences of ocular hypertension in participants who received the DEX-implant (33.3% of DEX-implant eyes).

Conclusions: When combined with cataract surgery, the DEX-implant was non-inferior to bevacizumab for treating DMO in Aboriginal participants. We provide guidelines for the judicious use of the DEX-implant for the treatment of DMO among Aboriginal people, and a framework for performing ophthalmic clinical trials in Aboriginal communities.

1:51pm - 1:58pm

S15 – FREE PAPERS – Retina

Systemic administration of an ribonucleic acid therapeutic, IONIS-FB-LRx, for treatment of geographic atrophy

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Purpose: An overactive alternative complement pathway has been implicated in the pathophysiology of geographic atrophy secondary to age related macular degeneration (AMD). We determined clinical safety, pharmacokinetic (PK) and pharmacodynamic (PD) activity of IONIS-FB-LRx, an ribonucleic acid therapeutic specifically targeting human complement factor B gene and subsequent factor B (FB) production in the liver, as a means to decrease alternative complement pathway activity in the choriocapillaris and retina.

Methods: Healthy volunteers (N = 54; ages 25-65 years; 69% M) enrolled in subcutaneously administered, single

ascending dose or multiple ascending dose (MAD), randomised (1:3 or 1:4, respectively) to placebo or IONIS-FB-LRx at 10, 20 or 40 mg and 10 or 20 mg (MAD: 8 administrations in 6 weeks). Endpoints assessed throughout the study: ocular and systemic safety, PK and PD. All subjects completed study (week 19) (ACTRN12616000335493).

Results: No safety signals or clinically-relevant changes in ocular endpoints (best-corrected visual acuity, intraocular pressure, comprehensive examination), blood chemistries, hematology or vital signs following IONIS-FB-LRx dosing. Systemic PD: reduction of FB levels at the 20 mg dose (MAD) achieved lower alternative complement activity (AH50) without classical pathway (CH50) change (mean \pm SE % reductions on day 43 of -72 ± 3 , -62 ± 5 and $-12 \pm 5\%$, for FB, AH50 & CH50, respectively). PK: 3-4 week half-life supports monthly dosing.

Conclusions: This first-in-human study found the ribonucleic acid therapeutic, IONIS-FB-LRx, to exhibit robust lowering of systemic FB and excellent safety profile, leading to initiation of the phase 2 study determine the potential of systemic IONIS-FB-LRx in reducing progression of geographic atrophy (GOLDEN study; NCT03815825).



1:58pm - 2:05pm

S15 – FREE PAPERS – Retina

Longer treatment intervals are associated with reduced treatment persistence in neovascular age-related macular degeneration**Mark Gillies**

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The University of Sydney, Sydney, Australia

Purpose: To assess the association between the treatment interval at two years and the five-year non-persistence to follow-up in neovascular age-related macular degeneration.

Methods: Data were obtained from the prospectively designed Fight Retinal Blindness! registry. Eyes were grouped based on the mean treatment interval over the 3 visits prior to and including the two-year visit. Rates of non-persistence to follow-up was assessed from two to 5 years.

Results: There were 1538 eyes from 1414 patients eligible for the analysis. Patients on longer treatment intervals (12-weeks) at two years were found to be less

persistent to long-term follow-up. These eyes were found to have fewer active disease visits in the first two years (40%) than eyes treated at four-weekly intervals (66%, $p < 0.001$). In the multivariable analysis, eyes with better vision at two years had a lower risk of non-persistence (hazards ratio [HR] [95% confidence interval, CI]: 0.95 [0.93, 0.97], $p < 0.001$), while eyes with longer treatment intervals (HR [95% CI]: 1.31 [0.95, 1.8] and 1.54 [1.15, 2.06] for 12-week and >12-week intervals vs. 4-week intervals, respectively, $p = 0.002$) and older patients (HR [95% CI]: 1.03 [1.02, 1.04], $p < 0.001$) were at higher risk of non-persistence.

Conclusions: We found patients on longer treatment intervals at two years were more likely to be non-persistent to treatment in later years. Reinforcing the need for ongoing treatment is important for patients on longer intervals who may feel complacent or that treatment is no longer effective, particularly if newer, longer lasting agents become widely available.

2:05pm - 2:12pm

S15 – FREE PAPERS – Retina

Observational extension study to the laser intervention in the early stages of age-related macular degeneration (LEAD) clinical trial

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Purpose: To examine the long-term effect of subthreshold nanosecond laser (SNL) treatment with the Retinal Rejuvenation Therapy (2RT[®]) device on disease progression in the early stages of age-related macular degeneration (AMD).

Methods: The LEAD study is a 36-month trial that included 292 participants with bilateral large drusen who were randomised to receive either SNL or sham treatment in one eye at six-monthly intervals up to 30-months. At the end of the LEAD study, remaining participants at the two largest recruiting sites had an opportunity to enrol in a 24-month observational extension study (without further treatments). We examined the difference in progression to late AMD between treatment arms for these participants.

Results: Overall, the rate of progression over a 60-month period was not significantly different between the SNL and sham group ($p = 0.098$); a similar finding to the 36-month LEAD study. There was however, continued evidence of treatment effect modification based on the coexistence of reticular pseudodrusen (RPD) at baseline (adjusted interaction $p = 0.007$), where progression was significantly slowed with SNL treatment for those without coexistent RPD ($p = 0.004$), and no significant difference in progression with SNL treatment was observed for those with coexistent RPD ($p = 0.239$).

Conclusions: This 24-month observational extension study confirmed findings from the LEAD trial that

overall, SNL treatment did not significantly reduce the rate of progression to late AMD. However, it also confirmed a potential beneficial treatment effect in those

without coexistent RPD over a longer follow-up period without additional treatment. These findings warrant further investigation of this intervention.

2:12pm - 2:19pm

S15 – FREE PAPERS – Retina

Brolucizumab for the treatment of visual impairment due to diabetic macular edema: Fifty-two-week results from the KITE and KESTREL studies

David Brown¹, Sebastian Wolf², Justus Garwag³, Francesco Bandello⁴, Andres Emanuelli⁵, Jose Juan Escobar Barranco⁶, Joao Figueira^{7,8}, Vishali Gupta⁹, Nor Fariza Ngah¹⁰, Gerald Liew¹¹, Raman Tuli¹², Lixin Wang¹³, Emmanuel Bouillaud¹⁴, Eric Souied¹⁵, **Paul Mitchell**¹¹
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Purpose: KITE and KESTREL, two prospective pivotal Phase-III studies evaluating the efficacy and safety of brolucizumab (BRO) versus aflibercept (AFL) for the treatment of patients with visual impairment due to diabetic macular edema (DME).

Methods: KITE and KESTREL are two-year, ongoing, double-masked, randomised, active-controlled, multicenter studies. Adults with type 1 or 2 diabetes mellitus and visual impairment due to DME were included. In KITE, patients were randomised 1:1 to BRO 6 mg or AFL-2 mg; in KESTREL, the randomisation was 1:1:1 to BRO-3 mg, BRO-6 mg and AFL-2 mg. Patients in the BRO groups received five loading doses q6w followed by q12w dosing in the first year, with an option to adjust to q8w at predefined disease activity assessment visits. The AFL group received five loading doses monthly followed by fixed q8w dosing. The primary endpoint was the change from baseline in best-corrected visual acuity at week 52; secondary endpoints included the proportion of BRO patients maintained at q12w dosing up to week 52 and the change from baseline in central subfield thickness.

Results: In KITE, BRO-6 mg met the primary objective of non-inferiority to AFL-2 mg in the change from baseline in best-corrected visual acuity at week 52. More than 50% of BRO-6 mg patients were maintained on a q12w dosing interval through week 52, following the loading phase. BRO-6 mg showed superior improvements versus AFL-2 mg in the change from baseline in central subfield thickness. In KITE, the rate of intraocular inflammations was equivalent between BRO-6 mg and AFL-2 mg.

Conclusion: Brolucizumab offers an alternative treatment for patients with DME with >50% of patients maintaining at q12w interval. KESTREL data expected late 2021.



2:19pm - 2:26pm

S15 – FREE PAPERS – Retina

Efficacy and safety of intravitreal pegcetacoplan in geographic atrophy: Results from the phase 3 DERBY and OAKS trials

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Purpose: Currently, no approved therapies exist to slow the progression of geographic atrophy (GA). Intravitreal

pegcetacoplan, a pegylated complement C3 inhibitor peptide, demonstrated significant reductions in the growth of GA lesions compared with sham treatment in a phase 2 trial. DERBY and OAKS are two 24-month, phase 3, randomised, double-masked, sham-controlled clinical trials comparing the efficacy and safety of monthly or every-other-month intravitreal pegcetacoplan to sham inpatients with GA secondary to age-related macular degeneration.

Methods: Enrolled patients are ≥ 60 years old, have best-corrected visual acuity ≥ 24 letters, and GA area between 2.5 and 17.5 mm² or one focal lesion ≥ 1.25 mm² if multifocal GA at baseline. The primary endpoint for both studies is change in GA lesion size via fundus autofluorescence from baseline to month 12; secondary endpoints include change from baseline in visual function. Safety measures include incidences of ocular and systemic adverse events.

Results: DERBY and OAKS enrolled N = 621 and N = 638 patients, respectively. Baseline characteristics were well-matched across the groups. Enrolment was completed in June 2020 (DERBY) and July 2020 (OAKS). Twelve-month efficacy and safety data will be presented.

Conclusions: Pegcetacoplan is the only targeted C3 inhibitor being evaluated in phase 3 trials to control lesion growth in GA.

2:26pm - 2:33pm

S15 – FREE PAPERS – Retina

Automating the diagnosis of advanced age-related macular degeneration and high risk intermediate age-related macular degeneration, based on the Age-Related Eye Disease Study scoring system

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Aim: To develop a deep learning algorithm to detect: 1) advanced AMD; and 2) high risk intermediate AMD based on images extracted from the NHI Age-Related Eye Disease Study (AREDS) dataset.

Methods: The AREDS image datasets comprised a total of 118,254 images. An artificial intelligence (AI) was trained to remove very poor quality images, as well as

those with dense cataracts. Of the remaining images, 8627 were labelled as advanced AMD. Furthermore, 58,249 images had drusen labels (0-4) and 59,165 images had pigmented labels. Colour balancing, contrast enhancement and image normalisation techniques were applied to homogenise the dataset. The data was then split 70/15/15 to training, validation and test sets. Finally, an ensemble of AI algorithms was trained to detect advanced AMD and high-risk intermediate AMD model. A “waterfall” of AIs was then trained to automatically reproduce the scoring system in the AREDS Research Group's report 18.

Results: Compared to the ground truth provided by the NHI AREDS dataset, the final patient-level accuracy of detecting advanced AMD is 92.75%, with a sensitivity of 94.86% a specificity of 92.24% and negative predictive value of 98.66%. Compared to the ground truth provided by the NHI AREDS dataset, the final accuracy of detecting high-risk intermediate dry macular

degeneration, was 97.19%, with a sensitivity of 94.7% a specificity of 97.31% and negative predictive value of 99.74%.

2:33pm - 2:40pm

S15 – FREE PAPERS – Retina

Faricimab in diabetic macular oedema: One-year results from the phase 3 RHINE and YOSEMITE trials

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Purpose: To evaluate the efficacy, safety and durability of faricimab (bispecific antibody targeting angiopoietin-2 and vascular endothelial growth factor-A inhibition) in treatment-naïve and treatment-experienced patients with diabetic macular oedema (intent-to-treat population).

Methods: RHINE (NCT03622593, N = 951)/YOSEMITE (NCT03622580, N = 940) are identical double-masked, active comparator-controlled, 100-week phase 3 trials. Patients were randomised (1:1:1): faricimab 6.0 mg eight-weekly (Q8W) after six initial Q4W doses, faricimab 6.0 mg per personalised treatment interval (PTI) after

Conclusion: Our model was able to accurately identify both advanced AMD and intermediate AMD in this large publically available dataset. Further validity trials are required to test its generalisability to other datasets.

four initial Q4W doses, or aflibercept 2.0 mg Q8W after five initial Q4W doses. Primary outcome was best-corrected visual acuity (BCVA) efficacy. Secondary anatomical and safety endpoints were also assessed.

Results: RHINE/YOSEMITE primary endpoint was met; mean BCVA letters gained at one-year with faricimab Q8W (+10.7; +11.8) or faricimab PTI (+11.6; +10.8) were non-inferior to aflibercept Q8W (+10.9; +10.3). Treatment-naïve patient one-year BCVA gains were consistent with intent-to-treat population. No faricimab arm showed superiority to aflibercept. However, mean change in central subfield thickness consistently favoured faricimab; absence of protocol-defined diabetic macular oedema (central subfield thickness <325 µm) and absence of intraretinal fluid over 1 year were achieved by more faricimab-treated than aflibercept-treated patients. At 1-year, >50% of the faricimab PTI arm achieved Q16W dosing; and >70% achieved ≥Q12W dosing. Faricimab was well tolerated: intraocular inflammation rates were 1.3% compared to aflibercept 0.6%; no cases of vasculitis or occlusive retinitis were reported.

Conclusions: Faricimab Q8W or dosed per-PTI offered non-inferior vision gains compared to aflibercept Q8W, while demonstrating improvements in anatomic endpoints and the potential for extended (up to Q16W) dosing at one year.

2:40pm - 2:47pm

S15 – FREE PAPERS – Retina

Faricimab personalised treatment interval dosing dynamics illustrated with patient case profiles: YOSEMITE and RHINE phase 3 diabetic macular oedema trials

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Purpose: To illustrate treatment frequency dynamics with patient case profiles from the identical phase 3 YOSEMITE/RHINE (NCT03622580/NCT03622593) trials of faricimab (a bispecific antibody designed to inhibit angiopoietin-2 and vascular endothelial growth factor-A). Durability of faricimab effect in the personalised treatment



interval (PTI) arm was a key objective of YOSEMITE/RHINE.

Methods: Diabetic macular oedema patients from YOSEMITE/RHINE received either faricimab 6.0 mg every eight weeks (Q8W, $n = 630$), faricimab 6.0 mg PTI ($n = 632$) or aflibercept 2.0 mg Q8W ($n = 626$). The PTI algorithm is a protocol-driven regimen based on the treat-and-extend concept; dosing intervals were adjusted in 4-week increments (up to Q16W) using pre-specified central subfield thickness and visual acuity criteria. Achievement of treatment intervals (Q4W, Q8W, Q12W or Q16W) and additional anatomical endpoints were assessed at week 52.

Results: In YOSEMITE/RHINE, faricimab demonstrated non-inferior vision gains compared to aflibercept (faricimab Q8W: 10.7/11.8; faricimab PTI: 11.6/10.8; aflibercept: 10.9/10.3 letters), improved anatomic

outcomes (mean central subfield thickness change: faricimab Q8W: -206.6/-195.8; faricimab PTI: -196.5/-187.6; aflibercept: -170.3/-170.1 μm), and extended dosing potential at year 1. Week 52 PTI treatment intervals and proportion of patients achieving them were: Q16W (>50%), \geq Q12W (>70%), Q8W (16%) and Q4W (12%). Representative cases and associated retinal images of PTI dosing dynamics (baseline-week 52) will be presented.

Conclusion: This post-hoc analysis of individualised treatment frequency dynamics illustrates how the faricimab PTI algorithm was used effectively to optimise treatment intervals according to heterogeneous needs of patients with diabetic macular oedema. Faricimab PTI arm demonstrated durability of faricimab effect, with ~52% of patients on Q16W and ~72% on \geq Q12W treatment intervals at week 52.

2:47pm - 2:54pm

S15 – FREE PAPERS – Retina

Faricimab in neovascular age-related macular degeneration: Week 48 results from the phase 3 TENAYA and LUCERNE trials

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Purpose: To assess efficacy, safety and durability of faricimab, a bispecific angiopoietin-2/vascular endothelial growth factor-A antibody, in patients with neovascular age-related macular degeneration.

Methods: TENAYA (NCT03823287, $N = 671$) and LUCERNE (NCT03823300, $N = 658$) are randomised, double-masked, active comparator-controlled, 112-week, phase 3 trials of faricimab in neovascular age-related macular degeneration. Patients were randomised 1:1 to faricimab

6.0 mg up to every 16 weeks (Q16W) or aflibercept 2.0 mg every 8 weeks (Q8W). Based on disease activity at weeks 20 and 24, patients in the faricimab arm were allocated to Q8W, every-12-week (Q12W), or Q16W dosing until week 60.

Results: Both trials met their primary endpoint with consistent results; mean change in best corrected visual acuity from baseline averaged over weeks 40, 44 and 48 with faricimab up to Q16W (TENAYA +5.8; LUCERNE +6.6 ETDRS letters) was noninferior to aflibercept Q8W (+5.1; +6.6 ETDRS letters). 79.7% and 77.8% of TENAYA and LUCERNE patients, respectively, were on \geq Q12W dosing intervals at week 48, with 45.7% and 44.9% of patients on Q16W dosing. Central subfield thickness reductions from baseline (weeks 40, 44, 48 average) with faricimab up to Q16W (TENAYA -136.8 μm ; LUCERNE -137.1 μm) were comparable with aflibercept Q8W (-129.4 μm ; -130.8 μm). Faricimab was well tolerated; with no reported cases of vasculitis or occlusive retinitis.

Conclusions: Faricimab up to Q16W demonstrated non-inferior vision gains compared to aflibercept Q8W in neovascular age-related macular degeneration patients, with ~80% of patients on \geq Q12W and ~45% on Q16W fixed dosing intervals at week 48. Central subfield thickness reductions were meaningful. Faricimab was well tolerated.

3:00pm - 3:30pm

Afternoon Tea

CONCURRENT SESSIONS

3:30pm - 5:00pm

S16 – PROFESSIONAL DEVELOPMENT

3:30pm - 5:00pm

Venue: M1 & 2**S17 – SYMPOSIUM****Chair:** Dr Alison Chiu**Venue:** Great Hall 3**Title:** Improving Refractive Outcomes in Pseudophakic Patients – Secondary Sulcus Piggyback Lenses, Intraocular Lens Exchange and Toric Lens use

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Synopsis: This symposium aims to provide the most up to date information regarding the indications, safety and visual outcomes of currently available techniques to improve refractive outcomes in pseudophakic patients. Surgical options for the correction of pseudophakic refractive errors include intraocular lens (IOL) exchange, refractive laser correction or the implantation of a secondary IOL by the piggyback technique. This symposium aims to present and discuss corneal options as well as IOL-based options readily available to any cataract surgeon.

Intraocular lens exchange is utilised mainly when there is either IOL opacification or calcification, or intolerance to primarily implanted multifocal IOLs. Along with indications and techniques, we will present surgical pearls for retaining the capsule and management options when the capsule is lost.

The piggyback technique classically consists of the implantation of both the primary and secondary IOL in the capsular bag, usually as a primary procedure for high refractive errors that exceeded IOL powers. With IOL advances, more recent applications consist of the implantation of the primary IOL in the capsular bag and secondary IOL in the ciliary sulcus, either at the same time as cataract surgery or as a delayed procedure. Piggy back lenses are becoming an increasingly utilised technique to refine visual outcomes. Indications for secondary piggyback IOL implantation are predominantly post-operative ametropia, correction of toric residual refractive error in patients who had cataract surgery prior to the use of toric IOLs, and pseudophakic presbyopia both in elderly cataract patients. We present surgeon experience, techniques and pearls, as well as outcome data on currently available piggyback lenses in the Australian Market – Rayner Sulcoflex, 1stQ Add-on and Staar Surgical ICL.

Toric IOLs are now in general use for correction of astigmatism at the time of cataract surgery. Toric IOLs that do not sit at their desired rotational target result in suboptimal visual outcomes. Here we will present and discuss how to determine whether IOL rotation can resolve the issue, and surgical pearls in approaching this patient.

This symposium aims to inform the cataract surgeon with the available data and experience in order to expand their surgical practice with confidence. Attendees will gain an understanding of the indications and options in secondary IOLs. Surgical pearls for their use as well as limitations with the techniques will be highlighted.

Speakers and Topics:

Dr David Lockington – How to maximise hitting the refractive target the first time

Dr Andrea Ang – When the refractive target falls short: Laser after cataract surgery to refine the refractive outcome

Dr Alison Chiu – Indications and surgical technique for piggyback lenses with case studies

Dr Andrew Apel – Experience with piggyback lenses, pros and cons and comparisons of platforms

Dr Ben Lahood – Toric lenses and managing their shortcomings: what to do when rotation is off

Prof Gerard Sutton – IOL exchange – When to consider, surgical technique and pearls

Dr Brian Harrisberg – Case studies of sulcus IOL use

3:30pm - 5:00pm

S18 – SYMPOSIUM**Chairs:** A/Prof William Glasson, Dr Sunil Warriar and Dr Lindsay McGrath**Venue:** Great Hall 1 & 2**Title:** Ocular Oncology Symposium: Sunshine State Update

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Synopsis: This symposium will include short presentations from all members detailing new and interesting cases from 2020-2021 as well as treatment modalities new to the state.

Speakers and Topics:

Prof Hayward and/or members of his team from QIMR Berghofer – Advances in uveal melanoma research currently under investigation and publication through their institute

Dr Jaclyn White – A unique gene mutation noted in several Queensland patients in 2021

Presentations by interstate of the Ocular Oncology Special Interest Group – Interesting oncology cases for the general ophthalmologist

3:30pm - 5:00pm

S19 – FREE PAPERS – CPD Audits

Panel: A/Prof Lawrence Lee, Dr Peter Hinchcliffe and Dr John McCoombes

3:30pm - 3:37pm

Venue: Great Hall 4

Antimicrobial stewardship: Changing behaviour through collaborative audit. What more is needed for surgeons to kick the topical antibiotic habit?

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Background: Over 2017-2018 a collaborative antimicrobial stewardship audit and education activity was offered to RANZCO members. Its main focus was peri-operative antimicrobial management by cataract surgeons. Of 78 participants, all used povidone-iodine and 93% used intracameral cefazolin. Only 9.5% did not use post-operative antibiotic drops.

Benchmarking/Standard: European Society of Cataract & Refractive Surgeons guidelines (2013) recommended pre-operative povidone-iodine and intracameral cefuroxime at the end of cataract surgery. Meta-analysis supporting cefazolin as effective justified its use as intracameral prophylaxis by RANZCO surgeons with difficulty accessing cefuroxime. Publications from Scandinavian registries supported not using post-operative antibiotic drops.

Methods: Audit participants were surveyed in 2021 and results compared with those from the end of 2018.

Results: Of 40 responding surgeons who were still performing cataract surgery, 100% continued to use povidone-iodine and 97.5% were using intracameral cefazolin or cefuroxime, while 2.5% (1) used sub-conjunctival antibiotic. Of the 39 surgeons who prescribed post-operative antibiotic drops after cataract surgery in 2018, 11 (28%) had ceased this practice leaving 28 still using non-evidence-based treatment protocols. Reasons for ongoing topical antibiotic use included dissatisfaction with evidence for safety of omitting drops and wanting to go with the majority in standard of care. Those who had ceased using topicals were reassured by evidence provided during the audit while wanting to reduce waste, simplify treatment and practice good antimicrobial stewardship. Change in prescribing practices is encouraging but only partial.

Recommendations: RANZCO guidelines would reassure surgeons that topical prophylaxis could be omitted. The value of a registry to provide proof of safety is being considered.

3:37pm - 3:44pm

S19 – FREE PAPERS – CPD Audits

Outcomes of 32 bite continuous suturing technique in penetrating keratoplasty

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Background: To assess the visual outcomes of 32 bite continuous suture penetrating keratoplasty (PK).

Benchmark/Standard: Visual outcomes of conventional 16 bite continuous suture PK.

Methods: We retrospectively examined 20 eyes of 20 consecutive patients undergoing PK with 32 bites continuous suturing technique with diagnosis matched patients undergoing conventional 16 bites continuous PK. We quantitatively assessed corneal astigmatism, refractive

astigmatism, and best corrected visual acuity at 9 and 18 months post-operatively, and endothelial cell density 12 months post-operatively.

Results: Corneal and refractive astigmatism after 32 bites PK were significantly lower after conventional 16 bites PK at 9 and 18 months post-operatively ($p = 0.04$ and $p = 0.03$, respectively, Mann-Whitney U test). Thirty-two bites PK provided significantly faster visual recovery than conventional PK at 1 month post-

operatively ($p = 0.02$), but not at 3 and 6 months post-operatively ($p = 0.52$ and $p = 0.80$, respectively). We found no significant differences in the change in endothelial cell density between the two groups ($p = 0.30$).

Recommendations: Although technically more challenging, 32 bites continuous suture PK offers significantly better visual outcomes with consistently lower astigmatism compared to conventional 16 bites PK.

3:44pm - 3:51pm

S19 – FREE PAPERS – CPD Audits

Outcomes of intra-luminal stent usage in glaucoma drainage device surgery

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Purpose: To evaluate the outcomes of intraluminal stents used at the time of glaucoma drainage device surgery (GDD) in a tertiary referral glaucoma service.

Method: A retrospective chart review of patients undergoing GDD insertion between 2017 and 2019 inclusive was performed. Demographics, operative notes and surgical outcomes were recorded.

Results: One hundred and twenty-six eyes of 107 patients aged 59.4 ± 16.9 years (range 14-89) were included. Baerveldt implants were inserted in 111 eyes (88.1%) and Molteno implants in 15 eyes (11.9%). Intraluminal stent was used in 87 cases (69%). Pre-operative mean

intraocular pressure (IOP) was 29.8 mmHg (SD 14.5). At 12 months, IOP was slightly higher in those stented (14.3 mmHg, SD 7.6) compared to those without stents (12.8 mmHg, SD 7.2) ($p > 0.05$).

Patients receiving stents were more likely to return to theatre ($n = 53$, 60.9%) compared to those without stents ($n = 14$, 35.9%) ($p < 0.05$). Amongst the reasons for return to theatre, hypotony was more likely in those without stents ($n = 8$, 20.5%) compared to those stented ($n = 5$, 5.75%) ($p < 0.01$). As for return to theatre for stent related complications, five had exposure (5.7%) and 34 required removal (39.1%).

Conclusion: IOP reduction was slightly lower at 12 months in those without stents, although not statistically significant. Hypotony requiring return to theatre was more prevalent in the non-stented group. Overall return to theatre was more common in patients receiving intraluminal stents. Costs and morbidity from reoperation associated with intraluminal stenting is important when considering the use of stenting with GDD.

3:51pm - 3:58pm

S19 – FREE PAPERS – CPD Audits

Audit of temporal artery biopsies for giant cell arteritis performed at the new Royal Adelaide Hospital over a three year period

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Background: Giant cell arteritis (GCA) is a sight-threatening disease requiring long-term immunosuppression, which carries inherent risk. Temporal artery biopsy (TAB) is the gold-standard investigation to confirm the diagnosis. Guidelines classically recommend a post-fixation sample length of 20 mm to achieve reliable histopathological results, but recent studies suggest sample lengths >6 mm are adequate.



Benchmarking/Standard: Various papers report a minimum TAB length ranging from >6 mm to >20 mm to avoid false negative histology results. No reports examine the effect of COVID lockdowns on GCA presentations and TABs.

Methods: All TABs in South Australia processed by the public state-wide pathology provider from September 2017 until June 2020. Histological diagnosis and sample lengths were extracted from reports. Clinical information and biochemistry for cases at the Royal Adelaide Hospital were derived from medical records.

Results: A total of 362 temporal artery biopsies were conducted; 156 conducted at Royal Adelaide Hospital, of which 41% were performed by Ophthalmology. Thirty-one percent of Ophthalmology TABs were <10 mm

compared to 20% outside Ophthalmology ($p = 0.018$). TABs performed by Ophthalmology were twice as likely to be positive (34.4% vs 17.2%). Visual symptoms ($p = 0.046$), older age ($p = 0.02$), elevated ESR ($p = 0.002$) and elevated platelets ($p = 0.003$) were significant predictors of positive histology. Length was not significantly associated with positive histology after adjusting for above factors ($p = 0.617$). COVID-19 precautions and lockdown in April-May 2020 did not significantly alter the number of TABs.

Recommendations: Given that most TABs were performed by Ophthalmology registrars, more direct supervision and techniques such as ultrasound marking may increase sample length. However, TAB lengths <20 mm are acceptable.

3:58pm - 4:05pm

S19 – FREE PAPERS – CPD Audits

The power of audit: Changing intraocular lens preference among RANZCO surgeons

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Background: Participants in the 2016 RANZCO Collaborative Glistenings Audit reported glistenings most commonly in AlconAcrysof intraocular lenses (IOL) despite manufacturing improvements, with yellow chromophore a possible risk factor. A follow-up two surgeon audit of the AlconAcrysof material confirmed that glistenings were more common and of higher grade in chromophore containing IOLs. A prospective 19 surgeon study in 2019 showed a change in preference from chromophore to non-chromophore IOLs. The effect of previous audit participation on current clinical practice in IOL selection formed the topic of this audit in 2021.

Benchmarking/Standard: Surgeon preference for long-term optical performance including freedom from glistenings.

Methods: A four-item online questionnaire was sent to all 28 2016 Audit participants. Questions addressed participants' prior and current chromophore preference, reasons for this and sources of information influencing preference.

Results: Fifteen clinicians (54%) responded to the survey. Of these, 53% ($n = 8$) preferred chromophore lenses prior to the 2016 Audit participation, dropping to 33% ($n = 5$) after participation. Clear lens preference grew from 27% ($n = 4$) to 40% ($n = 6$). Undecided surgeons changed marginally (20%, $n = 3$ to 27%, $n = 4$).

Four clinicians preferred non-chromophore lenses with concerns that chromophore may increase the risk of glistenings. Participation in the 2016 audit had informed the preference of 60% ($n = 9$) of clinicians, as did reflection on personal experience (75%, $n = 12$) and related publications (47%, $n = 7$).

Recommendations: There are various factors that impact on clinician IOL preference. Importantly, this includes involvement in clinical audits. Audit participation with reflection should be encouraged as it can positively impact clinical practice.

4:05pm - 4:12pm

S19 – FREE PAPERS – CPD Audits

Characterisation of departmental use of B-scans

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Background: In our institution B-scans are performed by the Radiology department. Our audit sought to characterise the use of B scans.

Methods: B-scans performed by the Royal Adelaide Hospital from September 2017 to June 2020 were audited. The number of scan requests, the order-to-scan (OTS) time intervals, and the scan indications were audited. De-identified data extracted included the order datetime, scan datetime, clinical indication and scan report. Indications were manually categorised by a medical officer. The results were analysed with descriptive statistics.

Results: On average 143 B-scans were performed per six months, and 94.3% of all scans were performed in

business hours. Same-day scans account for 54.6%. Vitreous haemorrhage was the most common indication accounting for 35.8% of all scans, followed by cataract, (9.6%), mass (9.5%) and endophthalmitis (7.8%). The median OTS time for same day scans was 1.2 hours, mean 1.6 hours. The median OTS time for next day scans was 20.6 hours, mean 20.8 hours. The median OTS time for vitreous haemorrhage overall was 1.7 hours, mean 56.8 hours. The median OTS time for vitreous haemorrhage for scan performed within seven days was 1.53 hours, mean 22 hours.

Conclusion: The majority of B-scans were performed on the same day as ordered during business hours. Same day scans were on average performed within two hours. The most common indication was vitreous haemorrhage, and the median OTS time overall and mean OTS time for scans performed within seven days were within two hours.

3:30pm - 5:00pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Chairs: A/Prof Andrea Vincent and Dr Graham Hay-Smith

3:30pm - 3:37pm

Venue: M4

Profile of children with cerebral visual impairment and cerebral palsy – An Australian cohort

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Objective: To describe the characteristics of cerebral visual impairment (CVI) in children with cerebral palsy (CP) attending a tertiary care referral centre in Australia.

Method: Prospective cross-sectional study, children aged 3 months to ≤14 years with/high risk of CP or neurodevelopmental delay and a clinical MRI already performed were recruited. All children underwent a complete ophthalmological and visuo-perceptual assessment.

Results: One hundred and two children, M:F = 2:1, age range 7 months-14 years were recruited. Most common motor type and distribution (18%) was spastic quadriplegia. Features suggestive of CVI were seen in 98% of the cohort. Definite CVI seen in (62%) with predominantly dorsal stream dysfunction seen in 42% of children. Periventricular leucomalacia accounted for 75% of the brain lesion, with hypoxic ischaemic encephalopathy (50%) being the most common aetiology of brain injury. Nearly 32% of participants had visual acuity ≤ 6/60, 32% had hypo accommodation, 18% had convergent squint and 61% of children required hypermetropic correction. Among the visual perceptual dysfunction: impaired visual attention (83%), simultanagnosia (55%), problems



with clutter (89%), impaired visual guidance of hands (49%), lower visual field defects (51%) and impaired recognition of faces (18%) of the cohort.

Conclusion: CVI is an under recognised clinical presentation in children with CP. It is important that all children with early brain injury with high risk of CP or

adverse neurodevelopmental outcome have a detailed ophthalmological and CVI assessment performed to help understand the underpinnings of CVI and initiate rehabilitative strategies early to improve the quality of life of these children.

3:37pm - 3:44pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Vision screening in prep-school aged children in Queensland: Outcomes of the Primary School Nurse Health Readiness Program

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Purpose: To report the outcomes of vision screening in prep-aged school children through the Primary School Nurse Health Readiness Program in Queensland, Australia.

Methods: A retrospective review of vision screening records from January 2017 to December 2020 was undertaken. Vision screening through a unique dual-examination method, using the Parr 4 visual acuity chart and the Welch Allyn SPOT photoscreener, was offered to all prep-aged school children across Queensland. Based on a referral algorithm, those with a visual acuity of <6/9-2 in one or both eyes or a failed photoscreener test

were referred to an optometrist or ophthalmologist for review. Positive predictive values were calculated based on whether a visual abnormality, including refractive error, strabismus, anisometropia and/or amblyopia, was confirmed through a formal eye assessment by an ophthalmologist or optometrist.

Results: Of 185,685 eligible children, 176,164 (94.4%) consented to vision screening. A total of 164,890 (93.6%) children underwent vision screening, which ranged between 93.3% to 99.1% across all hospital and health services in Queensland. A total of 12148 (7.4%) children failed screening and were referred for an eye assessment and 6011 (49.5%) had a confirmed visual abnormality. The positive predictive value was 0.73 when a referral was indicated by the photoscreener result only, 0.76 when indicated by visual acuity only and 0.91 when indicated by both the photoscreener and visual acuity.

Conclusions: The Primary School Nurse Health Readiness Program vision screening program showed a very high uptake among targeted school children and was highly effective in identifying potential visual problems with higher accuracy when the visual acuity and photoscreener results were used in conjunction.

3:44pm - 3:51pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

To assess the efficacy of 0.01% atropine eye drops in decreasing the progression of myopia in Indian children

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Purpose: To assess the efficacy of 0.01% atropine eye drops in decreasing the progression of myopia in Indian children.

Methods: We conducted a prospective interventional study. Subjects with a baseline myopia of $\geq -2.0D$ to $-6D$ were randomised into two groups, Group A received 0.01% atropine eye drops and Group B received artificial tear drops every night for a period of

one year. Spherical equivalent (SE) and axial length (AL) were measured to assess progression. Minimum follow up was one year.

Results: A total of 60 eyes were included. Mean age was: Group A (n = 30): 11.33 ± 3.31 years and Group B (n = 30): 10.8 ± 3.41 years ($p = 0.602$). Mean pre interventional SE was Group A: -3.65 ± 1.08 D; Group B: -3.8 ± 1.15 D ($p = 0.603$). Mean pre interventional AL was Group A: 24.05 ± 1.27 mm; Group B: 24.62 ± 0.9 mm

($p = 0.068$). The progression of SE in two groups was: Group A: -0.53 ± 0.16 D; Group B: -1.01 ± 0.50 D ($p = 0.01$); and the progression of AL in two groups was: Group A: 0.16 ± 0.03 mm; Group B: 0.31 ± 0.01 mm ($p = 0.008$).

Conclusion: 0.01% atropine eye drops are a safe and effective treatment modality in reducing myopia progression (in terms of both spherical equivalent as well as axial length) in Indian children.

3:51pm - 3:58pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Paediatric uveitis cataract and glaucoma in the time of biologic therapy

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Introduction: The mainstay of uveitis treatment is steroids. Ocular hypertension and glaucoma are more common complications in children and glaucoma is the major cause of vision loss. The reported incidence of secondary glaucoma in children with uveitis is 10.3-42% and the incidence of blindness is 7%. Since 2010 steroid sparing agents and biologic therapy are increasingly being used.

Purpose: To investigate rates, timing and visual outcomes of paediatric uveitic cataract and glaucoma in relation to the diagnosis and treatment of the uveitis with steroid sparing/biologic immunosuppression.

Methods: Retrospective chart review of all paediatric uveitis patients presenting to the Children's Hospital Westmead, Sydney Eye Hospital and Save Sight Institute from 2005-2020.

Results: One hundred and eleven patients (207 eyes) were diagnosed with paediatric uveitis 2005-2020. The most common aetiological diagnosis was uvenile idiopathic arthritis-associated uveitis (n = 65, 59%), followed by idiopathic uveitis (n = 33, 29.6%). Over 50% eyes diagnosed with uveitis developed raised intraocular pressure. Close to 50% presumed to be steroid induced. Forty-three eyes (21%) had glaucoma surgery, 35 eyes had glaucoma drainage devices and 15 eyes had trabeculectomy surgery as a Majority prior to 2017.

Conclusions: Control of intraocular inflammation is essential for the best visual outcome. Rapid taper of any systemic steroids and minimisation of topical steroid therapy must occur. With the aim to be less than 3 × per day (as ocular hypertension dose dependent) and less than three months duration. Commencement of a step ladder systemic treatment should be conducted more quickly with early Immunosuppression and then addition of biologic therapy if needed.

3:58pm - 4:05pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Effects of increase in neonatal intensive care unit O₂ saturation targets on rates of retinopathy of prematurity: A multi-centre study

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Purpose: It has been noted by some studies that the increase in oxygen saturations >90% has been associated with increased rates and severity of retinopathy of prematurity (ROP). However, these studies are limited by small sample size. Our study aims to determine whether introduction of higher O₂ saturation targets

has resulted in increased rate or severity of ROP within preterm infants.

Methods: A retrospective review analysing data collected by the Australian and New Zealand Neonatal Network for infants <32 weeks gestational age (GA) and/or <1500 g birth weight born between the years 2012-2018 was conducted.

Results: Approximately 29,000 infant records were reviewed. After exclusion criteria, a final cohort of 17,298 was subject to analysis. A significant increase in hours of O₂ therapy exposure was noted for infants post-2015 ($p < 0.01$). ROP prevalence increased post-2015, both of any type ($OR = 1.25$, $p \leq 0.01$) and of Grades 2 or higher

(odds ratio [OR] = 1.21, $p < 0.01$) compared to pre 2015 levels. ROP requiring treatment was also observed to have increased ($OR = 1.33$, $p < 0.01$). Stratification based on GA demonstrated that the increase remained significant for infants born at <28 weeks ($OR = 1.23$, $p < 0.01$), but not for older infants.

Conclusion: New guidelines for O₂ therapy introduced since the BOOST II, SUPPORT and COT trials appear to have resulted in increased ROP prevalence in very pre-term infants born at <28 GA. Further adjustment of guidelines to minimise duration of oxygen therapy while maintaining the survivability benefits is advised.

4:05pm - 4:12pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Clinical approach for suspected optic disc swelling in children: Recommendations based on a six-year review

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Purpose: To report the outcome of referrals for suspected optic disc swelling in children and define features that may assist in the differentiation between true disc swelling and pseudopapilledema.

Methods: A retrospective review of children who were referred to the Queensland Children's Hospital in Brisbane, Australia between January 2014 – June 2020 for suspected optic disc swelling was performed. Referral details, subsequent investigations, and the final diagnosis were noted. Statistical analyses were performed for the presence of neurological symptoms and differences in retinal nerve fibre layer thickness.

Results: Sixty-six of 410 (16.1%) children referred for suspected optic disc swelling had confirmed disc

swelling, 25 (37.9%) were secondary to idiopathic intracranial hypertension. Twenty-two of 55 (40%) children who underwent neuroimaging prior to ophthalmology review had confirmed disc swelling. Of the 344 (83.9%) children with pseudopapilledema, 239 (69.5%) were optic nerve drusen and the remainder were tilted or crowded discs. Children with confirmed disc swelling were more likely to present with headache (odds ratio = 8.68, $p < 0.01$) and visual disturbance (odds ratio = 2.14, $p = 0.03$). Retinal nerve fibre layer was significantly thicker in true disc swelling compared to pseudopapilledema ($p < 0.01$). B-scan was the most sensitive ancillary investigation in the detection of drusen (100%), followed by OCT (70.4%) and fundus autofluorescence (44.9%).

Conclusions: The majority of referrals for optic disc swelling were pseudopapilledema. Ancillary investigations can be useful in the exclusion of drusen. Referrers should include a neurological assessment, visual acuity, and ancillary investigations to assist in the triage of ophthalmology review. We discourage the use of neuroimaging prior to ophthalmology review.

4:12pm - 4:19pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Addressing equity: A 10-year review of strabismus surgery in New Zealand

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Background: This study aimed to identify the relationship between the incidence of strabismus surgery, ethnicity and socioeconomic deprivation in the New Zealand Public Health system. Secondary outcomes explored the association between reoperation rate, ethnicity and socioeconomic deprivation, and how incidence varied by region.

Method: Cases receiving operative management for strabismus were retrieved from the National Minimum Data Set. The incidence of surgery was correlated to patient demographics by ethnicity and socioeconomic deprivation.

Results: There were 6079 strabismus surgeries recorded over a 10 year period from 1 January 2005 to 31 December 2014. There was an association between a lower incidence of strabismus surgery for Māori and

Pacific ethnicity, and the least socioeconomically deprived cohort. There were significant inter-regional variations in the incidence of strabismus surgery. The European ethnic group were 1.4 times as likely to receive subsequent procedures following a primary procedure than either Māori or Pacific Peoples.

Conclusions: Strabismus surgeries are disproportionately performed less frequently in Māori and Pacific peoples and New Zealanders from the lowest deprived group in the New Zealand Public Health System. Minority ethnic groups are less likely to receive secondary operations following a primary procedure when compared to a European cohort. Further research is needed to directly compare health outcomes between these high needs groups.

4:19pm - 4:26pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Comparative evaluation of unilateral two muscle versus bilateral three muscle surgery for large angle comitant exotropia

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Purpose: To evaluate the success of two muscle surgery versus three muscle surgery in large angle comitant exotropia.

Methods: A prospective interventional study. Patients with large-angle exotropia (45PD - 60PD) were randomised into two groups, Group A underwent unilateral lateral rectus recession and medial rectus plication, Group B underwent lateral rectus recession

in both eyes and medial rectus plication. Success was defined as a residual deviation of ≤ 10 PD with no induced lateral incomitance. The minimum follow up was three months.

Results: A total of 35 patients were included. Mean age was: Group A ($n = 17$): 21.1 ± 6.5 years and Group B ($n = 18$): 19.7 ± 6.5 years ($p = 0.53$). Mean pre- and post-operative deviations in the two groups were: Group A: 53.5 ± 5.8 PD and 9.3 ± 3.1 PD ($p = 0.3$); Group B: 53.9 ± 5.8 PD and 8.4 ± 3.5 PD ($p = 0.3$). Surgical success was seen in 82% and 78% in Group A and B respectively ($p = 1$). The incidence of post-operative lateral incomitance was 18% and 11 % in Group A and B respectively ($p = 0.658$).

Conclusion: Unilateral two-muscle surgery can successfully correct large-angle exotropia without causing significant motility limitation or lateral incomitance.

4:26pm - 4:33pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

A review of de novo uveitis in older adults presenting to a large tertiary centre

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Purpose: The main purpose of this study was to describe the causes of de novo uveitis in individuals 60 years and older. Secondary aims were to determine the incidence of intraocular lymphoma and the clinical predictors of lymphoma.

Methods: Retrospective chart review of all subjects presenting to the uveitis service at Auckland District Health Board (Auckland, New Zealand) between January 2006 and October 2020.



Results: Six hundred and eighty-six subjects (900 eyes) were aged ≥ 60 years at first presentation with uveitis, representing 23.4% of all subjects with uveitis during the study period. Non-infectious aetiology occurred in 631 (70.1%) eyes and infectious etiologies occurred in 269 (29.9%) eyes. The most frequent causes were idiopathic (36.3%), herpes zoster (14.8%), HLAB27 (8.7%) and sarcoidosis (4.8%). Twenty (2.2%) eyes of 13 (1.9%) subjects had a diagnosis of lymphoma. Lymphoma represented 11.2% of all intermediate uveitis. Subjects

diagnosed with lymphoma did not develop posterior synechiae, epiretinal membrane, cystoid macular oedema or ocular hypertension.

Conclusions: Intraocular lymphoma was uncommon, but an important cause of intermediate uveitis. A diagnosis of lymphoma needs to be considered in any older subject with de novo intermediate uveitis. The lack of posterior synechiae, cystoid macular oedema, epiretinal membrane and ocular hypertension further increase the suspicion for lymphoma.

4:33pm - 4:40pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Prevalence of ocular toxoplasmosis in the Australian population

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Purpose: Ocular toxoplasmosis – caused by retinal infection with *Toxoplasma gondii* – is a common form of uveitis in many countries. Approximately 60% of affected eyes lose vision and 25% become blind. Serological testing suggests that the rate of infection is increasing in Australia, but associated eye involvement has not been measured. We sought to estimate the prevalence of ocular toxoplasmosis in Australians.

Method: We evaluated fundus images from 5024 enrolees of the Busselton Healthy Aging Study, a community-based prospective cohort study involving

‘Baby Boomers’ (born 1946-1964) residing in Busselton Shire, Western Australia. Images centred on the optic disc and macula were captured on a Canon CR-1 digital retinal camera after pupil dilation. Two uveitis specialists (JRS, LBF) assessed every image, and retinal lesions suggestive of ocular toxoplasmosis were confirmed with a third uveitis specialist (JMF). Serum *T. gondii* immunoglobulin (Ig)G was measured for enrolees with lesions judged clinically to be ocular toxoplasmosis.

Results: Amongst the 5024 enrolees, 12 (0.24%) had retinal lesions consistent with ocular toxoplasmosis, and eight (0.16%) also had detectable serum *T. gondii* IgG. Drawing from published work that shows 40% of toxoplasmic retinal lesions are situated at the optic disc or macula (PLoS Negl Trop Dis: e0004685), prevalence of ocular toxoplasmosis was estimated at one per 250 Australians.

Conclusion: This work represents the first effort to estimate prevalence of ocular toxoplasmosis in the Australian population. Our results indicate the condition is common, and efforts to quantify risk factors – including feline carriers and contamination of meat – are justified.

4:40pm - 4:47pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Systemic associations of sarcoid uveitis: Correlation with uveitis phenotype and ethnicity

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Purpose: To examine systemic associations of sarcoid uveitis and association with uveitis clinical phenotype and ethnicity.

Methods: Retrospective cross-sectional study of 362 subjects with definite or presumed sarcoid uveitis from

Moorfields Eye Hospital, Royal Victorian Eye and Ear Hospital and Auckland District Health Board. Data was collected from review of clinical notes, imaging and investigations. Sarcoidosis was diagnosed in accordance with the International Workshop on Ocular Sarcoidosis guidelines. Main outcome measure was diagnosis of associated systemic disease secondary to sarcoidosis.

Results: A total of 362 subjects with sarcoid uveitis were identified. Median age was 46 years and 226 (62.4%) were female. Granulomatous anterior uveitis (47.8%), intermediate uveitis with snowballs (46.4%) and multifocal choroiditis (43.1%) were the most frequent clinical presentations, and disease was bilateral in 313 (86.5%). Periphlebitis was observed in 21.0% and solitary optic nerve or choroidal granuloma in 11.3%. Lung parenchymal disease was diagnosed

in 200 (55.2%), cutaneous sarcoid in 98 (27.1%), sarcoid arthritis 57 subjects (15.7%), liver involvement 21 subjects (5.8%), neurosarcoid 49 subjects (13.5%) and cardiac sarcoid in 16 subjects (4.4%). Subjects with cardiac sarcoid were less likely to have granulomatous anterior uveitis ($p = 0.017$). Caucasian subjects were older at presentation (48 vs 41 years $p = 0.009$), had less granulomatous anterior uveitis (26.4% vs 51.7% $p < 0.001$) and were less likely to present with cutaneous involvement (23.1% vs 35.4% $p = 0.040$).

Conclusions: Ophthalmologists need to be aware of the systemic associations of sarcoid uveitis, in particular potentially life-threatening complications such as cardiac sarcoidosis. Differences observed in uveitis phenotype and between ethnicities require further investigation.

4:47pm - 4:54pm

S20 – FREE PAPERS – Paediatrics/Strabismus/Uveitis

Acute posterior multifocal placoid pigment epitheliopathy: Clinical presentation and risk of cerebrovascular accident

Rachael Niederer¹, Priya Samalia², Yi-Shing Chen³, Jonathan Goh², Elisa Cornish⁴, Stephen Guest⁵, Peter McCluskey⁴, Lyndell Lim², Joanne Sims¹, Oren Tomkins-Netzer^{3,6}

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Purpose: The primary objective was to determine the rate of neurologic complications and risk factors of cerebrovascular accident associated with acute posterior multifocal placoid pigment epitheliopathy. Secondary

objectives included the clinical presentation, visual outcomes and recurrence rates.

Methods: Multicenter retrospective case series.

Results: One hundred and eleven eyes from 60 subjects presenting with acute posterior multifocal placoid pigment epitheliopathy from January 2009 to June 2020 were included. Median age at presentation was 29.0 years (interquartile range 24.7 – 35.1) and 36 subjects (60.0%) were male. Twenty subjects (33.3%) reported a viral prodrome. Cerebrovascular accident was observed in seven subjects (11.7%). Older age was the only significant risk factor for cerebrovascular accident ($p = 0.042$), while the presence of viral prodrome, headache and inflammatory markers were not predictive. Vision loss occurred in seven eyes, with four eyes (3.6%) having final visual acuity 20/50–<20/200 and three eyes (2.7%) $\geq 20/200$. Recurrence occurred in ten subjects (16.7%).

Conclusions: The presence of headache cannot reliably predict those at risk of cerebrovascular accident. All individuals presenting with acute posterior multifocal pigment epitheliopathy should therefore undergo a neurologic assessment and further investigation for cerebral vasculitis as deemed appropriate by the collaborating neurologist.

CONGRESS DINNER

7:00pm - 11:00pm

Venue: Victoria Park

7:00am - 8:15am **H07 – Apellis Hosted Morning Symposium**
Venue: M4

8:30am - 9:00am **L06 – NEURO-OPHTHALMOLOGY UPDATE LECTURE**

Chair: A/Prof Celia Chen

Venue: Great Hall 1 & 2

Title: Neuro-ophthalmic Complications of Immune Checkpoint Inhibitor Therapy for Cancer: Lessons Learned through Case Reports and Big Data

Dr Lynn K. Gordon

Synopsis: Treatment of specific cancers was revolutionised through the use of immune checkpoint blockade (ICI) which unleashes the body's own immune surveillance and mechanisms to kill tumour cells. This innovative treatment strategy induces remission for many patients with treatment-resistant cancers. Unintended consequences of ICI result from disrupting tolerance, therefore creating autoimmune consequences which can affect the eye and central nervous system. Following ICI therapy, case reports and series document dry eye, uveitis and multiple neuro-ophthalmic complications involving the optic nerve, cranial nerves, neuromuscular junction and extraocular muscles. The majority of patients with uveitis or optic nerve disease respond to discontinuing the ICI or to systemic or local corticosteroid therapy. Clinical improvement is however variable for patients with other types of neuro-ophthalmic sequelae. Case series provide insights about specific disease sequelae but do not help us understand the incidence or prevalence of complications following ICI therapy. Two big data studies provide additional complementary information, one using the IRIS database developed by the American Academy of Ophthalmology, and the other using the Kaiser Permanent Medical Record system. Using big data, cancer patients were identified to have a higher rate of uveitis and neuro-ophthalmic disease, even without the use of ICI. Patients with a prior history of immune-mediated ocular disease, uveitis or other, had a higher rate of recurrent disease following ICI therapy. Coordination of care between ophthalmologists and oncologists is suggested for patients in which ICI therapy is indicated.

9:00am - 9:30am **L07 – RETINA UPDATE LECTURE**

Chair: Prof Adrian Fung

Venue: Great Hall 1 & 2

Title: Gene Testing Reveals New Insights into Retinal Dystrophies

Anita Agarwal MD

Synopsis: With recent access to gene testing, the genotype phenotype correlation picture is evolving. Examples of novel gene mutations causing a particular phenotype, unexpected gene mutations of a known phenotype and extreme phenotype difference within family members will be discussed. Methods of confirming a disease-causing gene defect – Polyphen, SIFT, Muttaster – will be explained. Clinical examples of variable phenotypes in Peripherin/RDS (PRPH2), mitochondrial mutations and their phenotypic overlap with other non-inherited disorders, heterozygous ABCA4 and other diseases will be presented. Ancillary testing including electrophysiology and multimodal imaging features aid in the process. A reasonable combined clinical and genotyping approach towards arriving at a diagnosis of a given patient in a clinical setting will be summarised.



9:30am - 10:00am

L08 – THE COUNCIL LECTURE**Chair:** Prof John Grigg**Venue:** Great Hall 1 & 2**Title:** Seeing Stars, Stones and Snow

A/Prof Clare L. Fraser

Synopsis: Sometimes in neuro-ophthalmology it is the patient who is not quite sure what they are seeing and sometimes it is the doctor. My neuro-ophthalmic research has always been driven by the curiosities and patient vignettes, particularly those rare conditions that have been overlooked by past research efforts. This lecture will explore recent advances in three areas of neuro-ophthalmology from my own research. A concussion is often colloquially referred to as “seeing stars” after a head injury. The visual pathways make up 30-50% of the brain substance, and therefore a diffuse brain injury like a concussion will often result in visual symptoms. These can be persistent and difficult for the patient to explain. Research is expanding on the diagnosis and management of acute concussion, post-concussion syndrome and chronic traumatic encephalopathy. Drusen is the German word for a geode or stone. Optic disc drusen are calcified areas in front of the lamina cribrosa within the disc substance. Drusen can cause difficulty for the ophthalmologist who needs to decide if the patient has papilloedema or true disc swelling. New diagnostic guidelines have been published, and there is increasing research into the nature of disc drusen, how they progress and the risks to a patient's vision. Finally, Visual Snow Syndrome is an increasingly recognised visual phenomenon which now has its own set of diagnostic criteria. While not being dangerous or progressive, it can cause very disabling symptoms for the patient. New research is providing insights into the neurological substrate of this phenomenon and will hopefully lead to better treatment options.

10:00am - 10:30am

Morning Tea

10:30am - 12:00pm

P08 – CLINICAL CONTROVERSIES**Chair:** Dr Amy Cohn**Venue:** Great Hall 1 & 2**Speakers:** Dr Liz Insull, A/Prof James Elder, A/Prof Lyndell Lim and Dr Daniel McKay

12:00pm - 1:30pm

Lunch

1:30pm - 3:00pm

CONCURRENT SESSIONS**S21 – PROFESSIONAL DEVELOPMENT****Venue:** M1 & 2

1:30pm - 3:00pm

S22 – SYMPOSIUM**Chairs:** A/Prof Heather G Mack and A/Prof Andrea Vincent**Venue:** Great Hall 3**Title:** Retinal Dystrophy: Diagnosis and Treatment

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Synopsis: *RPE 65* retinal dystrophy is now treatable with gene therapy; and bionic eye development is well advanced in Australia. However, identifying patients with dystrophy who might benefit from treatments can be challenging. This symposium will cover the diagnosis of patients with retinal dystrophy with an emphasis on identifying those who are candidates for treatment; treatments including gene therapy and bionic eye, and patient knowledge and experiences with gene replacement treatment.

Objectives:

To gain a better understanding of:

1. Approach to evaluation of retinal dystrophy in patients
2. Principles and utility of electrophysiology testing
3. Genetics and gene testing in inherited retinal disease
4. Gene therapy
5. CRISPR technology
6. Stem cell transplants



7. Bionic eye
8. Patient experience with gene therapy

Speakers and Topics:

A/Prof Andrea Vincent – Clinical phenotyping: Clinical assessment of patients with retinal dystrophy, classifying into not bad, moderate and very bad

1. History includes signs and symptoms
2. Examination pearls and imaging (optical coherence tomography, autofluorescence, widefield)
3. Electrophysiology testing

Characteristics of potential RPE65 gene therapy patients and pathways for referral in Australia and New Zealand

Prof Robyn Jamieson – Principles, ethics and utility of genetic testing

1. Principles of testing, types of tests, limitations and interpretation
2. Specific tests compared with genome sequencing
3. Counselling

Dr Tom Edwards – Update on ocular gene therapy

Prof Alex Hewitt – Stem cells for dystrophy: pre-clinical and human experience

A/Prof Penny Allen – Update on bionic eye

A/Prof Heather G. Mack – Patient knowledge and experience in ocular gene therapy

1:30pm - 3:00pm

S23 – SYMPOSIUM

Chair: Dr Michael M. Jones

Venue: Great Hall 4

Title: Old and New Issues in Paediatric Ophthalmology

michaelmurrayjones@gmail.com

Synopsis: This symposium covers topics in paediatric ophthalmology that are essential information for all ophthalmologists. We will look at how to handle the oldest and hardest of common paediatric ophthalmology problems including learning difficulties, non-organic vision loss, convergence issues and blepharitis. We will also equip the general ophthalmologist with the latest information for new treatments of age-old problems such as myopia control and amblyopia.

Speakers: Dr Michael M Jones, A/Prof James Elder, A/Prof Shuan Dai, Dr Deepa Taranath, Dr Caroline Catt, Dr Maree Flaherty

1:30pm - 3:00pm

S24 – COURSE

Chairs: A/Prof Chameen Samarawickrama, Dr Louise Robinson and Dr Bernardo Soares

Venue: Great Hall 1 & 2

Title: A Beginner's Guide to Multifocal Intraocular Lenses/Extended Depth of Focus

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Synopsis: Ophthalmologists are widely trained in an environment where monofocal intraocular lenses (IOL) are the standard of care. However, in private practice, knowledge and expertise in multifocal/extended depth of focus IOLs are increasingly expected by our patients. But where do we go to bridge this gap? Look no further! This session, run by the Younger Fellows Group, aims to cover the basics of understanding multifocal and extended depth of focus IOLs, which eyes are suitable for implantation and which patients would be happy with the outcomes. It is an interactive session featuring presenters who can share their fellowship gained knowledge and experience, in a relaxed, fun environment, designed to engage the audience and allow an open forum where any question can be asked.

Speakers and Topics:

1. Debate

- a. Dr Andrea Ang – If I had my way, I would only ever inset a monofocal
- b. Dr Tanya Trinh – If I had my way, I would only ever insert an EDOF

- c. Dr Nicholas Toalster – If I had my way, I would only ever insert a multifocal
2. Dr Chameen Samarawickrama – Picking the eye that suits a multifocal (including where calculation errors occur including effective lens position, axial length and keratometry measurements etc, as well as irregular astigmatism/spherical aberration etc.)
3. Dr Elaine Chong and Dr Ben La Hood – Which multifocal should I use? (this will be about hydrophilic vs hydrophobic, the different distances for different IOLs, Zeiss vs Alcon vs J&J vs Teleon etc)
4. Dr John Hogden – How to pick the right patient for a multifocal (covering the main drawbacks of multis, the perfect person, when to avoid implanting the IOL etc.)

1:30pm - 3:00pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology**Chairs:** Dr Jennifer Fan Gaskin and Dr Colin Clement**Venue:** M4

1:30pm - 1:37pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

Quality of life in adults with childhood glaucoma: An interview study

Lachlan S. W. Knight^{1,2}, Bronwyn Ridge¹, Sandra E. Staffieri^{3,4,5}, Jamie E. Craig¹, Mallika Prem Senthil⁶, Emmanuelle Souzeau¹

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Purpose: To explore and report on the quality of life (QoL) issues encountered by adults with childhood glaucoma.

Methods: A qualitative research methodology was applied and data were collected through semi-structured in-depth interviews. NVivo-12 software was used to inductively analyse and code data to identify QoL themes.

Results: Forty-seven adults with childhood glaucoma were recruited from the Australian and New Zealand Registry of Advanced Glaucoma (mean age: 40.0 ± 15.3 years; 55% female). We identified 10 QoL themes pertinent to adults living with childhood glaucoma. Coping strategies and emotional wellbeing were the most prominent themes. Maladaptive coping mechanisms, including treatment nonadherence, were observed more commonly in individuals aged <40 years and those without a vision impairment. Emotional wellbeing was impacted by feelings of being misunderstood due to the rarity of the condition, being self-conscious of physical manifestations of the disease and anxiety related to possible disease progression and vision loss. The effect of childhood glaucoma on family planning formed a novel QoL theme and included worry for their child to inherit the condition and inability to fulfil parental duties. This often led to genetic counselling-seeking behaviours. Mobility issues were infrequently experienced.

Conclusion: Childhood glaucoma poses a substantial impact to the emotional wellbeing of adults with childhood glaucoma which is mediated by the use of coping strategies. Genetic counselling and family planning options may further be important. This study supports the development of a childhood glaucoma-specific patient reported outcome measure for assessment of the psychosocial impact of childhood glaucoma in adults.



1:37pm - 1:44pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

Clinical update on vascular changes in glaucoma

Danit G. Saks¹, Angela Schulz¹, Ayub Qassim², Bronwyn Ridge², Ryan Pham², Samran Sheriff¹, Ting Shen¹, Vivek Gupta¹, Jamie E. Craig², Stuart L. Graham¹
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Purpose: To identify retinal vascular changes in primary open angle glaucoma including vessel density (VD), vascular wedge defects and foveal avascular zone (FAZ).

Methods: A total of 548 eyes from 304 suspect or manifest glaucoma participants (age=67.02 ± 10.37 years) and 60 eyes from 44 healthy controls (age=62.43 ± 8.21 years) were imaged using optical coherence tomography (OCT) and angiography. Superficial vascular complex (SVC) and deep capillary plexus scans were exported to ImageJ for analysis of VD; presence and nature of vascular wedge defect, including correlation with retinal nerve fibre layer (RNFL) defect and wedge VD; and FAZ parameters

(n=200 suspect/manifest glaucoma eyes and 60 control eyes), including area, perimeter and circularity. All relevant statistics controlled for sex, age, OCT angiography system and OCT angiography scan quality.

Results: Superficial VD was significantly lower ($p = 0.003$) and deep VD was not significantly different in glaucoma eyes vs controls ($p = 0.420$). There were 81 eyes found with vascular wedge defects (15% of suspect/manifest glaucoma eyes), visible only at the SVC, with no vascular wedges found in controls. VD within the wedge was approximately $\frac{3}{4}$ of macula SVC VD. Vascular wedges corresponded with visible RNFL wedges, but not all RNFL wedges corresponded with vascular wedges. All FAZ parameters were significantly higher in suspect/glaucoma eyes than control eyes ($p < 0.001$) other than circularity which was significantly lower ($p < 0.001$).

Conclusions: While the vascular contribution to the aetiology of glaucoma is still being established, this study characterises vascular alterations found in glaucoma including vessel density, unique vascular wedge defects and enlarged foveal avascular zone.

1:44pm - 1:51pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

The apolipoprotein E4 allele is associated with structural markers of primary open-angle glaucoma disease progression in the PROGRESSA cohort

Sean Mullany¹, Henry Marshall¹, Puya Gharahkhani², Mark M. Hassall¹, Lachlan S. W. Knight¹, Ella C. Berry¹, Georgina Hollitt¹, Thi Nguyen¹, Angela Schulz³, Richard A. Mills¹, Ashish Agar⁴, Anna Galanopoulos⁵, John Landers¹, Paul R. Healey⁶, Stuart Graham³, Alex W. Hewitt⁷, Robert Casson⁵, Owen M. Siggs^{1,8}, Jamie E. Craig¹
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University of Tasmania, Hobart, Australia, ⁸Garvan Institute of Medical Research, Sydney, Australia

Purpose: Due to conflicting evidence from epidemiological studies, it remains unclear whether the common dementia-associated apolipoprotein E (APOE) E4 allele is associated with primary open-angle glaucoma. This study seeks to investigate associations between APOE E4 allele prevalence and longitudinal spectral domain optical coherence tomography change in participants recruited to PROGRESSA, a prospective longitudinal study of suspect and early-manifest glaucoma.

Methods: APOE genotypes were imputed for 1206 individuals from PROGRESSA for whom genotyping data was available. Rates of longitudinal change in the macular ganglion cell layer/inner plexiform layer (mGCIPL) and peripapillary retinal nerve fibre layer (pRNFL) were compared between eyes of participants harbouring at least one copy of the E4 allele and participants lacking the E4 allele. Statistical comparisons were made between groups with adjustment for age and gender.

Results: Eyes of participants harbouring at least one copy of the APOE E4 allele demonstrated faster rates of mGCIPL thinning ($\beta = 0.11\mu\text{m}/\text{year}$; $p = 2 \times 10^{-4}$) but equivalent baseline mGCIPL thickness ($\beta = -0.64\mu\text{m}$; $p = 0.12$). These differences were not observed in longitudinal pRNFL thinning ($\beta = 0.07\mu\text{m}/\text{year}$; $p = 0.12$) nor baseline mean pRNFL thickness ($\beta = -0.94\mu\text{m}$; $p = 0.12$).

Conclusion: The APOE E4 allele is associated with faster rates of mGCIPL thinning in the PROGRESSA cohort. These data suggest that the APOE E4 genotype may be a relevant genetic risk factor for mGCIPL thinning and primary open-angle glaucoma disease progression.

1:51pm - 1:58pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

Final results from the HORIZON trial: Five-year follow up of a Schlemm's canal microstent combined with cataract surgery in primary open angle glaucoma

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Purpose: The purpose of this study was to assess five-year outcomes in patients who underwent cataract surgery alone (CS) compared to those who underwent cataract surgery combined with a Hydrus[®] Microstent (HS).

Methods: Subjects with primary open angle glaucoma and visually significant cataract with washed-out diurnal

intraocular pressure (IOP) 22 - 34 mmHg were randomised 2:1 to undergo CS or HS in the HORIZON study.

Results: At five years, the mean IOP reduction was greater in the HS group vs CS $-8.3\% \pm 3.8\%$ vs. $-6.5\% \pm 4.0\%$ ($p < 0.001$). The proportion of eyes requiring medications was significantly lower in the HS group (34% vs. 64%, $p < 0.001$). Among eyes that were medication free, the mean unmedicated IOP was unchanged from the pivotal two year report (16.6 vs. 16.6 HS group and 17.6 vs. 17.4 CS group). There were no significant changes in BCVA or other adverse events compared the original pivotal two year report.

Conclusion: Hydrus combined with phacoemulsification results in sustained IOP and medication reduction from year 2 to year 5. The treatment arm showed a significant reduction in secondary incisional glaucoma surgery (trabeculectomy or tube shunt). Mean annual endothelial cell density declined in both groups within the range of normal aging. There were no significant changes in safety findings from two years.

1:58pm - 2:05pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

Long-term outcomes of standalone Schlemm's canal hydrus microstent implantation for primary open-angle glaucoma in a real-world setting: Findings from the SPECTRUM registry

Ashish Agar^{1,2}, Paul Healey^{3,4}, Graham Lee^{5,6}
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Purpose: The SPECTRUM Global Registry provides high quality data for over 2900 eyes implanted with the Hydrus[®] Microstent in patients from 18 countries. This includes Standalone MIGS without concomitant cataract surgery, ie, a purely glaucoma procedure. We evaluated outcomes up to 5 years in eyes with primary open-angle glaucoma (POAG) and no prior glaucoma surgery, who underwent Hydrus implantation as standalone treatment.

Methods: Eligibility criteria were age >18 years, diagnosis of POAG, no prior incisional glaucoma surgery, Standalone Hydrus microstent implantation, and ≥ 6 months follow-up.

Results: A total of $n=406$ eyes of 353 patients were analysed with post-operative follow-up from 1 to 60 months. Mean intraocular pressure (IOP) (standard deviation) at

baseline was 20.2 (6.1) mmHg, at 12 months (n=375) it was 16.1 (4.9) mmHg; at 36 months (n=149) 14.9 (3.8) mmHg, and at 60 months (n=53) mean IOP was 15.3 (3.9) mmHg, $p < 0.0001$ at every time point. Mean medications were 2.5 (1.2) per eye at baseline and remained significantly lower from 1 through 60 months (range 1.2-1.6 per eye, $p < 0.005$ at all time points), representing reductions of 0.7-1.5 medications per eye. The most common adverse events were IOP elevations of >10 mmHg

above baseline (4.2%) and peripheral anterior synechiae formation (3.7%).

Conclusion: Standalone Hydrus Microstent implantation in eyes with POAG in the real-world clinical setting produces significant and lasting reductions from baseline in both mean IOP (29.1% at 12 months, 22.3% at 60 months) and the need for IOP-lowering medications, with an excellent safety profile and low rate of failure requiring additional surgery.

2:05pm - 2:12pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

Lower nocturnal basal SpO₂ is associated with progression in early stage primary open-angle glaucoma

Ella C. Berry¹, Henry N. Marshall¹, Sean Mullany¹, Lachlan S. W. Knight¹, Georgina Hollitt¹, Thi Thi Nguyen¹, Angela Schulz², Richard A. Mills¹, Ashish Agar³, Anna Galanopoulos⁴, John Landers¹, Paul R. Healey⁵, Stuart L. Graham², Alex W. Hewitt⁶, Robert Casson⁴, Stuart MacGregor⁷, Owen M. Siggs^{1,8}, Jamie E. Craig¹

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Purpose: To investigate for association between nocturnal hypoxia and baseline and longitudinal structural thinning in early stage primary open angle glaucoma (POAG).

Methods: One hundred and sixty-three participants recruited to the Predicting Risk Of Glaucoma: RElevant SNPs with Strong Association (PROGRESSA) study were fitted with a finger probe pulse oximeter (Nonin WristOx2) to measure nocturnal oxygen saturation over three consecutive nights. Macular ganglion cell inner plexiform layer (mGCIPL) and Peripapillary Retinal Nerve Fibre Layer (pRNFL) thickness was assessed in 326 eyes using spectral domain optical coherence tomography. Participants were then classified as showing predominantly mGCIPL, predominantly pRNFL, both mGCIPL and pRNFL, or no structural change. Basal peripheral oxygen saturation (SpO₂) levels, and oxygen desaturation index were evaluated in each of the sub-phenotypes.

Results: Following adjustment for age, gender, and intraocular pressure, individuals with predominantly mGCIPL thinning had a lower basal SpO₂ (odds ratio 0.33/SD [0.15, 0.77] $p = 0.008$), exhibited a greater proportion of time below SpO₂ 88% (odds ratio 3.86, [1.29, 11.56] $p = 0.016$), and had a higher oxygen desaturation index indicating nocturnal desaturation events (odds ratio 1.81/SD [1.38, 1.80] $p = 0.029$) than patients with no structural change.

Conclusion: Nocturnal hypoxia may be an important risk factor for glaucoma progression. Further investigation of this association is required to evaluate the contribution of sleep apnea syndrome to these findings, and glaucoma progression.

2:12pm - 2:19pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

A cardiovascular disease polygenic risk score predicts macular ganglion cell inner plexiform layer progression in primary open angle glaucoma

Henry N. Marshall¹, Xikun Han², Sean Mullany¹, Ayub Qassim¹, Ella C. Berry¹, Mark M. Hassall¹, Thi Nguyen¹, Georgina L. Hollitt¹, Lachlan S. W. Knight¹, Bronwyn Ridge¹, Emmanuelle Souzeau¹, Angela Schulz³, Richard

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Purpose: To investigate the relationship between cardiovascular disease genetic risk score and glaucomatous progression.

Methods: A cardiovascular disease polygenic risk score was calculated for 828 participants from the PROGRESSA study. Participants were characterised as showing either predominantly macular ganglion cell inner plexiform layer (mGCIPL) thinning, predominantly pRNFL thinning, or equivalent mGCIPL and pRNFL thinning at enrolment. The cardiovascular disease polygenic risk score for these study groups was compared to a reference group of stable glaucoma suspects and to an external normative population. Replication was undertaken by

phenotyping 634 participants from the Australian and New Zealand Registry of Advanced Glaucoma (ANZRAG).

Results: After accounting for age, sex and intraocular pressure, participants with predominantly mGCIPL thinning had a higher cardiovascular disease genetic risk score than reference participants (OR 1.69/SD, 95% CI [1.14, 2.52] $P = 0.007$), and then external normative population (OR 1.27/SD 95% CI [1.09, 1.49] $p = 0.003$). This was reproduced in a replication cohort of perimetric glaucoma participants from ANZRAG (OR 1.39/SD; 95% CI [1.05, 1.83] $p = 0.022$). Review of longitudinal spectral domain optical coherence tomography data showed that a higher cardiovascular disease genetic risk score was associated with a faster rate of mGCIPL progression (β : 0.095 $\mu\text{m}/\text{year}/\text{quintile}$ 95% CI [0.003, 0.18] $p = 0.043$). Review of visual field data showed that a higher cardiovascular disease score was associated with a greater likelihood of para-central visual field change (OR 1.86 95% CI: [1.14, 3.05] $p = 0.013$). Participants with predominantly mGCIPL thinning also exhibited a higher VCDR genetic risk score (OR 1.40/SD 95% CI [1.18, 1.66] $p < 0.001$), but a comparable intraocular pressure genetic risk score (OR 1.12/SD 95% CI [0.95, 1.32] $p = 0.180$) to the normative population.

Conclusion: A polygenic risk score highlights the susceptibility of macular GCIPL to cardiovascular disease in glaucoma.

2:19pm - 2:26pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

Childhood and early-onset glaucoma classification and genetic profile in the Australian and New Zealand Registry of Advanced Glaucoma: An update

Lachlan S. W. Knight¹, Jonathan B. Ruddle^{2,3,4}, Deepa A. Taranath¹, Ivan Goldberg⁵, James E. Smith^{5,6,7}, Glen Gole⁸, Mark Y. Chiang⁹, Faren Willett⁹, Guy D'Mellow¹⁰, James Breen^{11,12,13}, Ayub Qassim¹, Sean Mullany¹, James E. Elder^{2,14}, Andrea L. Vincent^{15,16}, Sandra E. Staffieri^{2,4}, Lisa S. Kearns⁴, David A. Mackey^{3,4,17,18}, Susie Luu¹, Owen M. Siggs^{1,19}, Emmanuelle Souzeau¹, Jamie E. Craig¹

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Purpose: To report the relative frequencies of childhood and early-onset glaucoma subtypes and their genetic findings in a large single cohort.

Methods: Referrals of individuals with childhood glaucoma (diagnosed 0 to <18 years) and early-onset glaucoma (diagnosed 18 to <40 years) recruited to the Australian and New Zealand Registry of Advanced Glaucoma (ANZRAG) over a 14-year period (2007-2021) were respectively reviewed. Glaucoma subtypes were determined using the Childhood Glaucoma Research Network classifications. DNA extracted from blood or saliva samples underwent sequencing of genes associated with glaucoma.

Results: Three hundred individuals with childhood glaucoma and 392 individuals with early-onset glaucoma

were referred to the ANZRAG. Primary glaucomas were most prevalent in either cohort (childhood: 226/300, 75.3%; early-onset: 288/392, 73.5%). Genetic testing in probands resulted in a diagnostic yield of 26.4% (137/518) and reclassification of glaucoma subtype in 9.5% of probands (13/137). The highest molecular diagnostic rate was achieved in probands with glaucoma associated with non-acquired ocular anomalies (57.1%). Pathogenic variants in 20 genes were found. Biallelic variants in CYP11B1 ($n = 32$; 6.2%) and heterozygous variants in MYOC ($n = 25$; 4.8%) and FOXC1 ($n = 21$; 4.1%) were most commonly reported amongst probands. Biallelic CYP11B1 variants were more commonly reported in females (61.5% vs 38.5%; $p = 0.03$).

Conclusion: We report on the largest cohort of individuals with childhood and early-onset glaucoma from Australasia using the Childhood Glaucoma Research Network classification. Primary glaucomas were most prevalent. Genetic diagnoses ascertained in 26.4% of probands supported clinical diagnoses and genetic counseling. International collaborative efforts to characterise genetic associations in rare phenotypes will improve genetic diagnostic rates and management of these glaucomas.

2:26pm - 2:33pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

An open access normative database and smart phone application of A-scan data using the Heidelberg Spectralis spectral domain optical coherence tomography machine

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Purpose: Develop the first normative database of standard macular and circumpapillary optical coherence

tomography (OCT) scans at the level of the A-scan using the Heidelberg Spectralis machine. This study aims to help clinicians and researchers identify abnormal patterns of change through a normative database, smart phone application and open access dataset.

Methods: A retrospective cross sectional analysis of OCT scans of healthy individuals. All participants had a full ophthalmic examination, including best corrected visual acuity, intra ocular pressure, biomicroscopy, posterior segment examination and OCT scan. The volume and thickness of each of the nine Early Treatment Diabetic Retinopathy zones at the macula were analysed for the total retinal thickness, retinal nerve fibre layer, ganglion cell layer (GCL) and inner plexiform layer (IPL). The circumpapillary retinal nerve fibre layer thickness. Associations between age, gender, refractive error and OCT measurements were explored. A smart phone application was created for clinical use. A-scans were extracted from the OCT machine and made available as an open access database.

Results: Two-hundred eyes from 146 participants, mean age (SD) 48.52 (17.52), 69 (47%) female were included. The mean retinal, GCL and IPL volumes

were significantly greater in males than females. Age and total retinal volume ($r = -0.2561$, $p = 0.0003$), GCL volume (-0.2911 , $p < 0.0001$) and IPL volume (-0.3194 , $p < 0.0001$) were negatively correlated. Smart phone application <http://normdb.com/> and open

access database <https://doi.org/10.6084/m9.figshare.14794839>

Conclusion: This study provides a normative database Heidelberg Spectralis OCT scans which may provide clinical utility for identifying abnormal patterns of change.

2:33pm - 2:40pm

S25 - FREE PAPERS - Glaucoma/Neuro-Ophthalmology

Study of ganglion cell complex and retinal nerve fibre layer in perichiasmatic brain tumour patients: A prospective observational study

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Purpose: Compressive lesions of anterior visual pathway can cause severe and permanent visual loss. Optical coherence tomography can pick up ganglion cell complex (GCC) thinning, even with normal retinal nerve fibre layer thickness and subtle visual field changes. We aim to find an association of GCC thickness with visual parameters in such patients.

Method: A prospective study was conducted on 37 patients with perichiasmatic brain tumour, operated between February 2019 and June 2020 at a tertiary care institute. Patients with ocular comorbidities were excluded. A comprehensive neuro-ophthalmological work-up was done. Documentation of demographic,

clinico-radiological, and surgical profile with 6 months follow-up, was done. Statistical analysis was significant at $p < 0.05$.

Results: Mean age was 35.14 ± 11.98 years. Pre-operative GCC thickness in 63.7% eyes measured $65.67 \pm 14.85 \mu$ and final post-operative GCC thickness in 53.6% eyes measured $66.19 \pm 15.62 \mu$. Improvement in mean visual acuity was noted at the final visit, the difference being statistically significant ($p = 0.03$). GCC thickness showed clinically positive correlation with visual acuity ($r = -0.48$, $p < 0.001$) and field defect ($r = -0.27$, $p = 0.04$) at six months post-operative period. The cut-off value beyond which blindness could be prevented was found to be GCC thickness of 92μ m.

Conclusion: Optical coherence tomography, a non-invasive tool, can aid in early diagnosis, monitoring, and detection of recurrence in perichiasmatic brain tumour patients. Apart from thinning of GCC, there is a positive correlation between GCC thickness, visual acuity, and field changes. Pre-operative GCC thickness $>92 \mu$ m is a strong predictor of visual recovery.

2:40pm - 2:47pm

S25 - FREE PAPERS - Glaucoma/Neuro-Ophthalmology

Magnetic resonance imaging analysis reveals intracranial volume is associated with multifocal VEP and retinal nerve fibre layer thickness measurements

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Purpose: To better understand whether visual pathway measurements are associated with brain volume changes, we assessed the relationships between retinal structural (optical coherence tomography, OCT), visual functional (multifocal visual evoked potentials, mfVEP), and brain structural assessments (magnetic resonance imaging, MRI) in healthy aging subjects.

Methods: Seventy-two healthy participants (144 eyes) with a mean age of 67.7 (9.0) years were recruited from the Optic Nerve Decline and Cognitive Change study for cross-sectional analysis. All participants underwent OCT peripapillary ring scan for retinal nerve fibre layer (RNFL) evaluation, mfVEP for amplitude measurements

and MRI for brain volume assessment in multiple regions including estimated total intracranial volume (TIV), cerebral white matter (WM) volume, hippocampus and putamen volume (3 Tesla). Associations between OCT, mfVEP and MRI parameters were analysed using generalised estimating equation models and adjusted for age, gender and eye as within-subject variables ($p < 0.05$).

Results: The estimated TIV was observed to be significantly associated with mfVEP amplitude ($p = 0.001$), global RNFL ($p = 0.03$) and temporal superior sector of RNFL thickness ($p = 0.04$). MfVEP amplitude is associated with cerebral WM volume ($p = 0.003$) and

putamen volume ($p = 0.04$). Association between putamen volume and nasal inferior RNFL ($p = 0.02$) was also noticed.

Conclusions: Our results suggest a significant association of RNFL and mfVEP amplitudes with estimated TIV. MfVEP amplitude was also associated with cerebral WM volume and putamen volume but not hippocampus volume. These observations indicate that the mfVEP and RNFL may parallel brain structural measurements in the aging population. Further longitudinal studies are planned in ageing and cognitively impaired subjects.

2:47pm - 2:54pm

S25 – FREE PAPERS – Glaucoma/Neuro-Ophthalmology

Stroke risk after ocular cranial nerve palsy – A systematic review and meta-analysis

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Purpose: Isolated ischemic 3rd, 4th and 6th cranial nerves palsies are prevalent conditions in neuro-ophthalmology practice. However, it is not clearly established whether such patients are at increased risk of stroke after onset of ocular cranial nerve palsies (ONCP).

Methods: Medline, PubMed Embase and Cochrane Central registers were systematically searched for eligible studies comparing isolated ischemic ONCPs against matched controls on the subsequent development of stroke with at least two years of follow up. Case reports

and series were excluded. Appropriate studies were entered for meta-analysis to determine hazard ratios. Search and data extraction was completed on 22 February 2021. Random effect models were used to generate pooled hazard ratios and 95% confidence intervals (CI).

Results: Three studies were suitable for meta-analysis (total $n = 2756$ ONCP cases and 21,239 matched controls). The meta-analysis demonstrated a hazard ratio of 5.96 (4.20-8.46 95% CI) of subsequent stroke after isolated ONCP within the first year. The hazard ratio reduced to 3.27 (2.61-4.10 95% CI) after five years although remains raised at 2.49 (1.53-4.06 95% CI) up to 12 years. The highest risk was demonstrated with 3rd cranial nerve palsies.

Conclusion: Ischemic OCNPs represent a significant risk factor for development of subsequent stroke in a similar magnitude to transient ischemic attack within the first year.

3:00pm - 3:30pm

Afternoon Tea

3:30pm - 5:00pm

CONCURRENT SESSIONS

S26 – PROFESSIONAL DEVELOPMENT

Venue: M1 & 2

3:30pm - 5:00pm

S27 – SYMPOSIUM

Chairs: A/Prof Celia Chen, A/Prof Clare L. Fraser and Prof Helen Danesh-Meyer

Venue: Great Hall 1 & 2

Title: What Happens after you've Diagnosed...

dr.celia.chen@gmail.com

Synopsis: Neuro-ophthalmology conditions often present with diagnostic and management dilemma. A close collaboration between an ophthalmologist and another specialist is often required to ensure best management for the patient. This symposium will cover four important neuro-ophthalmology conditions: optic neuritis, neuromyelitis optica, giant cell arteritis and arterial occlusion to the eye. In each condition, an ophthalmologist will present the perspective from the ophthalmology side including diagnostic dilemma and when to refer to a subspecialist. Then a neurologist or immunologist will present the perspective from their side to discuss the investigation and ongoing management issues.

Speakers and Topics:

Prof Helen Danesh-Meyer, A/Prof Clare L. Fraser, Dr Ioanne Anderson, Prof Pamela McCombe, Prof Simon Broadley, Dr David Heyworth-Smith

Optic neuritis

A/Prof Clare L. Fraser - Ophthalmology perspective

- Discussion of clinical presentation and diagnosis
- Discussion of investigations that an ophthalmologist should do
- When to refer to a neurologist

A/Prof Andrew Lee - Neurology/Neuro-immunology perspective

- Is the optic neuritis a clinically isolated syndrome or due to systemic demyelination
- Investigations and updated diagnostic McDonald Criteria 2017
- Management for clinically isolated syndrome and multiple sclerosis

Neuromyelitic Optica

Prof Helen Danesh-Meyer - Ophthalmology perspective

- Discussion of “typical” versus “atypical” presentation of optic neuritis
- Discussion of when clinical suspicion should be raised for neuromyelitis optica

Prof Simon Broadley - Neurology perspective

- Discussion of the diagnostic test(s) for Neuromyelitis Optica
- Presentation of the results from the Australia and New Zealand NMO Spectrum Disorder Collaboration study

Giant Cell arteritis

Dr Ioanne Anderson - Ophthalmology perspective

- Discussion of the clinical presentations of giant cell arteritis
- The investigation(s) organised by an ophthalmologist

Dr David Heyworth-Smith - Immunology perspective

- Steroid use and misuse
- Discussion of tocilizumab and steroid sparing agents

Arterial occlusion to the eye

Prof Lynn K. Gordon - Ophthalmology perspective

- Clinical presentation of arterial occlusions to the eye
- Acute management options

A/Prof Andrew Wong - Neurology perspective

- Discussion of vascular secondary prevention
- Discussion of the role of the TIA Rapid Assessment Clinics in Australia and how to access it

3:30pm - 5:00pm

S28 – COURSE

Chair: Dr Tim Haymet

Venue: Great Hall 3

Title: What Did I Miss... that I Really Need to Know NOW?

mosmaneye@gmail.com



Synopsis: This course attempts to help both the general and sub-specialist ophthalmologist ensure that they are across the most significant developments in nine major areas, and to provide helpful links to assist further self-directed learning in any subject of interest. (Time constraints mean that many of these important new facets can only be touched on briefly during the course.) Hopefully attendees will find that, while they may have most of the "bases" covered, they will take home a few invaluable pearls that had eluded them previously.

Speakers and Topics:

Dr Tim Haymet - Pretest
 Dr Caroline Catt - Paediatrics
 Dr Con Petsoglou - Cornea
 Dr Daniel Black - Cataract
 Dr David Wechsler - Glaucoma
 Dr Sophia Zagora - Uveitis
 Prof Mitchell Lawlor - Neuro
 Dr Brett O'Donnell - Oculoplastics
 A/Prof Max Conway - Oncology
 Prof Adrian Fung - Retina
 Dr Tim Haymet - Post test

3:30pm - 5:00pm **S29 – FREE PAPERS – Cataract/Cornea/Refractive**

Chairs: Prof Nigel Morlet and Dr Laurence Sullivan

Venue: M4

3:30pm - 3:37pm **S29 – FREE PAPERS – Cataract/Cornea/Refractive**

Glistenings in intraocular lenses: A collaborative study of risk factors including chromophore and time in-situ spanning 19 years

Josephine Richards¹, Anmar Abdul-Rahman², Philip House³, Isabelle Teo¹, **Jackson Lee**¹
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Background: To determine risk factors for glistenings in the diversity of intraocular lenses used in real world cataract surgical practice throughout Australia and New Zealand.

Methods: Nineteen surgeons from throughout Australia and New Zealand prospectively assessed glistenings in 742 intraocular lenses in situ for more than 300 days in eyes of 601 consecutive patients presenting for review of any type.

Results: Lens materials with 10 identifiable variations in chromophore and matrix were implanted between 2001 and 2020. Blue light filtering chromophore was present in 279 lenses and was the main risk factor for glistenings ($p < 0.0001$). A mixed effects Cox proportional hazard analysis indicated that chromophore increased the risk of glistenings by a factor of 5.97. Glistenings were more common in lenses with longer implantation times χ^2 (1, N = 742) = 98.4, $p < 0.0001$. In eyes in which chromophore intraocular lenses were implanted, uveitis, glaucoma and diabetes conferred an increased risk of glistenings. There was a declining trend for the implantation of blue light filtering compared to non-filtering chromophore lenses by RANZCO fellows over the last 5 years.

Conclusions: Blue light filtering chromophore and time in situ are the main risk factors for glistenings. Analysis suggested a trend for an increased risk in patients with uveitis, glaucoma and diabetes. A lengthy period of real-world surveillance by surgeons is essential when a new material comes into clinical use.

3:37pm - 3:44pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

Development and validation of cataract risk calculator: An assessment and consent tool for surgeons and patients

Deus Bigirimana¹, Ben Au¹, Brad Guo¹, Ebrar Al Yasery¹, Tess Ryan¹, In Young Chung¹, Rachel Jui-Chi Li^{1,2}, Alp Atik¹, Catherine Green¹, Anton Van Heerden¹
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Purpose: Various scoring systems to stratify pre-operative risk of complications during cataract surgery, including the New Zealand Cataract Risk Stratification, have been described. Their application in case selection has been shown to successfully reduce complication rates. However, the effect of the co-existence of more than one risk factor in an individual patient on the risk of complications has not been assessed. The aim of this study was to develop and validate a web-based predictive model for patient-individualised cataract risk estimation.

Methods: Data from 2011 eyes that underwent surgery between September 2019 and February 2020 were

analysed. Patient demographics and ophthalmic risk factors were recorded. Logistic regression models were developed to predict cataract surgery complications based on pre-operative risk factors. Subsequent validation was performed by retrospectively calculating the probabilities of complications and comparison with the incidence of complications from 574 eyes operated between January and February 2021 at the same institution.

Results: The risk factors that were included in the model were: age, pseudoexfoliation, small pupil, dense cataract, tamsulosin use, zonular dehiscence and anterior chamber depth (measured by biometry). There was no significant difference between predicted and observed rates of any complication (7.2% vs 8.2%) or PCT (1.78% vs 1.57%), $p > 0.05$. Predicted scores correlated strongly with the New Zealand Cataract Risk Stratification scores ($R = 0.78$, $p < 0.05$).

Conclusion: This novel web-based calculator provides estimated individual risk of surgical complications. Its application includes enhanced informed consent, risk – based case allocation, particularly for trainee surgeons and facilitates the inclusion of complexity of case-mix when interpreting audit data.

3:44pm - 3:51pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

An Auckland cataract study: Prospective study of gender, ethnicity and practitioner influence on the efficacy of sub-Tenon's anaesthesia in phacoemulsification

Corina M. Chilibeck¹, Charles N. J. McGhee^{1,2}, Rachael L. Niederer^{1,2}, Soobin Namkung¹, Jie Zhang¹, Akilesh Gokul¹, Jina V. Han^{1,2}
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Purpose: To establish predictors of good intra-operative control of analgesia, ocular movement and head movement after sub-Tenon's anaesthetic block (STB), and determine any association with intra-operative complications.

Methods: Auckland Cataract Study cohorts (tertiary hospital setting, 2017-2019) were amalgamated ($N = 1500$) for analysis of: anaesthesia type, administering practitioner,

analgesia score, control of ocular movement, control of head movement and intra-operative complications.

Results: A total of 1417 (95.2%) surgeries were performed under STB without sedation. Practitioners included 137 anaesthesiology doctors and two STB nurse-specialists. Subjects with good analgesia (94.1%) were more likely to have good control of ocular and head movement (odds ratio [OR] 17.297 and 3.685 respectively, $p < 0.001$). Subjects were less likely to have good control of ocular movement if they were females (OR 0.700, $p = 0.034$) or Māori or Pasifika ethnicity (OR 0.619, $p = 0.013$). Māori or Pasifika subjects were graded to have a dense cataract more frequently than other ethnic groups (65.8% vs 41.1%, $p < 0.001$) and were less likely to have good control of head movement even when controlled for cataract density (OR 0.570, $p = 0.028$). Subjects with a nurse-administered STB were more likely to have good control of head movement (OR 2.005, $p = 0.042$). Univariate analysis revealed poor to moderate analgesia, control of ocular or head



movement were risk factors for intra-operative complications.

Conclusion: Gender, ethnicity and nurse-administered STB are good predictors of ocular analgesia and control

of ocular or head movement. Poor or moderate analgesia and control of ocular or head movement were associated with intra-operative complications.

3:51pm - 3:58pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

Cataract surgery outcomes before and after applying risk stratification systems at a tertiary referral hospital

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Purpose: To assess the effect that two recently-developed cataract surgery risk allocation systems have on intra-operative complications of cataract surgery and compare these systems to allocation by clinician judgement.

Methods: Data was retrospectively collected for all cataract surgical patients at Westmead Hospital between 2017 and 2020. Patients' risk factors were used to score them using the United Kingdom Cataract Complexity Scoring System (UKCCSS) and the New Zealand Cataract Risk Stratification System (NZCRSS). These systems were then compared to the classification of a senior surgeon, described as clinical judgement (CJ).

Results: A total of 3245 eyes had adequate data for risk stratification. CJ, the UKCCSS and NZCRSS categorised 34.8%, 10.1% and 6.5% as high-risk, respectively. The intra-operative complication rate for the high-risk group (15.0-17.8%) was twice that of their low-risk group (6.1-8.8%) for all three systems. All three systems had low sensitivities for intra-operative complications, with CJ's sensitivity (56.7%) being considerably higher than the UKCCSS (19.5%) and NZCRSS (11.1%). However, CJ had poor specificity for detecting intra-operative complications (56.7%) compared to the UKCCSS (90.1%) and NZCRSS (93.4%).

Conclusion: This is the first study to externally validate the UKCCSS and NZCRSS as risk stratification systems for cataract surgery. CJ's relatively high sensitivity led to many more patients being classified as high-risk, but yielded an almost equivalent intra-operative complication rate to the two systems. Thus, the two systems should be used as strong adjuncts to CJ for allocating cataract surgery cases to trainees, thereby minimising overcalling of risk or compromising safety.

3:58pm - 4:05pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

Victorian experience of endophthalmitis following cataract surgery and the role of chloramphenicol eye drops

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Aims: To establish the relationship of topical chloramphenicol use following cataract surgery and the risk of post-operative exogenous endophthalmitis. Secondary outcomes of this study are to report patient demographics, visual consequences, risk factors and microbial cultures of endophthalmitis.

Methods: We conducted a retrospective study of cataract surgeries performed between December 2014 – April 2021 at the Royal Victorian Eye and Ear Hospital and recorded events of exogenous endophthalmitis following surgery. Post-operative chloramphenicol drops were no longer routinely prescribed to patients from April 2019 onwards. Endophthalmitis was defined as severe intraocular inflammation warranting intravitreal sampling and antibiotics.

Results: A total of 30,429 and 12,448 cataract surgeries were performed between December 2014 – March 2019 (period 1) and April 2019 – April 2021 respectively (period 2). Eight cases of endophthalmitis (0.026%) were identified in period 1 and four cases (0.032%) in period 2. The odds ratio of an endophthalmitis complication

post cataract with use of chloramphenicol drops was 0.82 (95% confidence interval 0.25 – 2.72), $p = 0.74$.

Conclusions: There is no evidence to suggest routine use of chloramphenicol drops changed the risk of

endophthalmitis following cataract surgery. The risk of endophthalmitis is low and seen in approximately 1 in 3000 cataract surgeries, regardless of the use of chloramphenicol drops.

4:05pm – 4:12pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

Efficient capture of real-world data for dry eye: The Save Sight Dry Eye Registry

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Purpose: The Save Sight Dry Eye Registry (SSDER) is the world's first web-based multinational, interdisciplinary registry able to collect high-quality data from patients in clinical settings. We report the characteristics of dry eye (DE) patients at their baseline visit.

Methods: The SSDER collected data from clinics in Australia, Spain and United Kingdom. Patient demographics, medical history, index visit characteristics, Ocular Surface Disease Index (OSDI) and Ocular Comfort Index (OCI) were recorded. Primary outcomes were

baseline demographic data and DE diagnosis and secondary outcomes; visual acuity, tear break up time (TBUT), OSDI and OCI score.

Results: At time of analysis, 28 clinicians from 21 practices were registered to use the registry. Data entry was performed in under 2 minutes. The registry produced a 'real-time' graphical output of the patient's treatment journey. A total of 143 eyes from 72 patients (90% female) were included. The mean \pm SD age was 59.2 \pm 15.7 years (range 24-86). Forty-nine percent of eyes had evaporative DE, 48% mixed DE and 3% had aqueous-deficient DE. The median visual acuity and TBUT were 83 logMAR letters (interquartile range [IQR] 75-85) and 4 seconds (IQR 1-7), respectively. Seventy-two percent and 54% of patients completed the OSDI and OCI, the median score was 25 (IQR 10-41) and 26 (IQR 14-35), respectively.

Conclusion: The SSDER is an easy-to-use tool able to facilitate the collection of large amounts of data for DE from real-world clinical settings. The data collected will allow the comparative analysis of patient treatment outcomes and longitudinal data for improved understanding of DE natural history.

4:12pm – 4:19pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

Construction and evaluation of an artificial neural network based screening tool for keratoconus using refractive error measurements

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Purpose: To construct and evaluate the performance of an artificial neural network-based screening tool for keratoconus using serial refractive error measurements in conjunction with simple patient demographic data obtained from optometry practices.

Design: Observational multi-centre retrospective case-control study.

Method: A dataset was formed using refractive error measurements and basic demographics from patients from optometry practices. A total of 59 features were engineered from the dataset. These features were used to train a deep neural network, which was then used to classify unseen data as belonging to either a normal or a keratoconic patient.

Results: Bilateral eyes of 544 patients (65 keratoconic and 479 controls) were included in the study dataset. The final model tested on unseen data had a sensitivity of 0.923 and specificity of 0.979. The model had a positive likelihood ratio of 43.85, and negative likelihood ratio of



0.08. Models trained using serial refractive error measurements had better performance than models trained using single refractive error measurements.

Conclusion: This study demonstrates that it is possible to construct a neural network-based screening tool which can

accurately differentiate between keratoconic and normal corneas using only basic demographic data and the results of serial subjective refractions. The performance of our tool is comparable to other published tools in the literature.

4:19pm – 4:26pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

Corneal nerve microstructure as a biomarker of diabetic peripheral neuropathy regression following bariatric surgery

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Purpose: Corneal nerve microstructure abnormalities have been demonstrated to precede the development of clinical neuropathy in diabetes. We investigated the relationship between corneal and clinical neuropathy by assessing the progression of corneal nerve microstructure, corneal sensitivity, and peripheral neuropathy in diabetic patients following bariatric surgery.

Method: Patients with type 2 diabetes were assessed prior to, and at 12, 26, and 52 weeks following, bariatric surgery. Measurements were made of corneal sensitivity, in vivo confocal microscopy quantification of

corneal sub-basal nerve density (SBND), and modified total neuropathy score (mTNS) by collation of neuropathy questionnaire, clinical assessment and biothesiometry. Statistical analysis employed linear mixed modelling.

Results: Twenty-nine participants (body mass index $44.7 \pm 6.4\sigma$ kg/m², duration of diabetes $11.6 \pm 7.6\sigma$ years) were recruited. Corneal SBND displayed a significant increase from a baseline estimated marginal mean of $12.20 \pm 1.0\sigma$ to $17.23 \pm 0.93\sigma$ mm/mm² by 52 weeks ($p < 0.001$). Concurrently, corneal sensitivity threshold fell from $1.11 \pm 0.15\sigma$ to $0.67 \pm 0.10\sigma$ mBAR ($p < 0.001$). Clinical neuropathy improved from an average mTNS score of $1.39 \pm 0.30\sigma$ to $0.34 \pm 0.14\sigma$ ($p = 0.003$). A significant inverse correlation was found between corneal SBND and sensitivity (β coefficient = -0.057 ± 0.013 , $p < 0.001$), and between corneal SBND and mTNS (β coefficient = -0.061 ± 0.020 , $p = 0.004$).

Conclusion: Corneal nerve microstructure and corneal sensitivity displays significant improvements following bariatric surgery. SBND improvements are correlated with concurrent improvements to neuropathic symptoms. These findings suggest a reversal of both small and large fibre neuropathy, and that in vivo confocal microscopy measured corneal microstructure may act as a biomarker for the regression of diabetic peripheral neuropathy.

4:26pm – 4:33pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

The outcomes of transepithelial corneal cross-linking: Real-world one-year outcomes from the save sight keratoconus registry

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Purpose: To report the efficacy and safety of transepithelial (epi-on) corneal cross-linking (CXL) for keratoconus, and compare the outcomes with that of the epithelium-off (epi-off) CXL.

Methods: Data from 18 practices in Australia and Italy were included. Thirty-three eyes underwent epi-on CXL (mean age 27.7 ± 11.0 years; female 35%; 61% CXL with ultraviolet-A power 45 mW/cm^2 for 2 minutes) and 619 eyes underwent epi-off CXL (mean age 27.2 ± 11.3 years; female 31%; 73% cases with ultraviolet-A power 9 mW/cm^2 for 10 minutes). Outcome measures included changes in visual

acuity (VA), keratometry, minimum corneal thickness (MCT), and frequency of adverse events.

Results: Epi-on CXL was undertaken in milder cases (mean baseline values for epi-on and epi-off CXL respectively: VA 70.1 ± 21.2 vs 62.2 ± 20.3 logMAR letters, Kmax 52.2 ± 11.3 vs 58.0 ± 8.6 D, K2 48.6 ± 8.5 vs 50.8 ± 6.2 D, MCT 457.6 ± 63.2 vs 455.6 ± 46.4 μ m ($p < 0.05$). The visual, keratometry and pachymetry outcomes in epi-on cases at one-year post-CXL were not statistically significant to the baseline values: mean

VA gain 3.0 (95% confidence interval, -0.1 to 6.2) logMAR letters; Kmax 0.3 (-0.7 to 1.3) D; K2 -0.1 (-0.5 to 0.4)D; and MCT 1.4(-9.2 to 12.1) μ m (all $p > 0.05$). The keratometry outcomes showed more flattening for epi-off than for the epi-on CXL (mean change in Kmax with epi-off CXL, -0.7 (-1 to -0.4) D; $p = 0.05$). Two (6.1%) eyes with epi-on CXL and 108 (17.4%) eyes with epi-off CXL had clinically significant haze.

Conclusions: Epi-on CXL produced less haze and did not produce corneal flattening.

4:33pm – 4:40pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

Comparison of standard versus accelerated corneal collagen cross-linking for keratoconus: Two-year outcomes from the save sight keratoconus registry

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Purpose: To compare two-year efficacy and safety of standard (UV power 3 mW/cm², duration 30 min) vs accelerated (9 mW/cm², 10 min) corneal cross-linking (CXL) in keratoconus using the real-world data from the Save Sight Keratoconus Registry.

Methods: Two hundred and fifty-four eyes (202 patients) who had standard CXL and 282 eyes (241 patients) who had accelerated CXL, with a follow-up visit at two-year post-CXL were included. Mean age was 26.0 ± 10.3

(standard 26.3 ± 9.9 vs accelerated 25.7 ± 10.5) years, and 31% female (standard 31% vs accelerated 32%). Outcome measures included changes in visual acuity, keratometry (Kmax; K2), minimum corneal thickness and frequency of adverse events. Outcomes were compared using mixed-effects regression models adjusted for age, sex, visual acuity, keratometry, pachymetry, doctor, practice and eye laterality.

Results: Adjusted mean changes (95% confidence interval) in outcomes were similar in standard and accelerated CXL [visual acuity, 4.71 (2.02 to 7.40) vs 3.08 (0.09 to 6.07) logMAR letters; Kmax, -0.78 (-1.49 to -0.07) vs -0.52 (-1.42 to 0.38)D; K2, -0.53 (-1.13 to 0.06) vs -0.61 (-1.32 to 0.10)D; minimum corneal thickness, -11.1 (-17.8 to -4.35) vs -13.5 (-21.10 to -5.90) μ m. None of the differences between the protocols was statistically significant (all $p > 0.05$). The frequency of adverse events was low in both groups (standard, 7[2.8%; clinically significant haze 5; progressive keratoconus 2] and accelerated, 9[3.2%; clinically significant haze 7, scarring 2]).

Conclusions: Both standard and accelerated CXL were similarly safe and effective in stabilising keratoconus at two years post-surgery, with improved visual and keratometry outcomes.

4:40pm – 4:47pm

S29 – FREE PAPERS – Cataract/Cornea/Refractive

Effectiveness and outcomes of multifocal intraocular lens implantation in the public sector

Christopher Z. Go^{1,2}, Cheng Fei Kong¹, Andrew White^{1,3}, Chameen Samarawickrama^{1,3}

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³Sydney Medical School, Discipline of Clinical Ophthalmology and Eye Health, The University of Sydney, Sydney, Australia



Purpose: To investigate the effectiveness and outcomes of patients undergoing multifocal intraocular lens (mIOL) implantation in the public sector.

Method: A single-surgeon (CZG) prospective randomised case series of eligible patients undergoing cataract surgery and mIOL implantation at a tertiary Sydney hospital. Patients' visual outcomes including distance, intermediate and near visual acuity, target and subjective refraction as well as a quality of life satisfaction questionnaire to determine their spectacle dependence post mIOL implantation. Patients will be randomised to receive one of 3 mIOL; Zeiss AT LISA, Johnson & Johnson Synergy and Lentis Mplus.

Results: Subjects recruitment and mIOL implantation is ongoing and the authors are expecting to implant 60 eyes in 30 patients over the course of the year and expecting to report at least preliminary results of 30 eyes by November 2021, providing real world data of mIOL being used in the public sector.

Discussion: This study aims to report the outcomes and effectiveness of mIOL implanted to provide real world data of these lenses in the public sector. This study will provide us with greater understanding on whether these lenses will be suitable for long term use in the public sector and provide a framework for a pathway to be created for eligible patients in the future.

TUESDAY 1 MARCH SPEAKERS

6:30am - 7:45am

H08 – ANZGS Morning Symposium Sponsored by Allergan**Title:** The Functional Consequences of Glaucoma and Why They Matter

Dr Pradeep Yammanuru Ramulu

Chair: Prof Keith Martin**Venue:** M4

Synopsis: That we see glaucoma patients every day, we may not understand the profound ways in which visual field damage and the treatment of disease impacts our patients on a daily basis. This lecture will review the real world consequences of glaucoma, including its impact on reading, driving, personal safety, mobility and activities of daily living. Possible bidirectional associations between behaviour and disease will be discussed, as will specific methods and approaches to decrease functional impairment in this patient population.

8:00am - 8:30am

L09 – GLAUCOMA UPDATE LECTURE**Title:** Novel Concepts in Evaluating Functional Damage in Glaucoma

Dr Pradeep Yammanuru Ramulu

Chair: Dr Ridia Lim**Venue:** M3

Synopsis: Functional testing in glaucoma has heavily relied on testing of the visual field in the central 24-30 degrees. However, glaucoma should be understood as a disease which affects a wide range of visual measures beyond visual field damage, many of which can be useful in understanding the impact of disease. Of course, visual field damage remains a mainstay for the clinical diagnosis of glaucoma and for the assessment of progression. But new concepts are emerging regarding visual field testing. This lecture will present data on the strengths and pitfalls of new algorithms for more rapid field testing and offer evidence-based insights on how to better integrate visual field reliability data into clinical decision making. New emerging technologies to capture visual field testing using novel platforms will also be discussed as well all the methods to assess the quality of life impact of glaucoma on the individual within the daily flow of clinical care.

8:30am - 10:00am

P09 – PLENARY SYMPOSIUM**Title:** Improving Eye Health for Aboriginal and Torres Strait Islander Peoples – Equity in Everyday Ophthalmic Practice

ggillor@unimelb.edu.au

Chairs: Dr Kristopher Rallah-Baker and Prof Hugh Taylor**Venue:** M3

Synopsis: Nine years after the release of the Roadmap to Close the Gap for Vision policy framework in 2012, eye health access and outcomes for Aboriginal and Torres Strait Islander Australians have measurably improved, but are yet to deliver equity with other Australians. The symposium will identify and explore practical measures that can be taken by ophthalmologists to contribute to improved and sustained access and outcomes for Aboriginal and Torres Strait Islander Australians.

In this session, speakers will identify practical contributions that ophthalmologists can make towards this goal in their own everyday work and practice, for those practicing both in urban centres and regional areas. Key topics include cultural safety, relationships and collaborations, patient identification and establishing effective pathways of care. Solutions to improved availability and access for ophthalmic services will be explored. The symposium will include a Questions and Answers session featuring presenters as an expert panel. Participants will discuss various experiences, strategies and approaches to improve eye health outcomes of Aboriginal and Torres Strait Islander Peoples living in the delegates' catchment area.

**Speakers**

Prof Hugh Taylor
Dr Kristopher Rallah-Baker
Prof Nitin Verma
Dr Rosie Dawkins
Dr Kristin Bell
Mr Shaun Tatipata
Dr Eline Whist

10:00am - 10:30am

Morning Tea

10:30am - 11:00am

L10 – THE FRED HOLLOWES LECTURE**Title:** Disruption and Innovation: Challenges and Opportunities in Ophthalmology

A/Prof Catherine Green AO

Chair: Dr Diana Conrad**Venue:** M3

Synopsis: Two types of innovation, defined as “the use of a new idea or method”, have been described. The first, sustaining innovation, makes something bigger or better. The second is disruptive innovation, which disrupts the bigger-and-better cycle, bringing to market a product or service that is more affordable and easier to use, allowing a whole new population of consumers to access a product or service that was historically only accessible to consumers with more money or greater skill. The introduction of affordable intraocular lenses for patients in developing countries, as championed by Professor Fred Hollows, is an example of a disruptive innovation that has had a profound impact on eye health globally.

The year 2020 will be remembered for the global disruption caused by a pandemic that will have ramifications for decades to come. 2020 also marked the culmination of a global initiative for the elimination of avoidable blindness, VISION 2020: The Right to Sight. Despite the global prevalence of blindness falling by 28% in the past 30 years, in 2020, 43.3 million people were blind and 553 million had vision impairment, with evidence of significant inequities. The COVID-19 pandemic has impacted eye health; however, innovations that address this disruption may present opportunities to improve eye health even after the pandemic is under control. A systems approach is required, with innovation not only in eye care delivery but in policy, workforce planning and education. Of course, we should promote sustaining innovations, but also be looking for truly transformative (disruptive) innovations that provide opportunities for improving eye health in ways not previously considered.

CATARACT

Breaking conventions while performing phacoemulsification in a posterior polar cataract

Sunil K. Thangaraj¹, Geoffrey Cohn^{2,3,4}

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¹OEU Lions Eye Hospital, Garividi, India, ²UNSW Sydney, Sydney, Australia, ³Myanmar Eye Care Project, Myanmar,

⁴Cambodia Eye Care Project, Cambodia

Conventionally we are taught not to hydro-dissect or rotate the nuclear epinuclear complex in cases of posterior polar cataracts. This frequently makes the surgery not only difficult but also can result in the very complications we are trying to avoid.

This video details three cases where the author breaks these very conventions and shows that by maintaining an environment of low intraocular pressure and never over inflating the anterior chamber we can perform both hydro-dissection and rotate the nuclear epinuclear complex. This makes the surgery much less complex than if we were to follow the recommended rules.

Coloboma lens – Chronology of events over seven years after phacoemulsification

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⁴Cambodia Eye Care Project, Cambodia

This is a rare case of a 35 year old woman who presented with bilateral inferior coloboma of the lens with significant nuclear sclerosis about seven years ago.

She underwent phaco with a foldable intraocular lens (IOL) and capsular tension ring implant in the right eye. At the end of the surgery the IOL was centred well and she presented seven years later with a superior subluxation of the IOL bag complex for which an anchor suture was placed. She also underwent a similar procedure of phaco with CTR in the fellow eye as well seven years ago but this

had no similar complication to date. The video however only depicts the right eye surgery.

Four flange fixation – Modern intrascleral intraocular lens fixation technique

Colby Hart, Bryan Matthews

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Royal Melbourne Hospital, Melbourne, Australia

Fixation of intraocular lenses following loss of capsular support pose a myriad of challenges to the ophthalmologist. We present a series of cases showing intrascleral intraocular lens fixation using the four-flanged Akreos Advanced Optics lens. This video displays the technique of loading the lens with 6.0 prolene sutures prior to insertion, scleral tunnelling with a 30G TSK needle and fixation with low temperature cautery. This unique technique is a modification of the Canabrava method of fixation, using a smaller wound than has previously been described.

Artisan phakic intraocular lens explantation and phacoemulsification

Uday Kumar Bhatt

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Vision Eye Institute, Melbourne, Australia

With a significant number of Artisan phakic intraocular lenses (IOL) implanted in the last two decades, we are likely to encounter patients with such IOLs coming with cataracts. This presents a unique challenge of explanting a rigid IOL needing a large incision and then performing phacoemulsification that is best performed through a small incision. This video shows how to tackle this issue.

Implantation of Malyugin ring with bevel down inserter technique

Uday Kumar Bhatt

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Vision Eye Institute, Melbourne, Australia



Malyugin ring is used to mechanically dilate small pupils during cataract surgery. The current version of this single-use device, the Malyugin Ring System, consists of a holder and inserter packaged together with each ring. The inserter is used to withdraw the ring from the holder. It also introduces the ring into the anterior chamber and removes the ring from the eye. Standard teaching is to introduce the ring inserter tip in bevel up position. However, the insertion becomes easier and less traumatic by keeping the inserter bevel down. This video shows this insertion technique.

CORNEA

An educational video to support the treatment of herpes simplex keratitis

Maria Cabrera-Aguas^{1,2}, Stephanie L. Watson^{1,2}

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¹Save Sight Institute, The University of Sydney, Sydney, Australia, ²Sydney Eye Hospital, Sydney, Australia

This short animated educational video was created to disseminate the treatment guideline for Herpes Simplex Keratitis (HSK) developed by The University of Sydney, Save Sight Institute in collaboration with the Sydney Eye Hospital. This five-minute video was created using Animaker, an online do-it-yourself animation video website. This guideline was based on published evidence and included treatment recommendations for epithelial HSK, stromal HSK with ulceration, stromal HSK without ulceration, endothelial HSK, keratouveitis, HSK prophylaxis, and renal dosing for adults, topical and systemic treatment recommendations for paediatric patients and recommendations for pregnancy. This is a useful video for consultants and trainees in ophthalmology to learn about the HSK treatment guideline created at the Sydney Eye Hospital.

EPIDEMIOLOGY/PUBLIC HEALTH

The 4eyes vision kit – An innovative way of tackling uncorrected refractive error in remote and disadvantaged communities

Sarah Crowe

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Uncorrected refractive error is a major cause of visual impairment worldwide, affecting over one billion people, mainly in remote and disadvantaged communities. There is a lack of professionals to test for refractive error, people

are not able to travel to where testing is available, and prescription glasses are not affordable to the majority.

The 4eyes Vision system is an innovative method of tackling this problem. It is an affordable, transportable kit that contains everything a layperson needs to test for and dispense affordable customised glasses on the spot. It is administered at the community level, in a culturally safe environment. It involves basic screening and eye health education, which will hopefully lead to increased awareness of and participation in available professional eye health services.

This short film introduces the 4eyes Vision system and shows it at work in Papua New Guinea.

GLAUCOMA

Subconjunctival air dissection technique for mitomycin C application combined with primary needling for XEN Gel Stent implant

Luke C. Northey^{1,2}, Andrew J. White^{1,2}

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¹Department of Ophthalmology, Westmead Hospital, Sydney, Australia, ²Discipline of Ophthalmology, Sydney Medical School, The University of Sydney, Sydney, Australia

This film exhibits a surgical technique for subconjunctival mitomycin C application using air dissection prior to XEN Gel Stent implant followed by primary needling. A 30-gauge sharp needle is used to enter the subconjunctival space in the superonasal quadrant and 0.3 mL of air is injected to achieve subconjunctival 'air dissection'. 0.2 mL of 0.2 mg/mL mitomycin C is then injected into this dissection plane. The XEN Gel Stent implant is inserted ab interno under direct visualisation and primary needling is performed with a 30-gauge needle to ensure there is no entrapment within Tenon's capsule.

Phacoemulsification cataract surgery combined with ab interno canaloplasty and hemi-gonioscopy assisted transluminal trabeculectomy in primary open angle glaucoma

Bentley Logan, Anne Lee, Jason Cheng

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Liverpool Hospital, Sydney, Australia

This film demonstrates a modified glaucoma surgical technique using the iTrack™ microcatheter: a minimally invasive glaucoma surgery device. The surgery is combined with cataract surgery and involves ab

interno canaloplasty followed by hemi-gonioscopy assisted transluminal trabeculotomy.

The utilisation of Reiss Patel Technique Forceps and iTrack™ microcatheter in ab interno canaloplasty

Jason Cheng^{1,2,3}, Anne Lee^{4,2}

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¹Liverpool Hospital, Sydney, Australia, ²UNSW Sydney, Sydney, Australia, ³Western Sydney University, Sydney, Australia, ⁴Liverpool Hospital, Sydney, Australia

This surgical technique video is a step-by-step guide on how to perform ab interno canaloplasty using the Reiss Patel Technique forceps and iTrack™ microcatheter. The RPT “All-In-One” forceps are designed to combine the surgical steps of goniotomy creation and canal intubation to reduce surgical time and reduce blood obscuration of the goniotomy site.

Novel method for ciliary sulcus placement of glaucoma drainage devices

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Sulcus tube placement is associated with lower endothelial cell loss rates and is considered to be the standard of care for pseudophakic patients. Many techniques for sulcus tube placement involve needle docking or countless surgical steps. This surgical video presents a novel method of ciliary sulcus tube placement that requires minimal equipment, minimises surgical steps and can be performed even when there is compromised surgical visibility of the anterior chamber.

NEURO-OPHTHALMOLOGY

Patient narratives – Through the eyes of the patient: A video of patients narrating their giant cell arteritis illness

Chirag Patel, Jane Wells, Jamie Craig

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Flinders University, Adelaide, Australia

Giant cell arteritis is a sight-threatening condition that cannot and should not be missed. Patient narrative videos have been used in various disciplines to improve learning through a symbiotic model. Learning from patients' illness experience can be helpful for both undergraduates as well postgraduate students. It encourages patient centred care and empathy as well as an understanding of patient reported symptoms and key features. This video, which is part of a research study looking at student views on the utility of such videos, provides two cases of the impact from a patient perspective of delayed diagnosis of giant cell arteritis, which led to blindness.

OCULOPLASTIC/ORBIT

Involitional lower eyelid entropion repair via the trans-conjunctival approach

Jwu Jin Khong

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The Royal Victorian Eye and Ear Hospital, Melbourne, Australia

Involitional lower eyelid entropion repair is usually performed via subciliary skin incision. Inherent to the nature of the procedure, complications include lower eyelid retraction, post-operative ectropion and entropion recurrence. Transconjunctival entropion repair, as first described by Dresner and Karesh, holds the promise for lesser entropion recurrence and no ectropion and eyelid retraction complications. This surgical video is a modified version of the transconjunctival entropion repair, to be considered under the category of surgical technique.

Combined external-endonasal approach for exophytic papilloma of the lacrimal sac and nasolacrimal duct

Alexandra I. Manta, Timothy J. Sullivan

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Royal Brisbane and Women's Hospital, Brisbane, Australia

Exophytic squamous papilloma of the lacrimal sac and nasolacrimal duct is a very rare benign tumour that can mimic innocuous primary nasolacrimal duct obstruction. A 23 year old female presenting with chronic epiphora for five years and recent haemolacria was investigated with a computed tomography scan,

which showed a suspicious mass within the lacrimal apparatus. She underwent exploratory surgery with intra-operative frozen sections, which confirmed an exophytic papilloma. This film presents a combined external and endonasal excision of the lacrimal sac and nasolacrimal duct for the curative treatment of an exophytic squamous papilloma of the lacrimal drainage system.

OTHER

“Misperception” – An ophthalmology trainee’s take on preparing for the first cataract surgery

Tanya Kowalski
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Royal Victorian Eye and Ear Hospital, Melbourne, Australia

“Misperception” is a stop motion animated short film that puts a fun spin on the trainee ophthalmologist’s journey through learning cataract surgery for the first time. Join the Lego registrar as she discovers that microsurgery takes more manual dexterity than just playing video games; take a trip down memory lane of practising your capsulorrhexis on organic edibles; and discover the impact that virtual reality surgical simulation has on improving the surgical outcomes of both patients and fruit. Nostalgia guaranteed.

REFRACTIVE SURGERY

Filling the gap – Artificial iris intraocular lenses

Tabitha M. Scott¹, Graham A. Lee^{1,2,3}
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¹City Eye Centre, Brisbane, Australia, ²University of Queensland, Brisbane, Australia, ³The Mater Hospital, Brisbane, Australia

Loss of the iris results in glare, loss of accommodation and poor cosmesis. This video will describe the various types of artificial iris intraocular lenses (IOL), the current market availability and the surgical technique for the Reper artificial iris IOL insertion with post-operative outcomes. The Reper artificial IOL is the only available foldable hydrophobic acrylic IOL with an iris diaphragm. There are 1200 colours available to match the patients existing iris.

SMILE rescue: Delayed lenticule removal in a patient with high myopia

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Purpose: First successful case of delayed lenticule extraction following an incomplete SMILE procedure. To report the first case of a successful stromal lenticule extraction, 18 weeks after an aborted small incision lenticule extraction procedure (ReLEX[®] SMILE).

Method: Video presentation of a case report, surgical technique and outcomes.

Results: SMILE was planned in both eyes in another centre to correct high myopia. The right eye was treated uneventfully, with normal intraoperative course and uneventful postoperative recovery. While femtosecond laser was applied to the left eye, the lenticule was unable to be reviewed. After the patient sought a second opinion, eighteen weeks later, lenticule extraction was re-attempted with success. Uncorrected distance visual acuity improved from count fingers to 20/15, with a successful refractive outcome as planned. The video demonstrates the surgical challenges and techniques to perform a delayed lenticule extraction.

Conclusion: This video presentation demonstrates that a corneal plane such as created with ReLEX SMILE can be found and dissected at a later time, in this case 18 weeks after initial creation.

RETINA

Unassisted vitreous base shaving using the modified illuminated scleral depressor

Yiran (Ian) Tan, Wilson Wong, David Sia, Shane Durkin, Jagjit Gilhotra, Weng Chan
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This film demonstrates the use of a modified illuminated scleral depressor during unassisted vitreous base shaving. We assembled a cost-efficient instrument using a modified cotton swab as a disposable light pipe adapter. The modified cotton swab is a substitute for specialised commercial adapters and allows light pipes of any gauge and make to be converted into a modified illuminated scleral depressor. Our instrument provided adequate transillumination of the peripheral retina, and is a cost-efficient and more accessible alternative to commercially available disposable caps.

Back from the brink – Management of choroidal haemorrhage

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¹City Eye Centre, Brisbane, Australia, ²University of Queensland, Brisbane, Australia, ³Royal Brisbane and Women's Hospital, Brisbane, Australia

Choroidal haemorrhage is a sight-threatening complication requiring prompt surgical management. It can occur as a complication of ocular surgery or trauma and may lead to high intraocular pressure with associated pain and inflammation. Surgical drainage is indicated in patients with choroidal detachment, raised intraocular pressure, retinal apposition, and anterior chamber flattening. This film will describe the presentation, risk factors and imaging modalities of choroidal haemorrhage, surgical technique and outcomes with timely intervention.

Patient information video – Face-down positioning after vitreoretinal surgery

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Patients are often required to position face down after vitreoretinal surgery for macular hole and retinal detachment repair for days to weeks. This is often challenging for many patients and can cause significant distress. We

developed a patient information video that demonstrates how to position face down in a variety of positions to improve patient confidence and comfort after surgery. The video is presenter is computer generated, which decreases the funding required for production and allows the video to be easily produced in many languages, without compromising quality or rapport.

STRABISMUS

Muscle spacer for large angle exotropia

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A young adult presented with outward deviation of eye. On examination he had 90 prism dioptres of exotropia with no limitation of extraocular movement. His vision was light perception in right eye along with optic atrophy. As the patient did not want his left to be touched we decided to perform a maximal lateral rectus recession and medial rectus resection in right only. However, for this extra large sensory exotropia we had to supplement it with a muscle segment taken from the resected medial rectus. The excised portion of the resected medial rectus was sutured to the lateral rectus with non-absorbable suture and the other end of this was attached to the intended site for recession. The patient was orthotropic at 6 months follow up. Muscle transplantation can be help augment recession effect in such large sensory deviations without risk of rejection.

CATARACT

Is zero incidence of post-operative endophthalmitis after cataract surgery achievable?Miao Y. Lim¹, Keith Ong^{2,3,4,5}

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Purpose: For over 10 years, there have been zero cases of post-operative endophthalmitis (POE) after cataract surgery at Chatswood Private Hospital. We conducted a retrospective audit study to evaluate the reasons for this, as well as the different preferences for route of antibiotic prophylaxis used.

Methods: Deidentified data on cataract surgery cases between the years 2010-2020 were extracted and analysed descriptively.

Results: A total of 28,937 cataract surgery cases were performed at Chatswood Private Hospital from 2010-2020, for which no cases of POE were identified. The intracameral route for antibiotic prophylaxis was more commonly used compared to subconjunctival or both.

Conclusion: Administration of prophylactic antibiotics, regardless of the route of administration, is beneficial and equally effective in preventing POE. Having operating theatres dedicated to ophthalmology helps maintain high standards of sterility of instrumentation and operating environments.

Using tropicamide instead of cyclopentolate for pupil dilation in cataract surgery reduces incidence of post-operative intraocular pressure riseRachel Xuan^{1,2}, Keith Ong^{1,3}

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Purpose: To compare the incidence of intraocular pressure (IOP) elevation post cataract surgery between using shorter-acting tropicamide or longer-acting cyclopentolate.

Method: This retrospective, consecutive audit was conducted at a tertiary care centre in Sydney, Australia from November 2019 to March 2021. The two regimens used by ophthalmic surgeons in the department were (A) phenylephrine 1% and cyclopentolate 2.5% or (B) phenylephrine and tropicamide 1%. Electronic medical records of 200 patients (Group A, n = 100; Group B, n = 100) were retrospectively accessed to record pre- and day 1 post-operative IOP of patients who had undergone uncomplicated cataract operations. Patients with a history of glaucoma were excluded from the study.

Results: The percentage of patients with a higher IOP on day 1 post-op was 46% in Group A and 32% in Group B. The mean post-operative IOP in Group A was higher than in Group B (14.4 ± 1.2 vs 13.1 ± 4.9 mmHg). A higher rise in mean IOP was detected in the operated eyes of patients in Group A compared to Group B (1.17 ± 1.1 mmHg, $p = 0.038$ vs -0.51 ± 0.9 mmHg, $p = 0.28$). A significant mean IOP elevation in patients with a clinically significant post-op IOP was detected in Group A (8.5 ± 4.4 mmHg, $p = 0.0012$).

Conclusions: Prolonged mydriasis and cycloplegia with cyclopentolate has a higher incidence of IOP rise at day 1 post-op compared to using tropicamide. This may be of low clinical relevance in a healthy eye but glaucomatous eyes and patients with poor circulation may be compromised by post-op IOP rise.

Subconjunctival antibiotics – An alternative to intracameral antibiotics for endophthalmitis prophylaxis in cataract surgeryRachel Xuan^{1,2}, Elizabeth L. S. Wong^{1,2}, Keith Wong^{1,3}

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¹Department of Ophthalmology, Royal North Shore Hospital, Sydney, Australia, ²UNSW Sydney, Sydney, Australia, ³Northern Clinical School, The University of Sydney, Sydney, Australia

Background: There has been an increase in the use of routine intracameral antibiotics for endophthalmitis prophylaxis in cataract surgery. However, this can be

associated with serious adverse events. Previously, subconjunctival antibiotics were the preferred route but there is minimal literature directly comparing the two. Hence, the safest and most efficacious route of prophylactic antibiotic administration remains controversial.

Purpose: To evaluate the efficacy and safety of subconjunctival with intracameral antibiotics for post-operative endophthalmitis (POE) prophylaxis in patients undergoing uncomplicated cataract surgery.

Methods: A literature review was conducted in Cochrane and PubMed for studies that compared the efficacy of prophylactic subconjunctival and intracameral antibiotics for post-cataract endophthalmitis. Searches were not limited to English or study design.

Results: Three observational studies showed that subconjunctival and intracameral antibiotics both reduced POE rates. Intracameral antibiotics demonstrated a high efficacy (odds ratio 0.25, 95% confidence interval 0.13-0.46, $p < 0.0001$) but was also associated with increased potential complications. All studies were conducted in a sequential nature during which cataract surgery techniques and instrumentation have improved in recent years.

Conclusion: In institutions with a high incidence of endophthalmitis, routine intracameral antibiotic use would be more appropriate. However, in facilities with lower rates of POE, the subconjunctival route of delivery can be an alternative due to its better safety profile.

Incidence of post-cataract surgery endophthalmitis: A chronological review and intercontinental comparison

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Purpose: This literature review aimed to investigate the global incidence of post-operative endophthalmitis (POE) after cataract surgery over the last three decades, with a particular focus on the use of prophylactic intracameral antibiotics.

Methods: A literature search was carried out in PubMed and Scopus. Data was collected from included studies and analysed in IBM SPSSv27.

Results: A total of 63 studies from 20 regions were included. The use of prophylactic intracameral antibiotics significantly reduced POE incidence. The baseline POE incidence in studies that involved intracameral prophylaxis tended to be high. A downward linear trend in POE

incidence was observed in studies that did not involve intracameral antibiotic prophylaxis. Interestingly, a study in Japan reported the use of intracameral antibiotic prophylaxis in only 10.4% of cataract surgeries with an overall POE incidence of 0.025%, which is comparable to countries that use intracameral prophylaxis routinely. Within studies from Australia, China, Europe, India, Singapore and US, Australia had the highest POE incidence with and without intracameral prophylaxis, while China had the lowest POE incidences.

Conclusion: Intracameral antibiotics are an effective prophylaxis against POE. However, the incidence of POE is decreasing worldwide even without intracameral prophylaxis. The benefits of intracameral antibiotics should be weighed against its risks prior to implementation as routine prophylaxis protocol for cataract surgery.

Effectiveness and outcomes of enhanced depth of focus intraocular lens implantation in the public sector

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Purpose: To investigate the effectiveness and outcomes of patients undergoing enhanced depth of focus (EDOF) intraocular lens (IOL) implantation in the public sector.

Method: A single-surgeon (CZG) prospective case series of eligible patients undergoing cataract surgery and EDOF-IOL implantation at a tertiary Sydney hospital. Patients' visual outcomes including distance, intermediate and near visual acuity, target and subjective refraction as well as a quality of life satisfaction questionnaire to determine their spectacle dependence post EDOF-IOL implantation.

Results: Subjects recruitment and intervention is ongoing and the authors are expecting to report on outcomes of at least 50 participants by November 2021, providing real world data of EDOF-IOL being used in the public sector. The authors will also collect data from subjects who have had monofocal lenses implanted in the other eye where possible and use those results as control.

Discussion: This study aims to report the outcomes and effectiveness of EDOF-IOL implanted to provide real world data of these lenses in the public sector. This study



will provide us with greater understanding on whether these lenses will be suitable for long term use in the public sector and provide a framework for a pathway to be created for eligible patients in the future.

Impact of COVID-19 on elective cataract outpatient's wait time at a tertiary public hospital in Sydney, Australia

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Purpose: To study the impact of the COVID-19 pandemic on the cataract outpatient waiting list at Liverpool Public Hospital and the effectiveness of subsequent service restructure.

Methods: A retrospective review of the Liverpool Hospital cataract outpatient clinic waiting time comparing pre-COVID (Sept 2019-Feb 2020) to the COVID pre-intervention period (March 2020-Aug 2020) and COVID post intervention period (Sept 2020-Feb 2021) where outpatient clinics on Saturday were initiated. Urgent cataract referrals should be seen within 30 days and non-urgent cataract referrals should be seen within 365 days of registration.

Results: The mean waiting time for a non-urgent cataract referral was 461.1 [STD = 11.7] days during the pre-COVID period compared to 577.6 [STD = 44.7] days (25% increase) during COVID preintervention period. The mean waiting time increased to 596.6 [STD = 13.5] days during the COVID post-intervention period.

The mean non-urgent cataract clinic waiting list increased from 1126.8 patients [STD = 63.5] (pre-COVID period) to 1269 [STD = 54.6] (COVID pre-intervention period). This was despite a 7% reduction (76.3 to 71) in monthly non-urgent cataract referrals during the same time periods. After the introduction of the Saturday Clinic, this number was reduced to 896.1 patients (30% reduction compared to COVID pre-intervention period).

Conclusions: The COVID-19 pandemic has caused a 25% increase in cataract clinic waiting times at Liverpool hospital. The introduction of Saturday cataract clinics has reduced the number of patients on the waiting list by 30% but the mean wait time is still above the target of 365 days at 596.6. Further measures are required to improve the service.

Phakochronology

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Purpose: Using phakochronology to estimate rate of crystalline lens growth in adult.

Method: Two adults with history of open globe injury (retinal foreign body with self-sealed corneal perforation) were recruited for the study; subjects being unique that lenticular opacity caused was minimal and remained so. Both subjects at the time of examination had a tract of localised lenticular opacity (in trajectory of retinal foreign body in first, and iris perforation in second) which was separated from the anterior capsule by a clear non-cataractous area. The anterior-most point of lenticular opacity depicted the point in timeline when the injury had occurred. Subsequent laying of new lens fibres behind the anterior lens epithelium pushed the opacity back deeper into lens substance. Anterior segment optical coherence tomography was used to measure the depth of the lenticular scar, which indirectly gave the linear dimension of newly formed lens fibres after injury. This was divided by the time since injury to calculate rate of lens growth.

Result: Patient 1 was a 58-year-old male with chisel injury 16 years ago, and intralenticular opacity 480 microns behind anterior capsule; lenticular growth rate calculated to be 81.99 nanometres/day. Patient 2 was a 30-year-old male with blast injury and multiple intraocular foreign bodies 24 months ago (vitrectomised), and intralenticular opacity by one such foreign body was 156 microns behind the anterior capsule; lenticular growth rate calculated to be 216.67 nanometres/day.

Conclusion: We have used phakochronology to estimate rate of lens growth in two different individuals.

Novel technique to measure intraocular lens decentration using ultrasound biomicroscopy

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Purpose: To propose a novel technique to measure intraocular lens (IOL) decentration using ultrasound biomicroscopy.

Method: Ultrasound biomicroscopy was done for a 7-year-old pseudophakic boy, who had been operated for lens aspiration, anterior vitrectomy and 3 piece lens in sulcus with optic capture (for post penetration injury cataract

development). The horizontal displacements of the optic edge from the scleral spur were noted using in-built callipers (ideally in case of a centred IOL, the two measurements should be equal). The two displacements were subtracted and divided by 2 to objectively give the magnitude of IOL decentration from the centre of visual axis.

Result: The optic edge displacement horizontally was 2.589 mm from one side and 2.194 mm from the diagonally opposite end of scleral spur. Horizontal decentration here was calculated to be 0.1975 mm in the particular meridian.

Conclusion: We propose a novel technique to measure IOL decentration using ultrasound biomicroscopy.

Cataract surgery in herpes simplex virus ocular disease

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Purpose: To investigate the outcomes and complications associated with cataract surgery in eyes with herpes simplex virus (HSV)-related anterior segment ocular disease.

Methods: Clinical records of patients diagnosed with HSV-related keratitis and/or anterior uveitis who underwent subsequent cataract surgery in the affected eye were reviewed. This was a retrospective observational cohort study set in Auckland, New Zealand. Main outcomes measured: visual outcome, complications, recurrence.

Results: Thirty-seven eyes of 37 subjects were included. Intra-operative complications occurred in one subject (2.7%) with iris prolapse. Keratitis or uveitis recurred post-operatively in 17 subjects (45.9%); 22.5% experienced recurrences in the first year following surgery. One case of post-operative cystoid macular edema (2.7%) and one post-operative endophthalmitis (2.7%) occurred. Corrected distance visual acuity at three months was >20/50 in 21 subjects (70.0%), 20/50 – 20/200 in four subjects (12.9%) and ≤20/200 in six subjects (19.4%). Vision improved in 26 eyes (83.9%) and worsened in only one eye (3.2%). Risk of recurrent inflammation was associated with greater number of recurrences prior to surgery (hazard rate [HR] 1.31), time quiescent prior to surgery (HR 0.48) and iris transillumination defect at pre-operative assessment (HR 57.66).

Conclusions: Cataract surgery in eyes with prior HSV disease may improve visual acuity for the majority of eyes but overall carries a guarded prognosis, particularly in eyes with corneal scarring. There is a significant risk of recurrent inflammation in the first year following surgery. As possible, surgeons should ensure a period of disease quiescence prior to surgery.

Change in corneal curvature and refraction after cataract phacoemulsification surgery

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Purpose: Corneal curvature and anterior chamber depth (ACD) affect post-operative refraction. This study aimed to identify the timeline changes in corneal curvature, ACD and refraction after cataract surgery.

Method: The study cohort consisted of 107 eyes who had cataract phacoemulsification surgery in the second half of 2018. All patients had 2.75 mm temporal corneal incision. Data were retrospectively collected on corneal curvature, ACD and refraction at various timepoints.

Results: The greatest average change in corneal curvature from a pre-operative baseline was observed 1 week post-operatively at 0.24 D (range 0.00 to 0.72). This decreased to 0.14 D (range 0.00 to 0.94) after 6 months and stabilised to 0.15 D (range 0.00 to 0.74) after 12 months.

ACD was evaluated by comparing to final ACD at 12 months. For individual patients, ACD was 98.1% at one week, 99.1% at one month, 98.9% at six months and 100% at 12 months.

The timeline changes of refraction before reaching a final outcome at 12 months were evaluated. At 1 week post-operatively, 52.2% of eyes were more hypermetropic, 26.9% were more myopic and 20.9% were similar to final refraction. At one month, 36.4% were more hypermetropic, 39.4% were more myopic and 24.2% were similar to final refraction. At six months, 34.8% were more hypermetropic, 42.0% were more myopic and 23.2% were similar to final refraction.

Conclusion: Changes in corneal curvature and ACD after cataract phacoemulsification surgery can affect refraction.

Impact of total keratometry on the visual outcomes of patients undergoing cataract surgery with toric intraocular lenses

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Purpose: To compare the refractive outcomes of total keratometry (TK) versus anterior surface-based keratometry (K) measurements in cataract surgery requiring a toric intraocular lens (IOL).

Methods: Eyes implanted with a toric IOL (AT TORBI), as calculated using TK with Barrett TK toric formula on the IOLMaster 700 were included. IOL power and predicted refractive outcomes were recorded. Using the values obtained for K and the Barrett toric formula, refractive targets for standard K were also identified. Six week post-operative manifest refraction was recorded. The difference from the post-operative spherical equivalent was calculated to achieve the absolute difference from target for both groups. Mean absolute errors and percentage of eyes within ± 0.50 , 0.75 and 1.00 D of predicted spherical equivalent were compared.

Results: The mean absolute error was 0.28 ± 0.19 D in outcomes using K values was and 0.29 ± 0.20 D in outcomes using TK values incorporating measured posterior cornea. Eighty-seven percent of eyes had a sphere equivalent error of prediction within 0.5 D using K versus 89% within 0.5 D using TK. In corneas with oblique astigmatism, the proportion of eyes within 0.5 D of predicted refraction was 56% in the standard K group, whereas that proportion increased to 89% in the group utilising TK measurements.

Conclusion: TK on the IOLMaster 700 provided excellent refractive and visual outcomes, comparable to those with anterior keratometry. TK provided equivalent accuracy for corneas with regular with-the-rule or against-the-rule astigmatism, and TK improved accuracy in eyes with oblique astigmatism.

Patient expectation, satisfaction and clinical outcomes with a new multifocal intraocular lens

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Purpose: To report patient expectations, visual performance and satisfaction with AcrySof IQ PanOptix multifocal intraocular lens in a heterogeneous patient

group. Additionally, determine if readily identifiable pre-operative characteristics can predict post-operative satisfaction.

Method: Data were prospectively collected for 67 consecutive patients (134 eyes) who underwent bilateral PanOptix implantation in a private ophthalmology clinic. A pre-operative questionnaire was completed regarding vision satisfaction, visual phenomena, expectations, and brief personality questionnaire. Routine clinical parameters were collected at one month and follow-up questionnaire three months post-operatively.

Results: Post-operative distance vision was 6/6 (0.01 ± 0.10) and binocular near vision 6/9 + 2 (N5; 0.16 ± 0.07). Patients satisfied with vision increased from 6% ($n = 4$) unaided and 48% ($n = 32$) aided to 94% ($n = 63$) unaided ($p \leq 0.001$). There was marked increase in frequency of halo from 14% ($n = 9$) to 69% ($n = 46$; $p \leq 0.001$) but no corresponding increase in how bothersome this symptom was ($p = 0.193$) nor the frequency of other visual phenomena. Worse post-operative vision, lower conscientiousness score on psychometric testing, and fluctuating vision were associated with lower post-operative satisfaction. There was no difference in satisfaction or residual astigmatism with toric lenses. 96% ($n = 64$) of patients were spectacle-free at three months and would recommend this procedure to others.

Conclusions: This study supports the trend towards increased patient expectations, matched by excellent visual outcomes and satisfaction. Visual phenomena may be less troubling with new multifocal lenses. The use of a pre-operative questionnaire may be a useful education tool but could not isolate pre-operative characteristics that predict post-operative satisfaction.

Mature cataract extraction techniques using the Zeiss miLoop

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Purpose: Mature cataract phacoemulsification is associated with poor visualisation, small pupils, poor capsular stability, loose zonules, prolonged surgical time and an increased complication rate.

Increased cataract density leads to prolonged phacoemulsification time and energy, which can result in collateral damage to corneal endothelium, iris and capsular bag structures.

Method and Results: Techniques to enhance visualisation, enlarge small pupils, stabilise capsules, and decrease phacoemulsification time with use of the Zeiss miLoop will be discussed.

Conclusion: The Zeiss miLoop provides a new method of cataract disassembly, which decreases phacoemulsification time and energy.

Analysis of phacoemulsification videos using machine learning

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Purpose: To train a convolutional neural network model to analyse phacoemulsification video files including identification of surgical instrument use, adjuvant devices and timing of operative phases. The project scope includes presenting time sequences of annotated frames to outlier detection algorithms to identify abnormal operations.

Method: Surgical video footage from 29 locally performed phacoemulsification operations were used to train a predictive model. Frames were extracted from the training videos and hand labelled to indicate visible surgical instruments. Preprocessing included isolating key sections of the eye, colour filtering and stabilisation. Transfer learning was then applied to a pretrained ResNet50 model, which formed the base component of the predictive model, and cross validation was used to test predictive performance.

Results: A total of 60,000 hand labelled frames from the 29 training videos were used to train and validate the models. Predictive modelling demonstrated a maximum cross validated AUC of 96.4%, and sensitivity and specificity of 95.7% and 99.6% respectively. Surgical instruments, adjuvant devices and annotated timelines were accurately detected in all video files.

Conclusion: Video file analysis in the current study demonstrates high levels of accuracy. Automated analysis will provide surgeons access to detailed information, qualitative analysis and automatic annotations of surgical videos. This analysis may be used to evaluate differences between surgical techniques, quantify surgical training progress, improve safety and enhance outcomes for patients. Further work is required for model refinement, outlier detection and model validation using a range of surgeons and cameras.

The superior chop: Efficacy of nitinol filament (Zeiss MiLoop) nuclear disassembly and primary chop technique for moderate density cataracts

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Purpose: To compare the efficacy of nitinol filament (Zeiss miLoop) nuclear disassembly with primary chop technique for moderate density cataracts.

Method: Prospective randomised two-surgeon non-blinded surgical audit of primary chop nuclear disassembly (control) against MiLoop disassembly with chop techniques. Pre-audit randomisation of 20 MiLoop and 10 control surgery order was conducted. Patients with nuclear cataract grade 3 or 4 (based on LOCI) assessed by either author pre-operatively were recruited. Pre-operative central endothelial cell count was performed. Surgery conducted by pre-determined randomised technique. Surgical timing and cumulative dissipated energy (CDE) were recorded. Three weeks post-operative endothelial cell count was recorded and difference calculated. All surgeries were performed by either authors using Alcon Centurion with Duovisc Viscoelastic. Patients undergoing MiLoop would also have Vision Blue for ease of identifying rhexis edge.

Preliminary results: Thus far nine patients have been recruited for the audit (six chop and three MiLoop and three MiLoop). As of present six patients have completed their three-week post op review. Three patients were randomised to the chop arm and two to the MiLoop arm. However, one patient from the chop arm had iris prolapse after rhexis formation and was converted to primary chop and analysed as part of the control group in this audit. Preliminary results for control (4) vs chop (1) are: Pre-operative CDE 2570 vs 2631, Average surgical time 21 vs 24 minutes. Mean % endothelial loss was 29.8% vs 8.5% and average CDE 11.21 vs 10.29. Current sample size is too small for statistical analysis.

Conclusion: Preliminary results suggest that nitinol filament nuclear disassembly may reduce endothelial cell loss compared to primary chop techniques.

A cost-effectiveness analysis of AcrySof IQ vivify intraocular lens from private health fund perspective in Australia

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Purpose: AcrySof IQ Vivity is the first and only extended depth of focus (EDOF) intraocular lens (IOL) with the Wavefront-Shaping X-WAVE technology and a clinically proven monofocal visual disturbance profile. This study estimates the cost-effectiveness of AcrySof IQ Vivity IOL vs standard aspheric monofocal IOL, from a private health fund perspective in Australia.

Methods: A Markov model was developed using the following health states: well, need for spectacles (near/distance/multifocal), severe visual disturbances – with/without spectacles, and death. Model inputs were sourced from a randomised clinical study (NCT03010254), published literature and expert opinion. IOL costs (AcrySof IQ Vivity AU\$651, and AcrySof SN60WF AU\$290) were derived from the published prostheses list. A lifetime time horizon (30 years) was considered, and cost and health outcomes were discounted at 5% per annum. Model outcomes included incremental cost-effectiveness ratio per quality adjusted life year (QALY) gain. Sensitivity and scenario analyses were also conducted.

Results: Bilateral implantation of AcrySof IQ Vivity IOL provided QALY gain of 0.16 at an incremental lifetime cost of AU\$384 vs. monofocal IOL leading to incremental cost-effectiveness ratio of AU\$2,383/QALY, which is well below the cost-effectiveness thresholds (range: AU \$45,000-AU\$75,000) typically used by Medical Services Advisory Committee Australia. Results were sensitive to the cost of IOL prosthesis, post-operative spectacle dependence, and disutility due to wearing glasses. The robustness of results was further confirmed by probabilistic sensitivity analysis and scenario analyses.

Conclusions: AcrySof IQ Vivity IOL is a highly cost-effective treatment strategy with improved vision-related quality of life outcomes for patients undergoing cataract surgery.

Comparative accuracy of Barrett toric calculator with and without posterior corneal astigmatism measurements and the Kane toric formula

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Purpose: To compare the accuracy of the Barrett toric calculator with and without posterior corneal astigmatism and the Kane toric calculator.

Methods: The study included a total of 79 eyes of 79 patients who underwent toric intraocular lens (IOL) insertion during uncomplicated cataract surgery by a single surgeon. Using vector analysis, the mean absolute prediction error, the standard deviation of the prediction error, and the percentage of eyes with a prediction error within ± 0.50 dioptre (D), ± 0.75 D, and ± 1.00 D were calculated. The IOL Master 700 (Carl Zeiss Meditec AG, Jena, Germany) was used for measuring biometry including posterior corneal astigmatism. Main analysis was designed to provide the clinical outcomes with each formula using the postoperative keratometry values and the measured post-operative IOL axis. Real-world analysis was performed using the pre-operative keratometry values and the intended IOL axis.

Results: There was no significant difference in mean absolute prediction errors calculated with two versions of the Barrett toric formula (predicted posterior corneal astigmatism and measured posterior corneal astigmatism) and Kane toric formula ($p > 0.05$). The Barrett toric calculator with predicted and measured posterior corneal astigmatism yielded the best results, with 60.8% less than 0.50 D prediction error in main analysis. In real-world analysis, the Barrett toric calculator with predicted posterior corneal astigmatism showed the best result, with 53.2% less than 0.50 D prediction error.

Conclusion: The Barrett toric formula with and without posterior corneal astigmatism measurements using the IOL Master 700 and the Kane toric formula yielded accurate and comparable outcomes.

Agreement between two swept-source optical coherence tomography biometry devices: ANTERION versus IOL Master 700

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Purpose: To assess the agreement between two swept-source ocular coherence tomography biometers: ANTERION and IOLMaster 700.

Methods: In this prospective comparative study, biometry was consecutively scanned with the IOLMaster 700 and ANTERION. The following were assessed: flat (K1), steep (K2) and mean (Km) keratometry for anterior, posterior and total cornea; lens thickness (LT); anterior chamber depth (ACD); central corneal thickness (CCT); white-to-white (WTW); and axial length (AL). Inter-device mean difference and 95% limits of agreement (LoA) were determined. Differences were considered clinically significant if spherical refractive outcome was altered by ≥ 0.25 D.

Results: In 159 eyes of 91 patients, statistically significant differences were found for anterior, posterior and total keratometry. Comparing ANTERION to IOLMaster 700, mean difference (lower ~ upper limits of agreement) were: anterior-K1: -0.17D (-1.07 ~ 0.70), anterior-K2: -0.18D (-1.15 ~ 0.81), anterior-Km: -0.17 (-1.05 ~ 0.69), posterior-K1: -0.38D (-0.57 ~ -0.19), posterior-K2: -0.36D (-0.51 ~ -0.21), posterior-Km: -0.37 (-0.51 ~ -0.23), total-K1: -0.65 (-1.49 ~ 0.18), total-K2: -0.82 (-1.74, ~ 0), total-Km: -0.74 (-1.36 ~ -0.11). Posterior and total-K differences were clinically significant. Differences in LT: 0.159 mm (-0.734 ~ 1.053), CCT: -0.004 mm (-0.019 ~ 0.011), ACD: 0.054 mm (-0.148 ~ 0.257), WTW: -0.152 mm (-0.783 ~ 0.478) were statistically but not clinically significant. Difference in AL: -0.004 mm (-0.205 ~ 0.196) was not significant.

Conclusion: Between ANTERION and IOLMaster 700, posterior and total keratometry showed statistically and clinically significant differences. Anterior keratometry, LT, CCT, ACD and WTW differences were statistically significant but did not reach the level of clinical significance. No significant difference was found for AL. Posterior and total corneal parameters cannot be considered interchangeable between devices.

Agreement between a new swept-source optical coherence tomography (ss-OCT) and a Placido disc – Dual Scheimpflug ocular biometric devices

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Purpose: To assess agreement between a new ss-OCT (ANTERION) and Placido-dual Scheimpflug (Galilei-G6) biometers.

Methods: In this prospective comparative study, biometry was consecutively scanned with Galilei-G6 and ANTERION. Inter-device agreement was assessed using mean difference (MD) and 95% limits of agreement (LoA) for: flat (K1), steep (K2), mean (Km) anterior, posterior and total keratometry; lens thickness (LT); anterior chamber depth (ACD); central corneal thickness (CCT); white-to-white (WTW); and axial length. Differences were considered clinically significant if spherical refractive outcome was altered by ≥ 0.25 D.

Results: In 159 eyes of 91 patients, MD for anterior-K1, K2 and Km were statistically but not clinically significant; MD (LoA) were -0.11D (-0.91, 0.70), -0.10D (-0.91, 0.70) and -0.10D (-0.80, 0.59) respectively. Posterior cornea showed no significant inter-device differences, with MD of -0.01D, -0.13D and 0.04D for K1, K2 and Km, respectively. LoAs were wide for posterior-K1 (-0.70, 0.68) and posterior-K2 (-1.01, 1.29). Differences in total-K1 (0.36D) and total-Km (0.25D) were statistically and clinically significant, but not for total-K2 (0.17D). MD were statistically significant for LT (0.179 mm), CCT (-0.005 mm), ACD (-0.111) and WTW (-0.158); but were not clinically significant. There was no significant MD in axial length (-0.021 mm, LoA -0.3, 1-0.269).

Conclusion: Between ANTERION and Galilei-G6, statistically but not clinically significant differences were found for anterior-K1, K2, Km, LT, CCT, ACD and WTW. Total-K1, Km differences were statistically and clinically significant. While no significant difference was found for posterior-K1 or K2, LoAs were wide. Posterior and total corneal measurements cannot be considered interchangeable between devices.

Surgical correction of presbyopia in a public health system: A farsighted solution

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Purpose: Patients undergoing cataract surgery in New Zealand's district health boards do not have access to premium lenses for correcting surgical presbyopia. This



study aims to portray monovision (MV) as a viable technique using surgical outcomes and patient satisfaction rates. **Method:** A retrospective study of patients offered MV in the Hawkes Bay district between January 2020 and May 2021 was conducted. Target refraction for near vision (NV) was aimed between -1.0D and -2.0D. Contact lens trial for MV tolerance was not performed. Pre and post-operative visual acuities (VA) and refraction were collected. A visual function questionnaire was used to gauge patient satisfaction.

Results: Seventy patients, averaging 71.8 years of age, underwent MV. The target refraction for NV was between -1.0 and -2.0 dioptres (D), averaging at -1.35D. Distance vision was improved from a mean of 6/20 to 6/7.5 with an average spherical equivalent of -0.1D. NV was improved from best corrected VA of N9 to uncorrected VA of N7, with an average spherical equivalent of -1.43D. Ninety-two percent of patients were satisfied with their visual outcome. Three patients reported symptoms consistent with reduced stereopsis. Nineteen percent reported spectacle independence.

Conclusion: Limited resources prevent district health boards from funding premium lenses and patients' ability to afford spectacles. MV requires no additional visits and utilises currently funded lenses which add no further financial burden to both the hospital and patients by reducing spectacle dependence. Meticulous patient selection and in-depth discussion about patient expectations is vital in achieving patient satisfaction and good visual outcomes.

First reported outcomes of trifocal toric intraocular lens implantation after laser vision correction and of trifocal intraocular lens implantation after hyperopic LASIK

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Purpose: To provide the first reported outcomes from implantation of trifocal toric intraocular lenses (IOL) after laser vision correction as well as the first reported outcomes of trifocal IOL implantation following hyperopic LASIK.

Methods: Forty eyes that had previously undergone LASIK laser vision correction for hyperopia were implanted with AT Lisa diffractive trifocal IOLs during cataract or clear lens exchange surgery. Ten eyes that had previously undergone LASIK for either myopia, astigmatism or hyperopia were implanted with AT Lisa trifocal toric IOLs during cataract or clear lens exchange surgery.

All IOLs were calculated using the online ZCalc calculator with Goggin nomogram adjusted keratometry. All eyes were assessed six weeks post-operatively with subjective refraction, optical biometry and clinical exam.

Results: No complications occurred during surgery or follow-up. No IOLs were explanted. Mean unaided distance visual acuity was 6/6 in both groups. In the previous hyperopic LASIK group, the average residual spherical refractive error was -0.19D and average astigmatic refractive error was 0.36D. Two eyes had significant myopic refractive surprise over 1.5D. In the group receiving trifocal toric IOLs, mean spherical residual refractive error was -0.17D and mean astigmatic residual refractive error was 0.5D.

Conclusion: The AT Lisa trifocal IOL provides very good refractive predictability and unaided visual acuity in eyes that have previously undergone hyperopic LASIK. The AT Lisa trifocal toric provides excellent visual acuity and refractive predictability in eyes post keratorefractive surgery. The AT Lisa trifocal delivers these patients with known high visual expectations excellent vision at all distances.

Early results with the new Clareon and Clareon toric intraocular lens

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Purpose: To assess real life results of implanting the new Clareon aspheric monofocal and Clareon toric intraocular lens (IOL) in terms of visual outcomes, refractive predictability, rates of posterior capsule opacification and glistenings.

Methods: Twenty-two eyes of 14 patients underwent uncomplicated cataract surgery with implantation of Clareon non-toric (8) and Clareon toric (12) IOLs via a 2.2 mm wound assisted implantation technique. Eyes were assessed one day, one week, one month and three months post-operatively. Subjective refraction was performed at one month. Slit-lamp examination and dilated red-reflex photography was performed to assess for glistenings and posterior capsule opacification. Two eyes were excluded from refractive and visual assessment due to macula pathologies.

Results: No complications occurred in any surgery. Residual refractive error was within 0.5D in 95% of cases and within 0.75D in 100% of cases. Astigmatic mean absolute prediction error was 0.22D. Unaided distance visual acuity in distance targeted eyes was 6/6 or better in 93.75% of cases. One eye underwent YAG posterior

capsulotomy due to posterior capsule opacification at one month. No glistenings were seen clinically or photographically during all follow-up.

Conclusion: The newly released Clareon toric and Clareon non-toric IOLs function extremely well in a real life patient population. They show excellent refractive predictability with a very low rate of posterior capsule opacity and no glistenings.

A new optical coherence tomography based grading system for cataract surgery incision architecture

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Purpose: Pilot study to assess corneal incision architecture changes following implantation of combinations of intraocular lenses (IOL) and injectors in order to create an objective grading scale.

Methods: Sixty eyes underwent cataract surgery via a 2.2 mm corneal incision. IOLs were implanted using a wound-assisted technique by a single surgeon. Twenty eyes received a hydrophobic monofocal/toric IOL via a gas powered injector (Clareon/AutonoMe). Twenty eyes received a hydrophobic monofocal/toric IOL via a screw injector (Acrysof/Monarch). Twenty eyes received a hydrophilic monofocal toric IOL via a pre-loaded injector (AT TORBI/Plunger). Optical coherence tomography analysis of incisions was performed at day 1, week 1 and 1 month. 1 month post-operative keratometry was also measured to assess surgically induced astigmatism. Optical coherence tomography assessment of epithelial, stromal and endothelial parameters were used to create a grading scale of incision architecture disruption.

Results: Least disruption at all time points and faster return to normal occurred in the Clareon/AutonoMe group. This significant difference was of highest magnitude at day 1. The AT TORBI/Plunger group trended towards being superior to the Acrysof/Monarch group at every time point. Surgically induced astigmatism (SIA) was low for all eyes. There was a trend towards lower SIA in the Clareon/AutonoMe group (0.18D).

Conclusion: Clareon/AutonoMe can safely be used via a 2.2 mm incision with wound assisted technique and causes the least disruption to incision architecture. This trends towards presenting clinically as lower SIA. This grading scale will be able to be used to compare new IOLs and injectors.

Post-operative visual outcomes with a diffractive trifocal intraocular lens: A pooled analysis of worldwide patients

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Purpose: To evaluate and compare the visual outcomes in subjects implanted with the AcrySof PanOptix intraocular lens (TFNT00) from an international post-market study (PMS) including four Australian sites to those from a pooled analysis (PA) of multiple trials including patients from Europe, South America, South East Asia, US and Japan.

Methods: The PA included outcomes obtained from six prospective, clinical trials of TFNT00 that used consistent methods and techniques to evaluate visual outcomes. The pooled defocus curve at 3-6 months post-operation was compared to the outcomes from the PMS including four Australian sites.

Results: Data was pooled for a total of 557 subjects implanted with TFNT00; of which 53% were White, 35% were Asian and 12% reported other races. The mean binocular distance corrected defocus curves from the PA (N=542) at 3-6 months post-operation and the PMS (N=144) at 6 months post-operation indicated a visual acuity 6/7.5 (0.14 logMAR) or better from +0.50 to -3.0D.

Conclusion: PanOptix provides patients continuous 6/7.5 or better vision from distance to near (33 cm).

Cataract audit: Comparison of post cataract surgery visual acuity and refractive error outcomes between intraocular lens Master 500 and intraocular lens Master 700

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Introduction: According to the World Health Organization, cataract is the most common cause of visual impairment and the leading cause of blindness in the world. There have been two major cataract audits in Australia, however none have looked at outcomes between intraocular lens (IOL) 500 and IOL 700.

Purpose: To evaluate outcomes in refractive error and visual acuity outcomes in patients whose eyes were examined by IOL 500 and IOL 700.



Method: Medical records from a tertiary teaching hospital in South Australia were examined. Patients who underwent examination with the two devices were retrospectively reviewed. Post-operative refractive error and visual acuity outcomes were compared between the two machines.

Results: Preliminary data showed 71 eyes were examined with IOL 500 and 29 with IOL 700. regarding visual acuity (based on logMAR <0.3), there was some evidence of an association between patient visual acuity improvement and machine type IOL 700 ($p = 0.057$). The mean (SD) difference overall between predicted and observed refractive error was 0.13 (0.82) D (diopters). For the IOL 500 machine the mean (SD) difference was 0.15 (0.86) D and for the IOL 700 machine the mean (SD) difference was 0.08 (0.74). There was no statistically significant difference in the prediction error between the two machines ($p = 0.705$).

Discussion: The IOL master 700 may provide an improved visual acuity score for patients and while the absolute prediction error difference was not significant, the IOL 700 predicted refractive error was close to the observed refractive error in comparison to IOL 500.

CORNEA

Comparing palliative care patients' and clinicians' views on corneal donation

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Introduction: Approximately 4.9 million people worldwide are blinded by corneal failure. Corneal transplantation, an effective form of treatment that palliative care patients can provide, is lacking.

Purpose: To evaluate palliative care patients' and clinicians' perception of corneal donations.

Method: A semi-structured interview of patients and clinicians was carried out at a Palliative Care Unit in South Australia to explore important issues around corneal donation.

Results: None of the patients ever had a discussion on corneal donations and yet 94% stated that they would like to, with 92% stating they would like to donate. Seventy-five percent of patients preferred the discussion to take place after illness acceptance. The clinicians did not have a particular preference of timing. Most patients would like a doctor to discuss this with them, while most doctors felt that other clinicians were more appropriate. Most of the patients and clinicians preferred face to face

discussions. Many clinicians and patients thought that the palliative care unit would be an ideal setting for conversation.

Discussion: There were no discussions about corneal donations taking place with palliative care patients, even though patients felt this was an essential topic concerning creating a legacy and altruism. Patient views on the importance, timing, and best personnel to discuss should be taken seriously. The patient and clinician preference of face-to-face conversations gives ample opportunities to raise this topic without causing distress. Consideration should be given to adding this topic to a nursing and medical admission checklist.

Scedosporium scleritis following pterygium excision with conjunctival autograft

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Purpose: To highlight the considerations in the clinical diagnosis and management of infectious scleritis through a rare case of donor site fungal scleritis associated with previous pterygium excision.

Methods: A review of electronic medical records.

Results: A 67-year-old female presented with presumed episcleritis six-months following left pterygium surgery with autoconjunctival graft. Past medical history was significant for Graves Disease without thyroid eye disease. A one-month trial of topical 0.1% dexamethasone resulted in worsening pain, reduced vision and a developing scleral nodule at the autograft donor site. A serological infectious and inflammatory screen was negative, followed by MRI orbits which showed evidence of scleritis. She was treated for presumed immune-mediated scleritis with a tapering course of oral prednisone 50 mg. After 10 days, her vision dropped to light-perception with significant vitritis overlying a sub-retinal lesion over the donor site. A positive vitreous tap for *Scedosporium auranticum* lead to a vitrectomy, scleral debridement with corneal patch graft, oral voriconazole, and multiple intravitreal voriconazole injections. Further scleral debridement was performed due to severe pain and refractory scleritis, but the posterior extent could not be reached. Repeat MRI orbits demonstrated persistent active scleritis in close proximity to the optic nerve which the infectious

diseases specialists deemed to pose a risk of life-threatening meningitis, leading to a decision for enucleation.

Conclusion: There is significant difficulty in distinguishing between infectious and immune-mediated scleritis, particularly in non-necrotising cases. In eyes with a history of prior surgery, infectious aetiologies are important to exclude prior to commencing immunosuppression.

Longitudinal outcomes of epithelium-on and epithelium-off pulsed-accelerated crosslinking

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Purpose: To compare the outcomes of epithelium-on versus epithelium-off pulsed-accelerated crosslinking (Avedro-KXL) in keratoconus at 12 months.

Method: A retrospective review of 61 patients, 30 males and 31 females (mean age 25.8 ± 6.2), with progressive keratoconus who underwent pulsed-accelerated crosslinking at the Princess Alexandra Hospital, Brisbane. At three months, six months and 12 months parameters collected included unaided visual acuity, best-spectacle corrected visual acuity, central corneal thickness, thinnest corneal thickness and keratometry using the Galilei G4 tomographer. Keratometric parameters included steep, flat, mean simulated and maximum simulated keratometry.

Results: Thirty-four patients with progressive keratoconus underwent epithelium-on and 27 patients underwent epithelium-off crosslinking. At baseline, there were no significant differences in visual and tomographic characteristics ($p > 0.05$). At three months, six months and 12 months follow-up, there were no significant changes in best-spectacle corrected visual acuity, keratometric parameters or corneal thickness in either group. When the outcomes were compared between the two groups, there were no statistically significant differences ($p > 0.05$).

Conclusion: The Avedro-KXL pulsed-accelerated crosslinking protocol offered stabilisation of keratometric parameters and visual acuity in eyes with progressive keratoconus at 12 months follow-up. There were no significant differences in outcomes between eyes that underwent epithelium-off crosslinking compared to eyes that underwent epithelium-on crosslinking.

Repeatability and agreement of biometric measurements using spectral domain anterior segment optical coherence tomography and Scheimpflug tomography in keratoconus

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Purpose: To compare the repeatability and agreement in biometric measurements using spectral domain anterior segment optical coherence tomography (AS-OCT, REVO-NX, Optopol) and Scheimpflug tomography (Pentacam-AXL, Oculus) in keratoconus.

Methods: A prospective case series of 157 keratoconus patients attending the University of Auckland Cornea and External Eye Disease Tertiary Service from January to August 2019. Axial length (AL), anterior chamber depth (ACD), central corneal thickness (CCT) and thinnest corneal thickness (TCT) were measured three times. The eyes were analysed in groups: no prior crosslinking or contact lens wear (Group A), prior crosslinking (Group B), and prior contact lens wear (Group C). Repeatability was assessed using the intraclass correlation coefficient (ICC). Agreement was analysed using Bland-Altman plots.

Results: In Group A ($n = 95$ eyes), Group B ($n = 86$ eyes), and Group C ($n = 33$ eyes), ICC was higher than 0.90 for all parameters, except for ACD in Group A with the REVO-NX (ICC = 0.83). Differences in ACD, TCT and CCT were statistically significant between the two devices for Groups A, B and C ($p < 0.05$). AL differed significantly between Groups A and B ($p < 0.05$) but not in Group C ($p = 0.18$). Repeatability did not vary significantly between Groups A, B, or C in any parameter with both devices ($p > 0.05$).

Conclusions: REVO-NX AS-OCT and Pentacam-AXL Scheimpflug system demonstrated good repeatability but poor agreement across AL, ACD, CCT and TCT measurements. Repeatability was not affected by prior crosslinking or contact lens wear. The two devices should not be used interchangeably in the assessment, surveillance or for IOL calculations in patients with keratoconus.

Repeatability of corneal and epithelial thickness measurements with anterior segment optical coherence tomography in keratoconus

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Purpose: To investigate the repeatability in corneal thickness (CT) and epithelial thickness (ET) measurements using spectral domain anterior segment optical coherence tomography (AS-OCT, REVO-NX, Optopol) in patients with keratoconus, and examine the effect of corneal crosslinking (CXL) on repeatability.

Methods: This prospective case series enrolled patients with keratoconus attending the University of Auckland Cornea and External Eye Disease Tertiary Service from January 2019 to August 2019. Eyes were analysed in two groups: eyes with no prior history of CXL (Group A) and eyes with prior CXL (Group B). Repeatability was assessed using the intraclass correlation coefficient (ICC) and coefficient of variation.

Results: In Group A, central corneal thickness was $472.18 \pm 45.41 \mu\text{m}$, and the ET was the thinnest in the inferior-temporal aspect at $51.79 \pm 5.97 \mu\text{m}$ and thickest at the superior-nasal aspect at $56.07 \pm 5.70 \mu\text{m}$. In Group B, the central corneal thickness was $465.11 \pm 42.28 \mu\text{m}$, and the ET was the thinnest at the inferior-temporal aspect at $50.63 \pm 5.52 \mu\text{m}$ and thickest at the superior aspect at $56.80 \pm 6.39 \mu\text{m}$. For CT measurements, ICC was above 0.86 and 0.83 for Group A and Group B respectively. For ET measurements, ICC was above 0.82 for Group A and Group B. CXL had no statistically significant impact on repeatability.

Conclusions: The REVO-NX AS-OCT provides repeatable CT and ET measurements in the central and peripheral cornea in patients with keratoconus. Repeatability was not affected by a history of CXL. The REVO-NX is a useful device in the diagnosis and surveillance of patients with keratoconus.

Case report of successful corneal crosslinking in a patient with corneal ectasia associated with Stevens-Johnson Syndrome

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Purpose: To report successful accelerated epithelium-off corneal crosslinking in a rare case of corneal ectasia secondary to Stevens-Johnson Syndrome (SJS).

Methods: A review of medical records.

Results: A 25-year-old Indian male presented with a three-year history of progressively deteriorating visual acuity in the left eye. He had a history of SJS secondary to penicillin ingestion five years prior, which resulted in corneal and conjunctival epithelial desquamation and pseudomembrane formation. Following the acute episode of SJS, the patient reported ongoing excessive eye rubbing. He had no other past medical or ocular history, and no family history of ectasia. There was progressive reduction in visual acuity of the left eye to 6/120 with increasing levels of astigmatism. Serial corneal tomography scans showed progressive inferior corneal steepening, thinning and abnormal posterior elevation, consistent with a diagnosis of corneal ectasia. Following preparation of the ocular surface with intense preservative-free lubrication and topical steroids, accelerated epithelium-off crosslinking was performed with four minutes of continuous ultraviolet-A exposure at 30 mW/cm^2 and a total energy dose of 7.2 J/cm^2 . Complete re-epithelisation was observed within 72 hours following crosslinking with no complications. Corneal tomography 15 months after treatment showed stabilisation of ectasia, with improvement in visual acuity.

Conclusions: Corneal ectasia is a rare but important complication of SJS. Accelerated epithelium-off crosslinking can safely be performed in patients with a compromised ocular surface following SJS. Pre-operative optimisation of the ocular surface and vigilant monitoring in the early post-operative period is recommended for the prevention of complications.

Comparison of ectasia detection in early keratoconus using Scheimpflug-based corneal tomography and biomechanical assessments

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Purpose: To determine the detection of keratoconus using corneal biomechanical parameters only, a corneal tomographic parameter only, and a parameter that combines corneal biomechanical and tomographic indices.

Methods: The discriminatory power of the Belin/Ambrósio Enhanced Ectasia Display (BAD-D) index, Corvis Biomechanical Index (CBI) and Topographical and Biomechanical Index (TBI) to differentiate between

normal eyes ($n = 84$), very asymmetric keratoconus eyes with ectasia (VAE-E, $n = 21$), and the fellow eyes without apparent ectasia (VAE-NT, $n = 21$) was assessed. Statistical analysis was completed with R software utilising t -tests, Wilcoxon rank-sum tests, and receiver operating characteristic curves. The DeLong test was used to compare the area under the receiver operating characteristic curve (AUROC).

Results: The TBI had the highest AUROC when distinguishing between Normal and VAE-E corneas (AUROC = 1.00, 95% confidence interval 0.99 - 1.00); however, it was not statistically superior to the CBI (AUROC = 0.97, $p = 0.27$) or BAD-D (AUROC = 1.00, $p = 0.34$). The TBI (AUROC = 0.92, 95% CI = 0.86 - 0.98) was superior to CBI (AUROC = 0.78, $p = 0.02$) and BAD-D (AUROC = 0.81, $p = 0.02$) when distinguishing between healthy and VAE-NT corneas. At a threshold of 0.72, the TBI had 99% sensitivity 67% specificity, and 92% accuracy in distinguishing Normal and VAE-NT corneas.

Conclusion: The TBI is a useful parameter for the screening of subclinical and manifest keratoconus in topographically normal eyes.

A five year review on fungal keratitis in metropolitan Queensland, Australia

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Purpose: Longitudinal epidemiological studies on fungal keratitis offer vital information to clinicians about the changing patterns of the disease and the distribution of pathogens within a given location. We present data on causative pathogens, treatment patterns and clinical course for this condition as seen in metropolitan Queensland over a five-year period.

Methods: A retrospective review of all patients diagnosed and treated for fungal keratitis at two tertiary Queensland Hospitals; The Royal Brisbane and Women's Hospital and The Princess Alexandra Hospital from 2014 to 2019. Patients were retrieved from a database of positive corneal scrape and fluid tap results provided by their microbiology departments.

Results: Fifty-three eyes from 53 patients had positive fungal cultures with 56 fungal isolates identified. Seventy-seven percent were Filamentous fungi and 23% yeasts. The

most common isolates were *Fusarium solani* ($n = 8$), *Candida albicans* ($n = 7$) and *Purpureocillium lilacinum* ($n = 6$). Ninety-six percent of patients had ≥ 1 predisposing risk factor for fungal keratitis and 42% had ≥ 2 risk factors. The most common risk factors were topical steroid use ($n = 18$), foreign body/trauma ($n = 18$) and ocular surface disease ($n = 17$). Eight patients developed corneal perforations, five corneal abscesses, two scleritis, two endophthalmitis, six required corneal grafts and four lost the eye. Median best-corrected visual acuity at presentation was 6/60 improving to 6/24 following treatment.

Conclusion: In metropolitan Queensland, filamentous fungi predominate with the representation of *Purpureocillium lilacinum* being higher compared to other regions globally. Despite multimodal treatment, outcomes remain poor with many patients requiring corneal graft, having poor final visual acuity or losing their eye.

Corneal wet laboratories: Determining the learning curve for corneal lamellar dissections using histological analysis

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Purpose: A major barrier to the uptake of new lamellar techniques in corneal surgery is the steep learning curve. We aimed to study the learning curve of a novel lamellar technique with the aid of histological analysis in order to help define the role of a wet laboratories in corneal surgery.

Methods: A microsurgical wet laboratory was established using pig eyes to simulate the human cornea. Three novice surgeons and an experienced corneal surgeon performed an anterior cornea lamellar dissection and the duration of each procedure was recorded. Tissue was processed using standard histological techniques and the thickness of the dissection determined microscopically. The number of attempts to complete the experiment, defined as three successful dissections with mean thickness below 100 μm , was recorded.

Results: Trainees reached the endpoint of the study in 21, 26 and 36 attempts (mean: 28 attempts) while the corneal surgeon completed the experiment in 12 attempts ($p = 0.07$). Mean dissection thickness decreased over time for all participants. The mean dissection time for trainees



was 10.6 ± 4.2 minutes compared to the corneal surgeon with a mean of 8.2 ± 3.1 minutes ($p < 0.001$). In the final five dissections, trainees reached comparability with the corneal surgeon across all measurements.

Conclusion: We propose a new model for surgical training that targets ophthalmic microsurgery. Trainees demonstrated the capacity to learn the microsurgical technique on ex vivo tissue with demonstrable improvement in all measurements. Wet-lab dissections and histological analysis could provide a valuable training tool for trainees prior to surgery with patients.

A review on the use of topical N-acetylcysteine in the treatment of ocular diseases

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Purpose: N-acetylcysteine (NAC) was first discovered as a mucolytic agent in 1960 and has since been used in the treatment of paracetamol overdose and chronic bronchitis in intravenous and inhaled forms respectively. A systematic review was conducted to investigate the role of topical NAC in the treatment of ocular pathologies including its therapeutic benefits and adverse effects.

Method: A systematic search of peer-reviewed articles was performed by two independent authors using major databases including MEDLINE, EMBASE, PubMed and Cochrane Library up to December 2020. This search identified 106 references including in vitro, in vivo and clinical studies on the use of NAC in the treatment of ocular diseases.

Results: The mechanisms of action of NAC include mucolysis, scavenging hydroxyl radicals and modulation of inflammatory cascades. Topical NAC has been used in the treatment of corneal wounds, chemical injuries, keratitis, dry eye disease and meibomian gland dysfunction. The clinical benefits of NAC are evident over a wide range of concentrations, most common being 5-10% topical NAC applied four times daily. Adverse effects such as corneal necrosis are rare but have been reported with higher doses. N-acetylcysteine also has potential applications in laser epithelial keratomileusis, diabetic eye disease, retinitis

pigmentosa, senile nuclear cataracts, macular degeneration and cigarette smoke-induced corneal damage. Recently, chitosan-NAC has been used as a nanocarrier for the topical administration of medications to the ocular surface.

Conclusion: NAC has potent antioxidant, anti-inflammatory and mucolytic properties. This review is invaluable in highlighting the role of topical NAC in ocular therapeutics.

Mitomycin C or interferon alpha 2 beta in treating ocular surface squamous neoplasia: A retrospective observational study

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Purpose: The purpose of this paper was to assess the clinical use and efficacy of interferon alpha 2 beta (IFN2b) or mitomycin C (MMC) for the treatment of ocular surface squamous neoplasia (OSSN).

Methods: Medical records of 65 patients diagnosed with OSSN and were prescribed either MMC or IFN2b were analysed. Primary outcome measures included clinical demographics, recurrence rates and failure of treatment. Participants were analysed retrospectively from a single quaternary centre.

Results: There was a clinician preference towards the use of IFN2b. There a general trend towards surgical excision in addition to topical chemotherapy over topical chemotherapy alone. Cryotherapy was only used in almost half of those patients that underwent surgical excision. Recurrence rates from the total group of 65 patients were 6%, with those undergoing topical chemotherapy having recurrence of 7.6% and those undergoing surgical and adjuvant topical chemotherapy 5.7%. There were no adverse events recorded from either treatment. IFN2b was used as topical chemotherapy alone in 84.6% patients, in conjunction with surgery in 56% and in combination with surgery and cryotherapy in 70.3%. MMC 0.02% and 0.04% were each used in 7.6% patients undergoing topical chemotherapy, in conjunction with surgery in 28% in 0.02% and 16% for 0.04%; and in combination with surgery and cryotherapy in 18.5% in 0.02% and 11% for 0.04%.

Conclusion: Both IFN2b and MMC have good clinical outcomes for treating OSSN in this analysis and in the literature. Clinicians must understand the considerations of prescribing either treatment and make appropriate judgements based on patient circumstance.

Immediate sequential bilateral corneal crosslinking: Safety and patient outcomes

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Purpose: The aim of the study was to evaluate the safety of immediate sequential bilateral corneal cross-linking (ISBCXL).

Methods: Retrospective consecutive case review of all patients who underwent ISBCXL at Waikato Hospital, Hamilton, New Zealand from August 2020 to June 2021. The prevalence of intra-operative and post-operative complications, best-corrected distance visual acuity, change in maximum keratometry and minimum corneal thickness were analysed. Patients were assessed from one week and up to seven months post ISBCXL.

Results: Thirty-five patients (70 eyes) were included for analysis. There was significant improvement in best-corrected visual acuity at one month post ISBCXL (0.24 logMAR, $p = 0.02$) and three months post ISBCXL (0.27 logMAR, $p = 0.049$) compared to pre-corneal cross-linking (0.34 logMAR). There was no progression in maximum keratometry or pachymetry over any follow-up assessments.

Conclusion: ISBCXL was safe and effective at halting the progression of keratoconus in a single visit. No cases of infectious keratitis were identified. ISBCXL provides a patient-centred option for the treatment of progressive keratoconus.

Repeatability of Scheimpflug tomography in advanced keratoconus

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Purpose: To evaluate the repeatability of corneal tomography in advanced keratoconus with severe corneal thinning.

Methods: A prospective study utilising Pentacam HR at a tertiary referral centre in Auckland. Three scans were performed on both eyes of all participants. Eyes with previous crosslinking, intraocular surgery, or acute corneal hydrops were excluded. Eyes were age and gender-matched and grouped into advanced or moderate

keratoconus based on thinnest corneal thickness (TCT) of $\leq 400 \mu\text{m}$ and $> 450 \mu\text{m}$, respectively. Repeatability of steep keratometry (K1), flat keratometry (K2), maximal keratometry, and TCT measurements was assessed using within-subject standard deviation (Sw) and intra-class correlation coefficient (ICC) and these were compared between the groups.

Results: The advanced keratoconus group comprised 91 eyes of 80 participants and the moderate keratoconus group comprised 91 eyes from 91 participants. In advanced keratoconus, maximal keratometry and TCT were least repeatable with $\text{Sw } 5.72 \pm 5.41$ and 17.12 ± 14.58 , respectively, compared to 0.67 ± 0.51 and 6.90 ± 5.45 in moderate keratoconus ($p < 0.01$). ICCs were 0.85 and 0.85, respectively, compared to 0.99 and 0.87 in moderate keratoconus. K1 and K2 were the most repeatable with $\text{Sw } 1.24 \pm 1.03$ and 1.16 ± 0.89 , respectively, compared to 0.25 ± 0.35 and 0.41 ± 0.32 in moderate keratoconus ($p < 0.01$ and $p = 0.01$). Respective ICCs were 0.98 and 0.98 in the advanced group compared to 0.98 and 0.99 in the moderate group.

Conclusions: Repeatability of Scheimpflug measurements in advanced keratoconus is significantly reduced compared to moderate keratoconus and should be accounted for when deciding on intervention such as corneal crosslinking.

Confidence intervals for assessing ectatic changes post-crosslinking using the ABCD grading system

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Purpose: The ABCD progression display monitors ectasia progression and demonstrates significant changes by displaying 80% and 95% one-sided confidence intervals (CI). Currently, CI after corneal cross-linking (CXL) are not displayed, as post-CXL noise has not been established. Our study measured post-CXL eyes with a minimal follow-up of one year and provides CI for this group.

Method: Patients from ELZA Institute (Zurich, Switzerland) and Homburg Keratoconus Center (Homburg, Germany) with a minimum of 12 months post-CXL were enrolled. Three separate Pentacam measurements were taken. A minimum 7.5 mm of coverage and acceptable quality score were required. Pooled variance, SD and one-sided CK were computed. Site specific and time specific comparisons were made using nonparametric statistics.



Results: Sixty eyes (38 Zurich, 22 Homburg) of patients aged 29.5 ± 12.3 (range 11-62) were enrolled. Patients were 26.1 ± 19.3 months post-CXL (range 12-28 Zurich, 16-115 Homburg). Values of ABC parameters and their respective noise measured as SD were comparable between the two sites. Subgroup analysis of eyes from Homburg comparing 1-3 years to 3-10 years post-CXL showed no difference in SD. The 80% CI for the ABC parameters were 0.0283, 0.0492 and 3.682 and 95% CI were 0.0553, 0.0962 and 7.196 respectively.

Conclusion: Measurement noise of each machine generated parameter of the ABCD progression display was analysed in post-CXL eyes with at least 12-month follow-up. Noise measurements were consistent after 12 month. CI of each parameter were reported as above and will be incorporated into the next iteration of the ABCD progression display.

The potential of novel polypeptide polyplexes as therapeutics for dry eye disease

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Purpose: Primary Sjögren's Syndrome (pSS) is a complex progressive autoimmune disorder characterised by destruction of lacrimal and salivary glands. pSS-associated dry eye disease (DED) is a debilitating life-long condition whereby dysregulation of the tear film and subsequent hyperosmolarity stimulates the production of proinflammatory cytokines that result in an endless cycle of inflammation on the ocular surface. There is increasing interest in the role of miRNA dysfunction in the inflammatory process of pSS. Our aim is to investigate the potential of novel polypeptide polyplexes to deliver therapeutics to the ocular surface as a novel means of treating pSS-associated DED.

Method: N/P ratios of 5, 10 and 50 or unencapsulated as control were added to neutral polypeptide polyplexes with a constant miR X dose. The particle size and charge were measured using Malvern Zetasizer Nano 3000 (Malvern Instruments, Worcestershire, UK). A SYBR Green RNA II exclusion assay was also used to evaluate the binding of miR X with the polypeptide polyplexes.

Results: The particles were within the size (100-200 nm) and charge range (15 – 40 mVolts) to be therapeutically relevant.

Conclusion: The current available treatments for DED focus on symptomatic management of the condition with topical agents. Our research highlights the potential of miR-modulating therapy as a novel means of drug delivery directly to the ocular surface and altering the inflammatory process of the disease.

Novel application of nanotechnology in the treatment and management of dry eye disease: A systematic review

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Purpose: Dry eye disease (DED) affects one in five adults and significantly impairs quality of life. Current topical treatments are limited by poor bioavailability or toxicity. The burgeoning field of nanotherapeutics provides promise of site specific and sustained drug delivery. This systematic review discusses the application of nanotherapeutics for the treatment of DED.

Method: A systematic review of peer-reviewed articles was conducted in December 2020 across evidence-based databases, including MEDLINE, PUBMED, Cochrane, Web of Science and Scopus. Randomised control trials and laboratory-based or in vitro studies were included. The review was registered with PROSPERO: CRD42021228820.

Results: Database searches yielded 3843 publication titles. There were 133 preclinical and clinical trials included in this review, with 120 trials published in the last 10 years. These investigated nanostructured drug delivery systems for cyclosporine A (n = 56), lubricants (n = 17), non-steroidal anti-inflammatory drugs (n = 11), steroids (n = 29) and other novel formulations and nanostructured lipid carriers (n = 20). Applications of nanotechnology included nanomicellar carriers, nanoemulsions, nanoparticles, nanowafers and nanofibres.

Conclusion: This is the first systematic review on the application of nanotherapeutics, a novel and promising field, in DED. It provides an important foundation for the future direction of DED treatment and management.

Novel application of nanotechnology in the treatment and management of corneal wound healing and keratoconus: A systematic review

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Purpose: Nanotechnology offers promising perspectives in regenerative ophthalmology and the management of corneal wounds and keratoconus. This systematic review focuses on the use of nanomaterials for corneal tissue engineering, drug delivery and cell therapy.

Method: A systematic review of peer-reviewed articles was conducted in December 2020 across evidence-based databases, including MEDLINE, PUBMED, Cochrane, Web of Science and Scopus. Randomised control trials and laboratory-based or in vitro studies were included. The review was registered with PROSPERO: CRD42021228820.

Results: Database searches yielded 3843 publication titles. Of the 98 studies which fulfilled inclusion criteria, 91 were related to corneal wound healing and seven were related to keratoconus. Most studies were published in the last 10 years ($n = 92$). Applications of nanotechnology for corneal tissue engineering included nanofibrous scaffolds, matrices and membranes. In drug delivery systems, nanoparticles, wafers, micelles and gels, demonstrated advantages with enhanced ocular bioavailability, increased duration of action and decreased toxicity. In cell therapy, nanotechnology showed benefits in reducing corneal neovascularisation and scar formation, and stimulating regulated healing. Nanoplatfrom-based riboflavin/ultraviolet-A corneal cross linking was also effective in biomechanical strengthening of the cornea in keratoconus.

Conclusion: This is the first systematic review on the application of nanotechnology for corneal wound healing and keratoconus. It provides a foundation for the direction of this burgeoning field.

Evaluation of the knowledge of corneal donation and the new opt-out system in England among junior doctors

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Purpose: To evaluate the knowledge of corneal donation and the new opt-out system among junior doctors in the East Midlands, UK.

Method: This was a cross-sectional study performed during June-September 2020. A 26-item questionnaire-based survey was disseminated to all 340 junior doctors working in the East Midlands, UK. Relevant data, including participants' background, knowledge of corneal donation and the new opt-out system introduced in England, were analysed.

Results: A total of 143 responses were received (response rate = 42.1%). Nineteen (13.3%) junior doctors had previously discussed about corneal donation. The majority (100, 69.9%) of them perceived the importance of obtaining consent for corneal donation as junior doctors, but only 24 (16.8%) felt comfortable in discussing corneal donation. The knowledge of corneal donation was low, with a mean correct response rate of $33.3 \pm 20.8\%$. Only 28 (19.6%) doctors were aware of the 24-hour death-to-enucleation time limit. The majority (116, 81.1%) of doctors would consider certifying a death on the ward quicker if they knew it could potentially compromise the quality of corneas. Most (103, 72%) doctors were aware of the new opt-out system but only 56 (39.2%) doctors correctly stated that donation can only proceed with family consent.

Conclusion: Junior doctors working at the frontline serve as valuable members in contributing to the process of obtaining consent for organ/tissue donation. We highlight the lack of knowledge of corneal donation and the opt-out system amongst junior doctors in the UK. Targeted postgraduate training during the induction process may potentially enhance the donation rate.

Public perception towards cornea donation in the UK

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Purpose: To evaluate the knowledge of corneal donation and the new opt-out system among members of the public in the East Midlands, UK.

Method: This was a cross-sectional study performed during September 2020-June 2021. A 23-item questionnaire-based survey was disseminated to all 320 members of the



public in the East Midlands, UK. Relevant data, including participants' background, knowledge of corneal donation and the new opt-out system introduced in England, were analysed.

Results: A total of 320 responses were received; 32.2% of public had not heard about cornea donation; and 40.6% were not willing to donate their corneas with the most commonly cited reasons as lack of information (31.3%) and not wanting their body cut up (36.7%). Only 53.8% were aware that the cornea is the front part of the eye. Only 38.9% believed the same blood type was not needed for cornea donation. 36.3% were not sure if cornea donation would delay a donor's funeral, with 9.8% believing it would.

Conclusion: We underline the lack of cornea donation knowledge amongst members of the public in the UK. Targeting these areas via social media and health professionals may increase cornea donation rates.

Riboflavin for corneal collagen cross-linking

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Purpose: To compare the clinical efficacy and safety of hypotonic and isotonic riboflavin used in corneal cross-linking (CXL) for patients with keratoconus enrolled in the Save Sight Keratoconus Registry.

Methods: A retrospective, case-series of 143 eyes (128 patients) from one quaternary eye centre and two corneal subspecialty practices in Sydney, Australia was performed. Eyes were divided into those who had received isotonic riboflavin (43 eyes) and hypotonic riboflavin (100 eyes) during CXL. Maximum simulated keratometry (Kmax), steep keratometry (K2), habitual visual acuity, pinhole visual acuity, thinnest pachymetry and adverse events were analysed for each tonicity group at baseline and 12-month follow-up. Differences in crude mean change between tonicity groups were evaluated using chi-square and independent t-test where appropriate. Further differences in mean change adjusted for confounders were analysed using mixed-effects linear and logistic regression analysis.

Results: No statistical differences were found between tonicity groups for both crude and adjusted means of all clinical outcomes. Eyes that had received hypotonic riboflavin demonstrated improved Kmax measurements 12 months following CXL (-0.80 ± 5.95 , $p = 0.048$).

Remaining keratometry and visual acuity measurements stabilised in eyes from both hypotonic and isotonic groups at 12-month follow-up. Clinically significant haze was the most common adverse event occurring in 24.4% of eyes in the isotonic group and 16.2% in the hypotonic group ($r = 0.42$; 95% confidence interval, 0.51, 7.20, $p = 0.677$).

Conclusion: The use of hypotonic and isotonic riboflavin in CXL for the stabilisation of keratoconus were both similar in efficacy and safety 12 months following surgery.

Accelerated versus conventional cross linking: Which eyes see better in the long term?

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Purpose: To compare long term outcomes between conventional and accelerated corneal collagen crosslinking (CXL) for progressive keratoconus.

Methods: Comparative study of 25 eyes that underwent conventional CXL (C-CXL at 3 mW/cm² ultraviolet-A light irradiance for 30 minutes) versus 25 eyes that had accelerated CXL (A-CXL at 9 mW/cm² for 10 minutes), with minimum 24 month follow up. Post-CXL changes including best spectacle corrected visual acuity (BSCVA), root mean square higher order aberrations (HOA), corneal clarity (densitometry), and maximal keratometry (Kmax) were analysed at final follow up.

Results: Mean follow up for C-CXL and A-CXL eyes were 46.28 ± 14.28 months and 40.64 ± 10.92 months respectively. After C-CXL, LogMAR BSCVA improved by mean -0.07 ± 0.17 ($p = 0.14$) and HOA reduced by -0.24 ± 0.72 ($p = 0.12$). In comparison, larger improvements in LogMAR BSCVA by -0.11 ± 0.18 ($p = 0.03$) and RMS HOA by -0.34 ± 0.61 ($p = 0.01$) were noted after A-CXL.

A significant decrease in corneal densitometry was observed after C-CXL ($p < 0.0001$) whereas a non significant decrease in values was seen after A-CXL ($p = 0.07$). A significant Kmax reduction by -1.79 ± 2.41 D ($p = 0.004$) was noted after C-CXL whereas Kmax reduction by -0.84 ± 2.10 D ($p = 0.098$) was seen after A-CXL.

Conclusions: In our study, both conventional and accelerated CXL significantly reduced the risk of keratoconus progression. The A-CXL group had better best-corrected visual acuity, reduced higher order aberrations and less disturbance of corneal clarity.

Long-term clinical outcomes of Descemet membrane endothelial keratoplasty

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Purpose: To evaluate the long-term visual and densitometric outcomes of Descemet membrane endothelial keratoplasty (DMEK).

Methods: Retrospective review of consecutive DMEK cases performed by a single surgeon. Outcome measures included best-corrected visual acuity (BCVA), higher order aberrations (HOA) and total corneal densitometry (CD) in grey scale units at 0-2 mm zone. Follow up visits were at 1, 3, 6, 12 and >12 months.

Results: Fifty-seven eyes underwent DMEK, 79% were primary and 21% were secondary DMEKs. Indications included Fuchs' endothelial dystrophy (81%), Pseudophakic bullous keratopathy (11%) and failed penetrating keratoplasty (7%). 31.6% cases were combined with cataract surgery. Glaucoma was present in 10.5% cases. Follow up achieved was 87.7%, 75.4%, 64.9%, 56.1% and 49.1% at 1, 3, 6, 12 and >12 months respectively. LogMAR BCVA was 0.41 ± 0.28 , 0.39 ± 0.43 , 0.29 ± 0.31 , 0.19 ± 0.21 , 0.14 ± 0.20 and 0.14 ± 0.34 at preop, 1, 3, 6, 12 and >12 months respectively. A significant improvement in BCVA was noted at 6 ($p = 0.01$), 12 ($p = 0.003$) and at >12 ($p = 0.001$) months. Higher order aberrations were unchanged.

A significant improvement in corneal densitometry was noted from 48.59 ± 18.06 (pre-op) to 34.84 ± 12.80 ($p < 0.0001$) at 12 months and to 33.98 ± 6.42 ($p = 0.0001$) at >12 months follow up. DMEK rebubbling was required in 38% cases.

Conclusion: DMEK improves visual outcomes with restoration of corneal clarity and endothelial function.

Herpes simplex keratitis local treatment guideline audit 2018-19

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Purpose: To report the adherence of clinician prescription to the evidence-based herpes simplex keratitis (HSK) guidelines at Sydney Eye Hospital, Australia to assess the sustainability of guideline implementation.

Method: A retrospective review was conducted of patients, aged 18 years and above, receiving treatment for HSK at the Sydney Eye Hospital from 1 January 2018 to 31 December 2019. Patients were identified from pharmacy records, viral swab results and hospital coding data. Medical history, antiviral and topical steroid therapy and outcomes were extracted from medical records.

Results: A total of 335 patients, median age 58 years (range 18 – 103); 61% males were included. Anti-viral therapy was given for therapeutic and prophylactic indications at presentation in 287 (86%) and 48 (14%) patients, respectively. Overall, anti-virals prescribed included valaciclovir 500 mg-1 g, 1-3 times daily, aciclovir 200-400 mg, 1-5 times daily, topical aciclovir 2-5 times daily, famciclovir 250 mg, 1-3 times daily, and topical trifluorothymidine two hourly or as needed daily or combined oral and topical anti-virals.

The dose of prescribed anti-virals was in alignment with the guidelines in 69% (231/335) of eyes compared to 75% (64/85) in 2017 ($p = 0.254$). For the type of HSK, alignment was found in 80/112 eyes (71%) with epithelial, 43/68 (63%) with stromal, 13/17 (76%) with endothelial, 52/90 (58%) with keratouveitis and 43/48 (90%) on prophylaxis.

Conclusion: Clinicians at Sydney Eye Hospital were less adherent, although not significant, to local HSK treatment guidelines in 2018-2019, compared to six month post guideline implementation audit in 2017. Regular activities are needed to sustain knowledge use.

Assessing the subjective quality of smartphone anterior segment photography

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Purpose: To assess the subjective quality of anterior segment photos taken from a smartphone camera adapted to the slit lamp compared to a commercial inbuilt slit-lamp camera.

Methods: Non-inferiority study.

Five paired images of the anterior segment of normal eyes were taken using an iPhone 11 (Apple, Inc., Calif., USA) camera attached to a universal slit lamp adaptor and a commercial inbuilt slit lamp camera (Haag-Streit Diagnostics, Bern, Switzerland). Images were collated into a survey in which ophthalmology students, residents, registrars, and consultants participated to select an image taken from the inbuilt slit lamp camera. If the image quality was subjectively indistinguishable, we expected a 50:50 split, no better than guessing. We selected a 10%



non-inferiority margin, with the hypothesis that no less than 40% of images believed to be from the conventional camera were in fact from the smartphone camera.

Results: There were 27 respondents in the survey: ophthalmology consultants (n = 7), registrars (n = 10) and residents (n = 7) and students (n = 2). The mean correct identification across the respondents was 11.3 out of 25 (45.2%) images. Overall, the smartphone camera was non-inferior to the inbuilt slit lamp camera ($p < 0.001$). The non-inferiority of the smartphone camera was significant for consultants (47.4%, $p < 0.01$), registrars (47.6%, $p < 0.001$) and residents (37.7%, $p < 0.0001$).

Conclusions: Anterior segment images obtained with a smartphone camera were non-inferior to the commercial inbuilt slit lamp camera. Smartphone cameras may be a non-inferior tool for communication of anterior segment images having implications for the ease of access to quality telehealth consultations.

The novel gelsolin GSN:c.1477T>C variant is associated with the systemic and ophthalmic phenotype of amyloidosis of the Finnish type

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Purpose: To validate the pathogenicity of a novel gelsolin GSN:c.1477T>C, p.(Trp493Arg) variant identified in a pedigree of three individuals affected by a lattice-like corneal dystrophy and various systemic features of Amyloidosis of the Finnish type.

Method: Whole-exome sequencing data were interrogated for known and predicted pathogenic genetic variants in genes associated with corneal disease. Histological and immunohistochemical investigations were performed on a full thickness corneal graft

specimen collected from an affected proband during penetrating keratoplasty.

Results: The predicted pathogenic gelsolin GSN: c.1477T>C variant which was absent from large publicly available genetic sequencing databases, was identified in all three affected individuals. Clinical examination demonstrated systemic features of Amyloidosis of the Finnish type in all individuals. Histopathology of the corneal graft specimen revealed stromal amyloid inclusions which stained positively for gelsolin in immunohistochemical studies.

Conclusion: The novel GSN:c.1477T>C variant is associated with the clinical phenotype of Amyloidosis of the Finnish type. Identification of this novel disease variant affecting a locus distant to a critical calcium binding region may lead to a more comprehensive understanding of the pathobiology of this vision-affecting disease.

Benefits and risks of orthokeratology treatment: A systematic review and meta-analysis

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Purpose: To assess the risks and benefits associated with orthokeratology (ortho-K) treatment compared with other methods of myopia control.

Methods: A search was conducted using Pubmed and Embase, including all studies in databases until February 2020. Studies including patients >5 years of age with myopia (-0.75 to -6.00D), reported on risks, visual and ocular biometric effects of ortho-K were included. Interventional, retrospective and hospital audit studies were also included to maximise available data.

Results: Forty-nine papers were included in this systematic review and meta-analysis, consisting of 18 randomised controlled trials and 31 non-randomised studies, including six hospital audits. Quality of included data was variable and selection bias coupled with discontinuation effects likely skewed the results towards a relative benefit for ortho-K. Rate of axial elongation was lower in participants undergoing orthokeratology treatment compared to other treatment modalities (MD -0.17 mm, 95% confidence interval [CI] -0.22 to -0.11). Rate of change in axial length rebounded rapidly after ortho-K discontinuation compared to participants which continued treatment (MD 0.10 mm, 95% CI 0.06 to 0.14). Participants wearing ortho-K lenses were seven times more likely to experience an adverse

event compared to alternative treatments (odds ratio 7.36, 95% CI 3.22 to 16.85).

Conclusions: Ortho-K arrests myopia progression while in use. However, upon cessation of treatment there is a rapid rebound in axial length growth, meaning that discontinuation comes with the high risk of significant myopia progression. This lifelong dependence on ortho-K coupled with the manifold increase in adverse events, make it a second line therapy for myopia control.

Microbial keratitis in South Western Sydney: A three-year review of burden and microbiological profile

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Purpose: Microbial keratitis (MK) is a serious sight threatening eye condition, requiring urgent empirical antimicrobials. Periodical surveillance of microbes and their antibiotic resistance profiles is critical to optimise patient outcomes. We present pilot data, along with treatment burden, prevalence, morbidity and current therapies for MK across South Western Sydney.

Method: Retrospective review between 2017-2020 of MK cases at Liverpool Hospital was conducted. Data was sourced from the ophthalmology department, the pharmacy's dispensing history for antimicrobial eye drops and pathology records of corneal scrapes.

Results: One hundred and two presentations of unilateral MK were included; 64.3% were male and the average age was 59.5 years (range: 5-101). Sixty-four cases involved admission with an average length of stay of 7.31 days. Contact lens use was the most frequent risk factor (10.8%). The culture positivity rate was 62%, of which 75% were bacteria, 19% were viral and 6% were fungal. Gram stain results indicated 44% of the bacteria were gram positive and 37% were gram negative. The most common bacteria were *Staphylococcus aureus* (18%) and *Pseudomonas aeruginosa* (16%). *Staphylococcus aureus* had a 31% resistance rate to flucloxacillin, but these were all cases of methicillin-resistant *Staphylococcus aureus* (MRSA). Methicillin-resistant *Staphylococcus aureus* had 0% resistance (n = 4) to vancomycin. *Pseudomonas aeruginosa* was most sensitive to gentamicin 100% and ceftazidime 88%. In 75% of presentations, the visual acuity improved by at least 1 Snellen line.

Conclusion: *Staphylococcus aureus* was the most common isolate. Monotherapy with a fluoroquinolone was the most common treatment and is highly effective for empirical antibiotic therapy of bacterial keratitis.

Visual outcomes following implantation of IC-8 (small aperture) intraocular lens in patients with irregular corneas

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Purpose: To evaluate visual performance of a small aperture extended depth of focus intraocular lens (IOL) in patients with irregular corneas from various underlying causes.

Method: A retrospective chart review of nine patients (mean age of 46.6 ± 11.6 years) with monocular implantation of IC-8 IOL (a hydrophobic acrylic non-toric IOL with an opaque mini ring measuring 3.23 mm in total diameter with a 1.36 mm central aperture) was undertaken. All patients' monocular uncorrected distance visual acuity (UCDVA) and near visual acuity were analysed.

Results: At three months, 8/9 (89%) of patients were 6/9 or better UCDVA in their IC-8 eye. Of the IC-8 implanted eyes 6/9 (67%) achieved N6 or better uncorrected near visual acuity. UCDVA of at least 6/9 or better was attained even in presence of up to 2.50D corneal astigmatism.

Conclusion: Implantation of a small aperture IOL provides patients with good simultaneous distance and near visual acuity, even in the presence of significant corneal astigmatism.

Descemetorhexis for guttatae predominant Fuchs' endothelial dystrophy: A prospective, interventional case series

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Purpose: To compare the visual outcomes, requirement for ripasudil therapy and success rate of patients with central Fuch's endothelial corneal dystrophy who underwent descemetorhexis without endothelial keratoplasty (DWEK).



Method: This is a prospective study of 10 eyes with moderate to severe Fuchs' endothelial dystrophy with corneal guttae and/or oedema limited to the central cornea, treated at the Royal Victorian Eye & Ear Hospital between 2019 to 2021. Inclusion criteria were decreased vision attributed to corneal disease only, with peripheral endothelial cell density >1000 cells/mm². Descemetorhexis was performed by removing the central 4 mm of diseased Descemet's membrane as a stand-alone procedure. Ripasudil was used as rescue therapy four weeks post-operatively if the cornea does not clear. Patients were followed up for 12 months.

Results: Eight of 10 eyes had improved visual acuity following DWEK. Three eyes cleared spontaneously without ripasudil rescue, while seven eyes required ripasudil, of which two required Descemet's Membrane Endothelial Keratoplasty as their cornea did not clear after 3 months. Pre-operative mean best corrected visual acuity was 6/15 (range 6/7.5 to 6/19) with mean contrast sensitivity of 1.20. Post-operative mean best corrected visual acuity was 6/7.5 (range 6/6 to 6/12) with an improved mean contrast sensitivity of 1.50. There were no reported adverse events.

Conclusion: DWEK was successful in the treatment of 80% patients with moderate to severe Fuchs' dystrophy with good visual outcomes. Descemet's Membrane Endothelial Keratoplasty can be performed successfully if the cornea does not clear following DWEK.

EPIDEMIOLOGY/PUBLIC HEALTH

Prevalence of visual impairment in older people with dementia and its impact on older people with dementia and their carers: A scoping review

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Objectives: Visual impairment and dementia both increase with age, and it is likely that many older people will suffer from both conditions. This scoping review aims to investigate the prevalence and types of visual impairment among older people with dementia, and the impact of visual impairment on older people with dementia and their carers.

Setting and Participants: This scoping review used Arksey and O'Malley's methodological framework. Studies in any setting involving people with dementia and some assessment of either visual impairment, eye

diseases causing visual impairment or the impact of visual impairment were included.

Results: Thirty-one studies investigating the prevalence of visual impairment among older people with dementia were included with estimates ranging from 19.7% to 51.6%. Only 10 studies reported on impacts of visual impairment on older people with dementia, including increased use of hospital services, increased disability and dependency, reduced social engagement, negative emotions, increased abnormal behaviours, loss of hobbies, difficulty in using visual aids or memory aids, and greater Neuropsychiatric Inventory symptoms. Only one study reported on impacts on carers and found increased conflict and physical exhaustion.

Conclusion: Visual impairment is common in older people with dementia and is associated with negative impacts on those with dementia and their carers. However, heterogeneity between studies in terms of setting and method for assessing visual impairment make it difficult to compare findings between studies. Further research is needed, particularly assessing the impact on carers and the potential benefits of cataract surgery using non-monofocal intraocular lenses.

Non-attendance at diabetic retinal screening in Northland, New Zealand

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Purpose: This study explores factors associated with non-attendance at diabetic retinal screening in Northland, New Zealand.

Method: A retrospective, register-based cross-sectional analysis of 9066 participants invited to diabetic retinal screening in Northland between 17 June 2015 and 17 June 2020 was performed. Multivariate logistic regression was used to assess the risk of age, sex, ethnicity, social deprivation and type of diabetes with non-attendance at diabetic retinal screening.

Results: Median age was 65 years (interquartile range 55-74) and 54.6% of participants were male ($n = 4947$). In total 1974 people (21.8%) did not attend their first invited appointment for diabetic retinal screening during the study period. In the multivariable analysis older age was associated with a lower odds of non-attendance (odds ratio [OR] 0.30, 95% confidence interval [CI] 0.22-0.40 of non-attendance in those aged over 75 years compared with those aged under 35 years, p value for trend <0.001). Māori

(OR 2.82, 95% CI 2.48-3.21) and Pacific Peoples (OR 2.48, 95% CI 1.75-3.51) had a higher odds of non-attendance compared with Europeans. Sex, social deprivation and type of diabetes were not associated with non-attendance.

Conclusion: Younger age and Māori and Pacific ethnicity were significant risk factors for non-attendance at diabetic retinal screening. This is the first study exploring social deprivation as a risk factor for non-attendance at diabetic retinal screening in New Zealand, with no association being found, in contrast with findings from other countries. Future qualitative research should explore barriers to screening in groups with high non-attendance rates and measures to increase screening uptake.

Dietary flavonoids are associated with longitudinal treatment outcomes in neovascular age-related macular degeneration

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Purpose: To assess whether dietary intake of flavonoids are associated with longitudinal treatment outcomes of patients with neovascular age-related macular degeneration (nAMD).

Method: A total of 547 participants with nAMD were recruited at baseline, 494 were followed-up after receiving 12 months of anti-vascular endothelial growth factor therapy. Baseline dietary intake of flavonoids was determined using a validated food frequency questionnaire. At follow-up, presence of intra-retinal fluid (IRF) and sub-retinal fluid, retinal pigment epithelium detachment and central macular thickness were recorded from optical coherence tomography scans. Visual acuity (VA) was documented using LogMAR charts.

Results: Participants in the first tertile of intake of the flavonol quercetin, and the flavan-3-ols epigallocatechin-3-gallate and epigallocatechin had significantly worse vision than participants in the third tertile-multivariable-adjusted least square mean VA: 14.68 vs. 19.53 ($p = 0.04$); 14.06 vs. 18.89 ($p = 0.04$); 13.86 vs. 18.86 ($p = 0.03$), respectively. Participants in the first compared to the third tertile of flavan-3-ol, epigallocatechin-3-gallate and epigallocatechin intake all had a twofold higher risk of IRF, multivariable-adjusted p trend of: 0.03, 0.01 and 0.02, respectively. The first vs. the third tertile of tea intake had significantly worse vision

(least square mean VA: 13.49 vs. 19.04, $p = 0.02$), increased risk of IRF (odds ratio 2.13, 95% confidence interval 1.18-3.85) and greater mean central macular thickness (279.59 μm vs. 256.52 μm , $p = 0.04$).

Conclusion: Higher intakes of dietary flavonoids, specifically flavonols and flavan-3-ols, could be associated with better long-term treatment outcomes in nAMD patients receiving anti-vascular endothelial growth factor therapy. Confirmation of these associations in interventional studies could result in promising new therapeutic approaches to the treatment of nAMD.

Impact of COVID-19 pandemic on ophthalmic presentations to an Australian outer metropolitan and rural emergency department

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Purpose: To analyse the pattern of ophthalmic presentations to an outer metropolitan and a rural emergency department (ED) during the COVID-19 pandemic in New South Wales (NSW), Australia.

Method: A retrospective audit of emergency department (ED) coding data for ophthalmic emergency presentations to Campbelltown Hospital (fifth busiest metropolitan ED in NSW with a population coverage of 310,000) and Bowral and District Hospital (a rural ED with a population coverage of 48,000) for the period of 1 March to 31 May in 2019 and 2020 was conducted. Variables including patient demographics, triage category, referral source, discharge diagnosis, length of stay, departure status and follow-up location were assessed. Differences before and during COVID-19 were analysed using chi-squared tests or independent samples t -tests.

Results: While there was a significant drop in total presentations to both EDs ($p < 0.01$), there was no change in ophthalmic presentations during COVID-19 at Campbelltown (+1.75%, $p = 0.12$) and an increase in ophthalmic presentations at Bowral (+11%, $p < 0.01$). Non-urgent ophthalmic presentations increased for both EDs ($p = 0.03$ for Campbelltown, $p < 0.01$ for Bowral). Urgent ophthalmic presentations decreased at Bowral ED ($p = 0.0075$). Patients presenting with visual disturbance decreased at Campbelltown ED (-71%, $p = 0.017$).

Conclusion: Despite a significant drop in total ED presentations during the COVID-19 pandemic, an upward



and varied trend in ophthalmic presentations to two EDs in an outer metropolitan and a rural location was observed, suggesting a need for a flexible ophthalmic healthcare delivery strategy such as tele-ophthalmology to optimise patient care during and after the pandemic.

Creating a population-based visual field database for big-data research

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Purpose: This project aimed to develop a method of exporting and standardising a database of HFA data with additional variables for modelling and linked data studies.

Method: Visual field data was obtained from hospitals, the Lions Eye Institute and private practices throughout Western Australia. Algorithms were created to clean the data and create reliability scores. Data has been prepared for subsequent phases of data analysis, and use in linked data studies.

Results: Over 350,000 tests from 18 practices in Perth, the Lions Eye Institute and several hospitals. Data for 62,000+ patients, an average of 5.46 tests per person. 54% of tests with gender were female. The average age of patients at the time of their test was 65.75 years. The number of tests per year increased from 664 to 19,279 tests in 1988 to 2019. Raw sensitivity values and test reliability indicators were available for all tests.

Conclusion: Visual field data from 350,000+ tests were collated into a single database that is fit-for-purpose in population studies related to visual field function, including linked data studies investigating co-morbidities and injuries and their relationship with visual fields. The database is relatively complete, containing raw sensitivity values and reliability indicators for all tests.

The MD and VFI results extracted suggests the majority of tests being close to the normal reference values utilised by the HFA.

An integrated binocular visual field and novel pattern classification and clustering methods will be applied to the database for use in later linked data studies and potential clinical decision-making tools.

Impact of the COVID-19 pandemic-related lockdown on public sector ophthalmic work by New Zealand's ophthalmologists

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Purpose: Assess the impact of the COVID-19 'alert level 4' nationwide lockdown (26 March to 27 April 2020) on the New Zealand public ophthalmology service.

Method: An anonymous online survey was sent to all New Zealand-based fellows of the Royal Australian and New Zealand College of Ophthalmologists after lockdown. Respondents provided retrospective assessment of practice patterns and their personal health during the COVID-19 lockdown. National-level administrative data from April 2019 and April 2020 was examined to contextualise survey findings.

Results: Fifty-seven respondents (response rate 49%) working in the public health system participated. A large majority of respondents (82% and 98% respectively) reduced elective clinic and surgical volumes by at least 75%. National-level information confirmed clinic reduced to 38.2% of normal and elective operating volumes to 11.5%, with virtual visits increasing 17.9 fold. Elective clinic and elective operating volumes promptly recovered to usual volumes in June (second month post-lockdown). Most respondents (58%) followed the RANZCO triaging guideline, and 28% triaged emergencies only. At a personal level, respondents reported significant physical health benefit ($p < 0.001$) associated with the lockdown experience, but no overall change in mental health or social well-being.

Conclusion: Publicly-employed ophthalmologists experienced dramatic reductions to elective clinic and operating volumes during COVID-19 lockdown. The prompt recovery of service delivery volumes back to pre-lockdown levels support the value of a COVID-19 elimination strategy in New Zealand. Virtual visits for selected patients allowed ongoing management without risking virus transmission. At a personal level, the lockdown resulted in reported physical health benefits for ophthalmologists.

Prevalence of refractive error in urban and rural Laos - Vientiane Eye Study

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Purpose: The Vientiane Eye Study is a cross-sectional population-based study which studied the prevalence of refractive error and various risk factors in the population of Vientiane Province in Laos.

Method: Participants were selected using a randomised, stratified, cluster sampling process. Demographics such as age and gender were obtained. Smoking status, presence of diabetes and hypertension were noted. Ophthalmic examination involved autorefractometry, World Health Organization cataract grading, applanation tonometry and, ultrasound pachymetry. Myopia, hyperopia and astigmatism were deemed present if the respective ametropia was > 1.0 dioptres. Prevalences were calculated as ratio estimates. Logistic regression models were fitted to determine univariate and multivariable associations between a range of risk factors and refractive error-related conditions.

Results: The mean refractive error was -0.36 D (SD 1.41). Myopia of > -1.0 and -6.0 occurred in 24.1% (95% confidence interval [CI] 19.9 to 28.4) and 0.7% (95% CI -0.2 to 1.7) of subjects, respectively. There was a correlation between myopic refractive error and both age and a higher grading of nuclear cataract ($p = 0.010$). Hypermetropia of $> +1.0$ D was associated with increasing age ($p < 0.001$). Astigmatism was present in 14.5% (95% CI 8.1 to 20.9) of the population and was associated with nuclear cataract ($p = 0.004$). Urban subjects had a reduced prevalence of myopia compared with rural subjects.

Conclusion: The study concluded that myopia was associated with younger age and a higher grade of nuclear cataract. The prevalence of myopia in this study was lower than the estimated pooled prevalence in this region but still contributed to low vision.

Evaluation of ophthalmic surgical cancellations at Waikato DHB over a 10-year period from 2010 to 2019

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Purpose: To evaluate causes and demographic associations for ophthalmic surgical cancellations in a tertiary hospital over a 10-year period.

Method: All ophthalmic surgical cancellations were identified using electronic records between 1 Jan 2010 and 31 December 2019. Associations between cancellations and demographics, calendar year, subspecialty and driving distance to Waikato Hospital were analysed.

Results: A total of 20,934 surgical bookings were identified over the 10-year period with overall cancellation and day of surgery cancellation (DOSC) rates of 21.2% ($n = 4447$) and 6.8% ($n = 1416$) respectively. The most common cancellation reasons included list overrun/acute case substitution (24.2%), not specified (23.3%) and acute illness (17.7%). Cancellations reduced yearly while total surgical bookings increased. New Zealand Māori accounted for 18.3% of bookings, with a total cancellation and DOSC rate of 20.5% and 9.0% respectively. Pasifika patients accounted for 2.5% of bookings, with a cancellation rate and DOSC rate of 22.7% and 7.8% respectively.

Conclusions: Māori and Pasifika patients were underrepresented in surgical bookings and overrepresented in cancellations and DOSCs. A large proportion of DOSCs are due to list overrun and substitution for emergency cases. Reducing surgical cancellations, and in particular DOSCs, would significantly increase theatre utilisation and surgical capacity with minimal increase in costs. Targeted strategies to reduce Māori and Pasifika cancellations would improve equity of access to ophthalmic surgical services.

*Note: Additional data analysis has been completed and added to presentation since the time of initial presentation at RANZCO Scientific Branch Meeting in Christchurch.

Patients' perceptions of artificial intelligence in diabetic eye screening

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Purpose: Artificial intelligence (AI) technology is poised to revolutionise the way we deliver healthcare. We set to evaluate the patient perspective of AI use in their diabetic eye screening.

Methods: Two-hundred and one patients undergoing diabetic retinal screening across three centres in Auckland participated in a survey about their opinion regarding the use of AI technology in their eye screening. The survey collected consisted of 17 questions covering topics of AI awareness, trust in AI systems, perceived benefits and receptivity towards AI systems.

Results: There was an equal distribution of males to females. The mean age was 57 years (range 18 – 90). The majority of participants identified as New Zealand European (44%), followed by Asian (39%), Pacific Islander (10%) and Māori (5%). While 66% of participants were aware of AI, only 49% have heard it was being implemented in healthcare. Overall, 70% of respondents were comfortable with AI use in their care, with 49%



saying they would trust an AI-assisted screening program as much as a health professional. The main perceived benefits of AI included faster diagnostic speeds and greater accuracy. Almost all respondents stated they would trust AI more with doctor supervision.

Conclusion: There is a low awareness of AI among our participants and wider public. Despite this, most are receptive towards the implementation of AI in diabetic eye screening. Overall, there was a strong preference towards continual involvement of clinicians in the screening process.

Exploring the views on implementing the Amsler grid as a screening tool for age-related macular degeneration, into the over-75-year-old health check in general practice: A qualitative descriptive study

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Purpose: Approximately 1.7 million Australians have some evidence of macular degeneration with 15% of over-80-year-olds suffering from age-related macular degeneration (ARMD)-related vision loss. The Amsler grid is a recognised and cost-effective test to monitor probable ARMD and it is feasible to be used in general practice. It has, however, not been recommended for screening. This study aims to explore views on the practicability and usefulness of the grid in the over-75-year-old health check for ARMD screening.

Method: This is a qualitative descriptive study using template thematic data analysis. Based on the process adopted by a Perth-based general practice, where ARMD screening is integrated into the over-75-year-old health check, an implementation process pack was developed. Semi-structured interviews were undertaken with an ophthalmologist and two general practice teams (two general practitioners and two practice nurses) to explore perceptions on the implementation process. Data analysis will be done using a template thematic strategy where a priori themes were determined, including 'Importance', 'Practicability' and 'Usefulness', and data will be coded.

Results: Data collection is in its last stages after which, data analysis will commence and is expected to be completed by August 2021.

Conclusion: This research explores views on implementing the Amsler grid into the over-75-year-old health check with the hope to detect ARMD earlier and prevent debilitating vision loss. Our study will be the first to explore the value of the Amsler grid as a screening tool for ARMD in general practice.

Establishing a diabetes retinal screening service in South Western Sydney: Patient satisfaction with retinal imaging and the correlation between diabetic retinopathy and quality of life

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Purpose: The multicentre, prospective South Western Eye and Diabetes Deep Learning Algorithm study has developed a new diabetes retinal screening service, incorporating a novel deep learning algorithm, for a low socioeconomic, multi-ethnic, outer-metropolitan Sydney region. This preliminary report examines patient satisfaction with retinal imaging and correlation between diabetic retinopathy (DR) and quality of life (QOL).

Methods: Supported by an Ophthalmic Research Institute of Australia grant, South Western Eye and Diabetes Deep Learning Algorithm participants were recruited from diabetes outpatient clinics and underwent two-field, table-top fundus photography and ocular coherence tomography. Questionnaires regarding patient satisfaction with retinal imaging and self-perceived QOL (EQ5D) were completed. Proportion of participants with high satisfaction levels were reported and mean self-perceived QOL (EQ-VAS) scores for those with and without DR were compared.

Results: The study is ongoing and preliminary data (n = 54) is presented. DR was detected in 50.0% of recruited participants. All participants found it very convenient to undergo photography on the same day as their diabetes appointment and 83.3% would undergo retinal imaging for DR screening again. This was despite 50.0% of participants requiring pharmacological pupil dilation. Preliminary QOL data showed that although DR did not correlate with greater disability, pain or anxiety/depression, average self-perceived health was lower (mean EQ-VAS scores of 68.3% vs 76.3%) in participants with DR than those without DR.

Conclusions: The correlation between DR and lower self-perceived QOL, occurring independently of both visual acuity and knowledge of DR diagnosis, supports

the need for efficient screening and early treatment. Retinal imaging was well-tolerated with an overwhelming preference for same-day outpatient DR screening.

Associations between intake of dietary micro-and macro-nutrients with dry eye syndrome. Blue Mountains Eye Study

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Purpose: To report on the relationship between dietary intakes of a broad range of macronutrients and micronutrients, including antioxidants and fatty acids, with the presence of dry eye symptoms.

Methods: Population-based cross-sectional study of 1952 urban Sydney residents aged 60 years or greater. Participants completed a validated semi-quantitative 145-item food frequency questionnaire and a dry eye questionnaire.

Results: A total of 1528 responses were recorded (78.3%) of which 902 (59.0%) were female. 53.8% of participants reported at least one dry eye symptom, more commonly by women (58.2%) compared to men (47.3%). Participants in the highest (8.11 mcg/day) versus lowest quartile of intake of dietary B12 had reduced likelihood of reporting more than 2 dry eye symptoms and 1 or more moderate-severe dry eye symptoms: odds ratio 0.64 (95% confidence interval 0.41–1.00) and odds ratio 0.63 (95% confidence interval 0.41–0.97), respectively. Higher dietary intakes of vitamin C, thiamine (vitamin B1), polyunsaturated fats and calcium, were all associated with a reduced likelihood of participants reporting more than two dry eye symptoms ($p < 0.05$ for all).

Conclusions: Intakes of a broad range of micro- and macro- nutrients were significantly and independently associated with reduced odds of experiencing dry eye symptoms.

Trends in emergency ophthalmic presentations in Victoria, Australia during the COVID-19 pandemic in 2020

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Purpose: To evaluate trends in ocular emergency presentations to the Royal Victorian Eye and Ear Hospital during the COVID-19 pandemic in 2020.

Methods: We conducted a retrospective audit of ocular emergency presentations to the Royal Victorian Eye and Ear Hospital between 1 March and 31 December 2020, the time period over which two waves of COVID-19 and associated lockdowns occurred in Victoria, Australia.

Results: Overall there were 18.4% fewer total emergency presentations observed (25641 vs 20933) compared to the same time period in the year preceding. A trend of decreasing presentations was noted across all triage groups, particularly category 4 and 5. There was a 51.5% reduction in presentations of viral conjunctivitis (1368 vs 663) and an 40.0% reduction penetrating eye injury (83 vs 50). Presentations for retinal detachment and acute angle closure glaucoma remained stable with 592 vs 528 and 86 vs 87 in 2019 and 2020 respectively. The greatest week-by-week difference in presentations were noted during weeks commencing 26 March and 20 August, coinciding with the peak of new cases at the end of March during the first COVID-19 wave and declaration of state of disaster in August during the second COVID-19 wave.

Conclusion: The data has allowed us to examine the impact of the COVID-19 pandemic and lockdown restrictions on trends in emergency ophthalmic presentations during two separate outbreaks. Overall reduction in presentations may be attributed to a number of reasons including delays in patients seeking appropriate medical attention and changing behaviours due to lockdown restrictions.

Assessment of barriers to access and associated visual outcomes in a follow-up Auckland keratoconus and crosslinking service

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Purpose: Determine the barriers to accessing care particularly among Māori and Pacific Peoples.

Method: Data at Auckland District Health Board currently being collected prospectively over 12 months includes; age, gender, body mass index, ethnicity, New Zealand Deprivation score of residence (NZDep; area



based measure of socioeconomic status, 1 = low deprivation - 10 = high deprivation), disease severity (maximum keratometry and thinnest corneal thickness), attendance, distance travelled to clinic and visual outcomes.

Results: Sixty-four subjects seen over a three-month period, had a mean age and body mass index of 22.7 ± 5.9 years, and 28.7 ± 6.9 respectively, and 61% were males. Ethnicity constituted 45% Pacific Peoples, 23% Europeans, 19% Māori, 11% Asian and 2% MELAA. Mean travel distance was 11.7 ± 8.4 km and mean NZDep was 6.9 ± 2.7 with 76.3% attendance. Between ethnicities, there was no difference in attendance and time from referral to triage. From referral to first offered appointment, Europeans waited longer ($p = 0.038$), but no difference in time from referral to attended appointments was found. Between ethnicities, severity of disease was insignificant but NZDep was significant; Māori (8.08 ± 1.98), Pacific People (7.93 ± 2.07) and Europeans (4.2 ± 2.43) ($p < 0.01$). However, this did not translate into differences in attendance or visual outcomes but travel distance with NZDep was significant ($p < 0.01$).

Conclusion: Māori and Pacific Peoples constitute majority of our clinic and have the highest NZDep. Despite this, they did not have worse disease severity, attendance or visual outcomes compared to other ethnicities. Our results suggest that NZDep and possible travel distance are active barriers to accessing care.

Assessment of variations in access to a tertiary first specialist assessment keratoconus and crosslinking service in Auckland

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Purpose: Determine the barriers to gaining access to the crosslinking service in Auckland particularly among Māori and Pacific Peoples.

Method: Data from patient records at Auckland District Health Board currently being collected prospectively over 12 months includes; age, gender, body mass index, ethnicity, New Zealand Deprivation score of residence (NZDep; area based measure of socioeconomic status, 1 = low deprivation - 10 = high deprivation), disease severity (maximum keratometry and thinnest corneal thickness), attendance, distance travelled to clinic and visual outcomes.

Results: Twenty-nine subjects seen over a 3-month period had a mean age 23.5 ± 1.1 years, mean body mass index 29.8 ± 4.9 and 50% were female. The mean distance travelled was 12.9 ± 9.5 km and mean NZDep was 7.3 ± 2.9 , with an attendance of 47.9%. Pacific People consisted of 44% of the population, Māori 31%, Europeans 22%, Asian 3% and MELAA 0%. Mean visual acuity at attendance was 0.264 ± 0.06 logMAR (20/36.7 snellen). There was a significant difference in total attendance between ethnicity with Pacific people having the lowest rates (21.43%) and Asians the highest rates (100%) ($p = 0.019$), with no significant difference in time from referral to offered or attended appointment. There was no significant difference between ethnicity and NZDep, or ethnicity and age of presentation, severity of disease or visual acuity.

Conclusion: A low rate of attendance was seen in this patient cohort attending a keratoconus clinic. Most absentees were Pacific People and Māori, despite consisting 75% of our clinic population. Further studies are required to investigate the underlying reasons for poor attendance.

Pop-up community-based vision screening in New Zealand

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Purpose: Visual impairment has a significant negative impact on quality of life, independence and ability to work. This study quantifies the prevalence of undiagnosed visual impairment detected at pop-up community screening clinics in the Waikato region of New Zealand. Locations were selected to target vulnerable populations including elderly Māori that may not otherwise attend vision assessments elsewhere.

Methods: Pop-up screening clinics were completed at two locations: regional marae performing COVID-19 vaccinations and at a local retirement home. Best corrected visual acuity (BCVA) and autorefractive was measured. Individuals were flagged for community follow-up if BCVA was better than 6/12 or hospital follow-up if BCVA was worse than 6/12 bilaterally or 6/15 in either eye. All individuals 40 years or older were invited to participate in the vision screening.

Results: In total 64 individuals were screened with 59% females. Ethnicities included Māori (44%), New Zealand-European (34%) and undeclared (22%). Average age was 69.74 years. Based on BCVA, 59% were flagged

for community follow-up and 41% for hospital follow-up. Of the 26 referred for hospital follow-up, 69% have been reviewed. Diagnosed pathology included: cataract (55%), age-related macular degeneration (17%), other (17%), and refractive error (11%).

Conclusion: This pilot study reports high rates of undiagnosed ocular pathology. Obtaining accurate prevalence data on visual impairment in vulnerable populations is important for developing service delivery models to provide timely treatment for these populations. This pilot highlights barriers to access public funded ophthalmic care for vulnerable populations using the existing models of healthcare delivery.

Melbourne cat associated trauma study

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Purpose: There are currently no publications on feline related ocular injuries. We collated the cases of cat associated ocular trauma in 2019-2020 to better understand the demographics, type and severity of injuries. We were also interested in whether the number of cases were higher in 2020.

Method: This is a retrospective cross-sectional study of patients presenting to the Royal Victorian Eye and Ear emergency department with cat related ocular trauma between January 2019 and December 2020.

Results: There were 56 cat related ocular injuries out of 80,463 emergency department attendances between January 2019 and December 2020 with 26 cases occurring in 2019 and 30 cases in 2020. Paw or claw related injuries accounted for 55 (98.2%) of cases and there was only one bite related injury. Majority of patients had non-sight threatening ocular injuries with corneal and conjunctival abrasions/superficial lacerations seen in 26 (46.4%) and 27 (48.2%) cases respectively. Four patients had sight threatening injuries with three requiring surgery. Seven extraocular injury patients, only one patient had concurrent ocular injury with no patient requiring surgery. There was only one incident of associated infections.

Conclusion: Cat related ocular injuries can be severe including corneal and scleral laceration. Some patients may have occult injuries thus all ocular injuries attributed to cats warrant a detailed ophthalmic examination. No statistical significance in the incidence rates of cat related ocular injuries between 2019 and 2020 attributable to lockdown.

Impact of COVID-19 outbreak and nationwide lockdown on ophthalmology services at a tertiary hospital in New Zealand

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Aim: In March 2020, the World Health Organization declared the COVID-19 pandemic a global health emergency. The outbreak has caused disruptions in the delivery of healthcare during periods of lockdown. This study aims to evaluate the impact of the COVID-19 pandemic on acute ophthalmology services at a tertiary hospital in Auckland, New Zealand.

Methods: Retrospective cohort study of all presentations to the emergency eye service during the 2020 lockdown period (1204) and equivalent 2019 time period (2140). Outcome measures included patient demographics, presentation, referral source, diagnosis, investigations, management and clinic outcome. A comparison was performed of subjects that presented during the seven-week lockdown in 2020 to the same period in 2019.

Results: There was a 40.0% reduction in new presentations to the emergency eye clinic during the 2020 lockdown compared to 2019 ($p < 0.001$). Proportion of referrals from general practitioners (24.7% vs 35.8%, $p < 0.001$) or hospital (8.2% vs 13.2%, $p < 0.001$) was higher in 2020. There were fewer optometrist referrals (4.8% vs 0.9%, $p < 0.001$) and self-referrals (32.3% vs 23.6%, $p < 0.001$) in 2020. Proportion of follow up visits during 2020 was also reduced (25.7% vs 20.8%, $p = 0.001$).

Conclusions and Relevance: This study highlights the influence of the COVID-19 outbreak and subsequent lockdown on care received at an emergency eye clinic in New Zealand. There was a substantial reduction in acute ophthalmic presentations during the 2020 lockdown period. An understanding of the impact of social distancing measures on the eye service is important in future planning and preparedness for other unprecedented lockdowns.

The relationship between incidence of syphilitic uveitis and syphilis: Results from Victoria, Australia between 2015-2019

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Purpose: Syphilis is a sexually and vertically transmitted disease caused by the spirochete *Treponema pallidum*. While the incidence of syphilis has recently increased in Australia, it remains unclear how this relates to ocular syphilis. We aimed to compare syphilitic uveitis rates with incidence of syphilis in Victoria.

Method: We extracted data from the Royal Victorian Eye and Ear Hospital emergency department database from January 2015 to December 2019. Australian syphilis incidence data was extracted from the Australian Department of Health database. The incidence of syphilis was divided into two groups: early and late. Early syphilis was defined as patients with primary, secondary or early latent syphilis. Late syphilis was defined as tertiary or late latent syphilis.

Results: From 2015 to 2019, there was a total of 6448 uveitis presentations to the Royal Victorian Eye and Ear Hospital emergency department. Syphilitic uveitis presentations increased by 34.7% between 2015-2019, 3.52 per 10,000 presentations to 4.74 per 10,000 presentations. The overall incidence of syphilis in Victoria increased by 44.8% between 2015-2019, from 27.7 per 100,000 to 40.1 per 100,000. The rise in incidence of early syphilis was 62.4% (15.7 per 100,000 to 25.5 per 100,000), greater than the 21.7% rise in late syphilis (12 per 100,000 to 14.6 per 100,000).

Conclusions: While the incidence of syphilitic uveitis rose between 2015-2019, this increase was less than the overall increase in syphilis in Victoria. This could be attributed to fewer syphilis infections progressing to ocular syphilis during this period, a possible positive outcome of improved early treatment of syphilis.

The demographics and clinical details of general ocular trauma in Victoria, Australia

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Purpose: To describe the demographics and clinical details of confirmed or suspected open globe injuries in Victoria, Australia.

Method: A retrospective audit of patients admitted under the General Eye Unit for confirmed or suspected open globe injuries that presented to the emergency department of the Royal Victorian Eye and Ear Hospital, Melbourne, Australia from 1 June 2015 to 30 December 2020.

Results: A total of 299 males and 55 females were admitted. The mean age of injury was 41.9 ± 20.5 years (range 3-89 years). Two hundred and seventy-eight eyes (78%) were open globe injuries, and 77 eyes (22%) were closed globe injuries. Sixty eyes of the open globe injuries had rupture, and 218 eyes had lacerations. Amongst 218 eyes with laceration, 216 had a penetrating eye injury two had a perforating eye injury and 33 had an associated intraocular foreign body. Amongst 77 closed globe injuries, 40 eyes had a contusion, and 37 had a corneal lamellar laceration. 160 eyes (45%) presented with injuries related to work/power tools, 40 eyes (11%) presented with injuries related to gardening and 33 eyes (9%) presented with injuries related to recreational/sports. There were 119 metropolitan patients and 61 rural to regional patients.

Conclusion: Metropolitan men in their fourth decade were at the highest risk of presenting to a specialist eye service with confirmed or suspected open globe injuries. The most common form of open globe injury was penetrating eye injury without an intraocular foreign body. The most common cause of open globe injury was from work/power tools followed by gardening.

Examination of cataract surgical data: Is access equity improving for Aboriginal and Torres Strait Islander Australians?

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Purpose: Persisting inequity in access to eye care for Aboriginal and Torres Strait Islander Australians has been well documented. Over the past decade, a number of frameworks and initiatives have worked towards improving access to eye care, though inconsistent data reporting and availability makes it challenging to form a coherent overview of actual increases in access, and progress towards the population-based needs. The paper will present an improved understanding of access to cataract surgery for Aboriginal and Torres Strait Islander Australians.

Method: Publicly available cataract surgical data over the past decade, including Medicare statistics, public hospital data, Australian Institute of Health and Welfare annual Indigenous Eye Health Measures reports, state health data, and past analyses in the literature, is combined and analysed to present an overview of existing surgical delivery and access and a more nuanced consideration of cataract surgery needs for Aboriginal and Torres Strait Islander Australians.

Results: Large variance has been identified across jurisdictions, across public and private settings, and across remoteness levels, suggesting significant differences in access. The combined analysis highlights challenges in access for cataract surgeries in metropolitan areas. Finally, impacts of COVID-19 on service provision and the existing backlog is considered.

Conclusions: Differing access rates provide an ongoing challenge to organised ophthalmology, as well as the wider eye care sector and national, state and territory-level programs and policies. The shared goal is to best support increasing the cataract surgery rates for Aboriginal and Torres Strait Islander Australians to population-based needs.

Implementation and uptake of an orthoptist-led chloroquine and hydroxychloroquine retinopathy clinic at Liverpool Hospital: July 2020 to May 2021

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Background: In July 2020, in response to COVID-19 clinic restrictions, Liverpool Eye Clinic instituted an orthoptist-led clinic, with subsequent virtual retinal specialist reviews, to screen and monitor for chloroquine/hydroxychloroquine (CQ/HCQ) retinopathy. We discuss its implementation, uptake and issues.

Standard: American Academy of Ophthalmology: Revised Recommendations on Screening for Chloroquine and Hydroxychloroquine Retinopathy.

Methods: The screening protocol included collecting data on patients' demographics, CQ/HCQ retinopathy risk factors, visual acuity, dilated fundus examination, automated visual fields (HVF) and macular spectral domain optical coherence tomography (SD-OCT). Results were reviewed by a retinal VMO, with clinic review if abnormal. Records of patients seen in this clinic from inception to May 2021 were audited.

Results: Forty-six patients (female: $n = 35$, 76.1%) were screened during this period. Twenty-six patients had CQ/HCQ retinopathy risk factors. All patients underwent baseline SD-OCT and 10-2 HVF with 24-2 HVF performed on those of Asian background ($n = 19$, 41.3%). Patients with pre-existing pathology or positive risk factors were appropriately referred for further ophthalmic review. Although orthoptists complied with examination protocols, issues included delays in retinal specialist

review of SD-OCT and/or fundus photography, discoordination with scheduled main clinic follow up for other pathology, and non-attendance for dilated fundus examination if required at a second visit.

Recommendations: Screening and monitoring for CQ/HCQ retinopathy can be effectively performed by an orthoptist with virtual ophthalmologist oversight. However, appropriate systems are needed to ensure that all examination results are reviewed, and abnormal results managed accordingly.

A cost-consequence analysis comparing telehealth, specialist outreach and outpatient specialist clinics for delivery of eye care to rural and remote Western Australia

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Introduction: Inequities in eye health between rural and urban populations are a catalyst for change in every health system. Existing models of care include subsidised patient travel to regional centres and mobile outreach services. Teleophthalmology presents an attractive alternative model of care for rural and remote populations, with the potential of improving accessibility for specialist ophthalmic care. We aim to compare the costs and consequences of different service models eye care delivery to remote communities, reported from a health service perspective.

Methods: Costs and outcomes of subsidised patient travel to outpatient clinics, specialist outreach services and teleophthalmology clinic models were compared using cost-consequence analysis principles. Cumulative costs were estimated by quantifying staff resources and travel costs for each clinic model. Quantitative and qualitative health service evaluation metrics were analysed, including marginal cost estimates and consequences.

Results: The marginal costs per patient for each clinic model were \$506 for patient travel, \$391 for outreach clinics and \$147 for teleophthalmology. Apart from potential cost-savings in replacing a proportion of face-to-face consultations, teleophthalmology may provide added advantages of timely care, opportunities for multidisciplinary education and minimisation of time away from usual activities for both patient and ophthalmologist.

Conclusion: Subsidised patient travel for outpatient ophthalmic care and outreach ophthalmology services posed



greater burden to health service and patients as compared to teleophthalmology. This has implications for the planning of a broad range of specialist outreach services, where telehealth could be used to optimise care to remote populations in conjunction with existing service delivery models.

Outcomes of a pilot study of community-based, collaborative glaucoma care in a tertiary referral public glaucoma clinic

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Purpose: To evaluate the outcomes of the Glaucoma Community Collaborative Care Program (G3CP) from the Royal Victorian Eye and Ear Hospital (RVEEH), Melbourne.

Method: The program enrolled community optometrists in a shared care model with the RVEEH Glaucoma Unit. Patients classified as low risk and/or stable glaucoma patients were recruited according to RANZCO Collaborative Care Guidelines. The program's aims were to increase access and provide timely glaucoma care, contribute to the continuing education of optometrists and to be scalable to accommodate increased future demand.

Results: The pilot program enrolled 104 patients between March 2019 and April 2020. The uptake rate by patients offered the G3CP was 73%. Clinical outcomes showed 93% of patients had stable glaucoma over the period and all had timely reviews. There was 95% agreement between the enrolled optometrists and a RVEEH Glaucoma Specialist. Surveys of patient and optometrist satisfaction demonstrated high acceptability.

The challenges identified were frequent changes in the optometry network (up to 50% of originally enrolled), low recruitment (35% of predicted) and low quality of information shared (40% of optical coherence tomography tests reviewed were too degraded for adequate review).

Conclusion: The G3CP pilot provided timely care to the patients enrolled and created additional capacity in outpatients, which has become even more important with the increased demand caused by the COVID-19 pandemic. With acceptability and feasibility of the project demonstrated, it is intended that this model of collaborative care will continue; however, to enable scalability, several challenges will need to be addressed.

GENETICS

A natural history study of GUCY2D-associated cone-rod dystrophy

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Purpose: Variants of the GUCY2D gene that encodes the photoreceptor guanylate cyclase are associated with inherited retinal diseases, including autosomal dominant cone-rod dystrophies (CRD). The main aim of this study was to describe the natural history and progression of GUCY2D-associated CRDs. In addition, the study aimed to investigate structural and functional biomarkers and their correlation with GUCY2D-associated CRD.

Methods: Retrospective analysis was conducted on data from 16 patients with GUCY2D-associated CRD across two sites. Assessments included central macular thickness (CMT) and length of disruption to the ellipsoid zone (EZ) via optical coherence tomography, electroretinography (ERG) parameters, best corrected visual acuity, and fundus autofluorescence.

Results: This study demonstrated significant reduction in CMT ($-1.96 \mu\text{m}$ per year) and lengthened disruption of the EZ ($77 \mu\text{m}$ per year) over time. Similarly, decreased cone function was significantly associated with increased age (ERG b-wave amplitude decreased $1.27 \mu\text{V}$ per year). CMT and EZ disruption on optical coherence tomography were significantly associated with functional changes including best-corrected visual acuity and cone function on ERG.

Conclusion: We have described the natural long-term decline in vision and cone function due to mutations in GUCY2D. We have also identified a set of functional and structural biomarkers that may be useful as outcome parameters for future therapeutic clinical trials.

Ophthalmic complications of Alagille syndrome: A systematic review

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Purpose: Several peer review articles are available on Alagille syndrome. The authors aim to review pathological ocular effects, diagnostic tests and management.

Methods: A comprehensive literature search was carried out on PubMed, Google Scholar, Medline, Scopus and Embase.

Results: The authors search found 135 articles, including 785 patients. Posterior embryotoxon was the most common presenting pathology, followed by disc drusen. Common posterior pathologies include optic drusen, pigmented retinopathy, angulated retina vessels and chorioretinal atrophy. Uncommon findings include moya moya, intra-cranial haemorrhages and idiopathic intracranial hypertension. Ocular pathologies are unlikely related to fat soluble vitamin deficiency. Diagnosis can be carried out by Jag1 and notch2 gene testing, with ultrasound detection of optic drusen a sensitive modality. Medical management includes ursodeoxycholic acid, fat soluble vitamin supplementation and cholestyramine, with surgical management including liver transplantation.

Conclusion: Alagille syndrome is a complex genetic disorder with variable manifestations. Ocular pathologies should be taken in context with systematic pathologies for diagnosis.

GLAUCOMA

Xen-related aqueous misdirection: Case report

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Aim: To report a novel case of aqueous misdirection (AqM) following Xen Gel implant, a minimally invasive glaucoma surgery (MIGS).

Result: An 82-year-old Ukrainian male presented 2 days post Xen Gel implant in his right and only eye with headache and blurred vision. He has an extensive past ocular history including advanced pseudoexfoliation glaucoma, bilateral pseudophake and multiple glaucoma surgeries in his left eye including trabeculectomy and Baerveldt tube insertion. Examination revealed an intraocular pressure (IOP) of 56 mmHg – compared to 6 the day prior – with a small hyphaema and a diffusely shallow anterior chamber. Ultrasound biomicroscopy (UBM) showed anteriorly rotated ciliary body and loculated fluids in the anterior vitreous, confirming the diagnosis of AqM. His IOP remained high despite maximal medical management including

atropine. Patient was unable to tolerate laser peripheral iridotomy due to pain. A pars-plana vitrectomy and zonulohyoidectomy were therefore performed as definitive treatment. This was complicated by an intense inflammatory reaction raising concerns of endophthalmitis. With an unremarkable intravitreal microscopy and culture, an intracameral tissue plasminogen activator was given to reduce fibrin formation and IOP was subsequently controlled. To the author's knowledge, only a single case has been reported in a large case series in the literature with no details of that specific case.

Conclusion: The authors report a novel case of AqM post Xen insertion. It shows that although MIGS may have a lower risk in causing AqM, it is a possible and serious complication that requires recognition and appropriate management to reduce glaucoma progression.

Trends in the management of new onset post-keratoplasty glaucoma: A systematic review

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Purpose: Glaucoma is the second leading cause of corneal graft failure after graft rejection. Sustained elevations in intraocular pressure can lead to graft decompensation, failure and vision loss. One of the most well-described risk factors for developing post-keratoplasty glaucoma is pre-operative glaucoma diagnosis. However, there is a paucity of data in the literature on the incidence and surgical outcomes of new-onset post-keratoplasty glaucoma.

Method: A MEDLINE Ovid search was conducted with various combinations of relevant key words. Main inclusion criteria were adults with no previous glaucoma history undergoing keratoplasty, and minimum 6 months follow-up. Exclusion criteria included paediatric cases, pre-existing or concomitant glaucoma diagnosis, and lack of clear documentation regarding pre-operative glaucoma status. Fifty-one eligible full-text articles were identified, and 11 included in the final analysis, for a total of 1809 eyes.

Results: Direct comparison between studies was not possible. A descriptive analysis is presented instead. The average age of new onset post-keratoplasty glaucoma was 60 years. The pooled incidence of new onset glaucoma was 24.4%. The pooled mean rates of endothelial graft failure was



28.7%. 51.53% of eyes received both medical and surgical intraocular pressure-lowering treatment, 47.85% medical treatment alone and 0.61% surgical treatment alone.

Conclusion: There does not seem to be a significant difference in the incidence, management, or outcome of those with medically treated pre-existing glaucoma undergoing keratoplasty compared to those without a prior history of glaucoma. Differences may start to arise when one compares those with a history of glaucoma surgery prior to keratoplasty to those without. Further comparative studies are needed.

Long-term outcomes of trans-scleral diode cycloablation (cyclodiode) for advanced glaucoma

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Purpose: Long-term outcomes of cyclodiode (5 years or more) are not well-documented, particularly pressure control, requirement for further procedures and complications. This study aims to examine long-term efficacy and safety in refractory glaucoma management.

Methods: Patient records with refractory glaucoma who underwent cyclodiode laser at City Eye Centre, Brisbane from 2012 to 2016 were reviewed. Data included gender, age, laterality, glaucoma type, cyclodiode parameters, glaucoma medications (pre- and post-treatment), intraocular pressure (IOP) measurements and visual acuity. Data underwent statistical analysis including generalised linear modelling and Kaplan-Meier analysis.

Results: In total, 54 eyes in 54 patients (29M:25F) with a mean age of 66 years (range 15-85 years) and minimum of five years follow-up were included. The mean number of burns was 23.3, ranging from 12-40, spread over 180-270 degrees with a mean power per burn of 1967 mW (range 1500-2000 mW) and mean duration of 1981 ms (1500-2000 ms). The mean pre-treatment IOP was 31.5 mmHg (range 17-56 mmHg) and mean IOP five years post-treatment was 16.1 mmHg (2-42 mmHg). Mean number of pre-treatment medications was 3.6 (range 1-6) and at five years mean number of 2.7 (range 0-5), including five (8.3%) on oral acetazolamide. Visual acuity pre-treatment was 6/60 and 6/240 at final follow-up. Complications were seen in five (8.3%) patients, including three (5.0%) cases of hypotony and two (3.3%) phthisis.

Conclusion: Cyclodiode can result in long-term reduction of IOP and reduce the number of medications

including acetazolamide. Hypotony and phthisis can be significant complications.

One-year surgical outcomes of the PreserFlo™ MicroShunt in glaucoma – a multicentre study

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Purpose: To evaluate the efficacy and safety of the PreserFlo™ MicroShunt.

Methods: Consecutive retrospective cohort of patients who underwent PreserFlo™ MicroShunt with MMC 0.4 mg/ml between May 2019 and December 2020 in four UK tertiary referral centres. Primary outcome was complete success ($6 \leq$ intraocular pressure [IOP] \leq 21 mmHg with $\geq 20\%$ reduction from baseline, no anti-glaucoma medication), qualified success (complete success plus anti-glaucoma medication), or failure (IOP > 21 mmHg or reduced by $< 20\%$; IOP ≤ 5 mmHg with vision loss on two consecutive visits; reoperation; or loss of LP vision). Secondary outcomes were best-corrected visual acuity, IOP, medications, complications and post-operative interventions/revisions.

Results: One hundred and seventy eyes (160 patients) were included; 73.5% were primary open angle glaucoma, 7.6% angle closure glaucoma, and 5.2% uveitic glaucoma. Complete and qualified surgical success at one year were achieved in 51.4% (N = 57) and 15.3% (N = 17), respectively, and failure occurred in 33.3% (N = 37). There was a significant decrease in IOP at 1 day (6.6 ± 0.3 ; N = 144), 1 month (12.0 ± 0.5 ; N = 163), three months (12.5 ± 0.4 ; N = 153), six months (13.2 ± 0.5 ; N = 132) and 12 months (14.1 ± 0.6 ; N = 111), compared to pre-operatively (23.7 ± 0.6 ; N = 170) ($p < 0.0001$). Number of anti-glaucoma

medications significantly decreased at 3 months (0.3 ± 0.1 ; $N = 153$), 6 months (0.4 ± 0.1 ; $N = 132$) and 12 months (0.6 ± 0.1 ; $N = 111$), compared to pre-operatively (3.0 ± 0.1 ; $N = 170$) ($p < 0.0001$). Complications were hypotony (24.1%; $N = 41$), choroidal detachments (10.0%; $N = 17$), hypotonous maculopathy (2.9%; $N = 5$), hyphaema (6.5%; $N = 11$), tube exposure (1.2%; $N = 2$) and bleb leak (3.5%; $N = 6$). 10.6% underwent revision.

Conclusions: PreserFlo™ MicroShunt with MMC 0.4 mg/ml demonstrated reasonable surgical success over one year follow-up, leading to significant IOP and medication reductions. There was a relatively low rate of complications and revision surgery.

Ethnic origins and languages of patients attending an outpatient glaucoma clinic

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Background: Clinical research in Australia often excludes people for whom English is not their primary language. Genomic studies examining polygenic risk scores have predominantly included individuals of European ancestry, with inadequate data on genomic variants from other ethnic populations. Understanding the diversity of culturally and linguistically diverse (CALD) people with glaucoma attending a metropolitan outpatient clinic is an important first step to developing research materials to promote their inclusion in future research.

Aim: To explore the cultural and linguistic diversity of glaucoma patients attending the Royal Victorian Eye and Ear Hospital glaucoma outpatient clinic.

Methods: Patients attending the Royal Victorian Eye and Ear Hospital glaucoma outpatient clinic were invited to complete a short survey relating to their own and their parents' ethnicity and the languages they speak.

Results: Over the six-month study period, 803 patients participated in the survey. Caucasian was the commonest ethnicity (62%) followed by Asian (27%), Middle Eastern (4%) and African (3%). A total of 491 patients are not native English speakers. Of these, 123 (25%) required an interpreter for their appointment. This rate was higher in Chinese patients (34%), followed by Greek (31%) and Vietnamese (27%) compared to other CALD people. More details on subgroups will be presented at the Congress.

Conclusion: Understanding the diversity of ethnicities and primary languages spoken by patients can support the inclusion of CALD people in research, including genomic studies in glaucoma. The successful engagement of a large sample size for this study indicates that culturally diverse patients are willing to participate in research; however additional resources, particularly professional interpreters, may be required.

Using Consensus-based standards for the selection of health measurement instruments to assess measurement properties of patient reported outcome measures in glaucoma: A systematic review

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Purpose: Accurate understanding of patient preferences is critical to differentiate novel technological innovations from existing standards of care, especially when the interventions under consideration possess comparable safety and efficacy profiles. Patient-reported outcome measures (PROM) are instruments designed to identify which health outcomes and healthcare experiences are the most important to patients. Despite the recognised importance of PROMs, awareness and use in the clinical setting remains low. The purpose of the current study was to identify and assess PROMs previously used in patients with glaucoma.

Methods: Systematic literature search was performed in six databases (EMBASE, MEDLINE, PsycINFO, Scopus, BIOSIS, WebOfScience) with no date restriction. Studies reporting construct, content or criterion validity, reliability, responsiveness, or interpretability data of PROMs in adult glaucoma patients were included for qualitative assessment using the Consensus-based Standards for the



selection of health Measurement INstruments (COSMIN).

Results: Forty-four studies were included in qualitative assessment. 37 distinct instruments were identified and assessed. Among the most instruments, two were glaucoma-specific: Glaucoma Quality of Life (GQL) and Glaucoma Symptom Scale (GSS); and one vision-specific: National Eye Institute Visual Function Questionnaire. On COSMIN assessment, all had sufficient validity (especially construct), with GQL and GSS alone having sufficient internal consistency.

Conclusion: GQL, GSS and National Eye Institute Visual Function Questionnaire have been highly validated in a glaucoma patient population and thus suggest a capacity to capture relevant outcomes. However, limited reports on interpretability and responsiveness in all 37 identified instruments make identification of optimal questionnaire for clinical use challenging and warrant further studies.

Intravitreal C3F8 injection for the treatment of recalcitrant hypotony with suprachoroidal haemorrhage

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Purpose: To describe a case of suprachoroidal haemorrhage and persistent hypotony successfully treated with intravitreal perfluoropropane (C3F8) and choroidal drainage.

Methods: Case report and review of literature.

Results: An 88 year-old male was referred with end-stage open angle glaucoma, recently complicated by idiopathic anterior uveitis and intraocular pressures of 39 mmHg and 41 mmHg in the right and left eyes respectively on maximal medical therapy. Visual acuity was count fingers in the right eye and 6/60 in the left. He underwent Baerveldt tube insertion in the left eye under local anaesthetic as COVID-19 precautions restricted general anaesthetic use. Unfortunately, he required increased sedation and post-operatively developed Type-1 respiratory failure and aspiration pneumonia with severe coughing. He was managed in intensive care. On

discharge from hospital, he restarted antiglaucoma therapy against medical advice and developed a suprachoroidal haemorrhage with kissing choroidals. This failed to respond to medical therapy and anterior chamber reformation with viscoelastic substance. A choroidal drainage was performed, but the effusions recurred. Finally, a repeat choroidal drainage and injection of intravitreal 100% C3F8 stabilised the eye. After eleven months the right visual acuity was light perception, while the left visual acuity was 6/12 with an intraocular pressures of 11 mmHg on no medications.

Conclusion: Intravitreal non-expansile gas injections have previously been described as a prophylactic measure for cases at high risk for suprachoroidal haemorrhage. To our knowledge, this is the first case of expansile C3F8 in the vitreous chamber used as rescue therapy for recalcitrant hypotony and suprachoroidal haemorrhage.

Investigating fibroblast-mediated changes to outflow capacity: A novel in vitro model of the subconjunctival outflow tract after glaucoma surgery

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Purpose: Glaucoma surgery outcomes can be improved by identifying novel subconjunctival wound healing adjuvants. This search is hindered by a lack of in vitro models that adequately recapitulate the post-operative microenvironment. No models currently incorporate the subconjunctival flow of aqueous humour containing TGFβ1, nor the newly established pressure gradient. We present a novel in vitro model incorporating these unique stimuli.

Methods: Human Tenon's capsule fibroblasts (HTCFs) were cultured within a 3D collagen matrix inside a perfusion chamber slide. Culture media supplemented with: 1) TGFβ1; 2) TGFβ1 + verteporfin; or 3) vehicle was perfused through the collagen matrix at the rate of aqueous humour production. Pressure afferent to the chamber slide was continuously recorded over 72-hours for comparison between groups. Slides were then stained for nuclei and F-actin to semi-quantitatively assess treatment related cytoskeletal changes.

Results: Pressure tracings were significantly different between control, TGFβ1, and TGFβ1 + verteporfin treated groups. TGFβ1 induced a significant pressure

elevation that increasingly diverged from control over the 72 hour experiment. Initially, co-treatment with verteporfin mitigated TGF β 1 induced pressure changes. However, this effect was transient and after 12-24 hours pressure returned to levels seen in the TGF β 1 group. TGF β 1 induced significant cytoskeletal changes relative to control, with partial attenuation with verteporfin co-treatment.

Conclusions: This novel in vitro model of the post-glaucoma surgery subconjunctival outflow tract demonstrated an expected decrease in outflow capacity relative to control when perfused with media containing TGF β 1. Data support use of this model to rapidly assess novel compounds for outflow capacity-preserving properties.

Transcriptomic analysis of the human lens capsular epithelium in pseudoexfoliation disease

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Purpose: Pseudoexfoliation disease (PEX) is a prevalent yet poorly understood systemic amyloid disease associated with complex polygenic and environmental risk factors. This study seeks to elucidate the pathobiology of PEX through analysis of ribonucleic acid (RNA) sequencing data generated using intraocular surgical specimens collected from disease-affected individuals.

Methods: Whole RNA extracted from anterior lens capsules collected as capsulorhexis samples from routine cataract surgery was subjected to bulk messengerRNA sequencing. Raw transcript read counts of protein coding genes were compared between PEX and non-PEX samples. Differential expression and pathways analyses were performed using established bioinformatic pipelines.

Results: RNA was extracted from samples collected from 28 participants with PEX, and 34 age, gender, and

intraocular pressure matched non-PEX controls. All samples successfully underwent library preparation and proceeded to sequencing. Of these, 63 samples passed quality control with a mean mapped read count of 5.2×10^7 per sample. A total of 2882 genes were differentially expressed in PEX lens capsules. Pathways analysis involving differentially expressed genes revealed enrichment of pathways associated with ribosomal function, oxidative stress, protein misfolding, and amyloid disease.

Conclusion: This is the first RNAseq study to investigate the transcriptional architecture of PEX. The results of this study may lead to further insights into the biological processes underlying this common yet enigmatic disease.

Safety and efficacy of phacoemulsification combined with ab interno canaloplasty and hemi-gonioscopy assisted transluminal trabeculectomy in primary open angle glaucoma: Six month results

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Purpose: To report the safety and efficacy of phacoemulsification cataract surgery combined with ab interno canaloplasty (ABiC) and hemi-gonioscopy assisted transluminal trabeculectomy (GATT) in primary open angle glaucoma (POAG).

Method: A prospective consecutive case series performed by a single surgeon comprising 30 eyes of 24 patients with POAG undergoing clear cornea phacoemulsification combined with ABiC and 180 degrees of GATT. Primary outcome measures included visual acuity, intraocular pressure, surgical complications, and number of glaucoma medications pre-operatively and at one month, 3 months and 6 months post-surgery.

Results: Mean IOP decreased from 17.48 ± 5.12 to 13.25 ± 5.99 mmHg ($p = 0.17$) at 6 months with a reduction in mean IOP of 2.63 ± 7.13 mmHg. Mean logMAR visual acuity improved from 0.51 ± 0.53 to 0.17 ± 0.08 ($p < 0.05$) at six months. Mean number of medications reduced from 1.64 ± 0.64 to 0.89 ± 0.93 ($p < 0.05$) at six months. Complications included transient hyphaema, corneal oedema and anterior chamber inflammation that resolved within one month. There was one case of refractive surprise.

Conclusion: Phacoemulsification combined with ABiC and hemi-GATT is a safe procedure and may be effective



in lowering the IOP and number of glaucoma medications at six months in patients with POAG.

Attitudes toward glaucoma genetic risk assessment among affected and unaffected individuals in an Australian population

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Purpose: Genetic testing for diseases with complex inheritance patterns such as glaucoma will become increasingly accessible with the advent of polygenic risk score (PRS) testing. This study investigates public attitudes towards the use of PRS testing to predict glaucoma at a population level.

Methods: We performed a cross-sectional, questionnaire based survey of 1169 individuals with glaucoma and 418 individuals without diagnosed glaucoma to evaluate attitudes towards glaucoma PRS testing.

Results: Our results demonstrated generally positive attitudes towards glaucoma PRS testing, with 69.4% of affected individuals and 71.3% of unaffected individuals indicating personal interest in testing. Among glaucoma-affected individuals, interest in PRS screening was highest in those who perceived their risk of developing glaucoma as high (odds ratio, OR 2.1, 95% confidence interval, CI [1.3-3.3], $p = 0.003$) and those who were worried about developing glaucoma (OR 2.1, 95% CI [1.3-3.4], $p = 0.004$). In individuals without glaucoma, interest was highest in those who perceived their risk of glaucoma as high (OR 14.6, 95% CI [1.1-185.5], $p = 0.039$), those who were worried about developing glaucoma (OR 4.4, 95% CI [2.3-8.2], $p < 0.001$), and those who would rather know than not know their risk (OR 4.5, 95% CI (2.3-8.8), $p < 0.001$).

Conclusions: This study demonstrated a strong community interest in glaucoma PRS testing. These findings support the drive to implement population-based genetic

screening as an initiative to reduce the burden of glaucoma-associated vision loss.

Automated detection of glaucoma from retinal fundus images using a variety of fundus cameras

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Retinal fundus images are routinely used for diabetic photo screening and may also be used to screen for glaucoma. Nearly 30 retinal fundus cameras from different manufacturers are currently in use.

In this study, we evaluate the influence of camera model for automated glaucoma detection algorithm accuracy.

ACRIMA and REFUGE, labelled datasets that capture device information, were included for analysis. REFUGE images were cropped around the optic nerve head to match the ACRIMA images. Features were extracted from images using the RESNET101V2 pretrained neural network and processed using random forest classifier for glaucoma classification. The experiment was conducted multiple times by assigning images from one camera as training set and images from another camera as the test set.

1905 images from 03 camera models were analysed and obtained the area under receiver operating characteristic curve (AUC) for the test set. The highest AUC of 0.81 is given when the model is trained on REFUGE test and validation sets and tested on its training set. The lowest was 0.23 when the model was trained on REFUGE training images and tested on ACRIMA dataset. In comparison, when the training data includes images from the camera that will be used for test, the AUC is 0.96.

Results indicate that automated detection of glaucoma from fundal images is currently unreliable due to the wide variety of camera models available. Automated accurate detection of glaucoma from fundal images is possible but care should be taken to specify the cameras for which the model is compatible.

Mapping retinal nerve fibre layer thickness with hyperspectral imaging

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Purpose: We hypothesised that hyperspectral retinal imaging could be used to estimate retinal nerve fibre layer (RNFL) thickness on the basis of wavelength-dependent variation in reflectance.

Method: Forty-seven people with glaucoma and 47 healthy controls underwent hyperspectral retinal imaging (Optina Diagnostics) and optical coherence tomography (OCT; Spectralis, Heidelberg Engineering; macular volume scan). RNFL thickness for each pixel was extracted from the segmented, co-registered OCT map of each participant and used as ground truth for a deep learning algorithm trained with hyperspectral images. Spectral data were the input for a convolutional neural network. As the network was constrained to spectral data, the number of tuneable parameters was small (<16k). The data set was randomly split into 80 images for training (>400k spectra) and 14 images for testing (>70k spectra). Learning was tuned to minimise the root mean square error (RMSE) without overfitting the training set.

Results: Root mean square error was 13 μm for the training set and 15 μm for test set. A high and significant pixel-wise correlation was found between OCT and hyperspectral RNFL thicknesses ($r = 0.8$, $p < 1e-20$ for training and 0.74, $p < 1e-20$ for testing). The limit of agreement (Bland-Altman) for mean RNFL measures was 12 μm . No significant bias of the mean thickness measurements was found ($r = 0.06$, $p = 0.56$).

Conclusion: these results indicate that hyperspectral retinal imaging can be used to generate high resolution maps of RNFL thickness that are comparable to those provided by OCT. Hyperspectral imaging is rapid, non-invasive, and can be performed without mydriasis.

Bleb dysesthesia following XEN[®] Gel Stent implant: Revision technique using fibrin glue

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Purpose: Bleb dysesthesia is a potential complication subconjunctival micro-invasive glaucoma surgery

techniques. There are no previous reports of this technique being applied to management of dysesthetic blebs following subconjunctival MIGS procedures. We describe a series of two patients who underwent XEN[®] Gel Stent implant bleb revision with fibrin glue for management of bleb dysesthesia.

Method: A retrospective case series of two eyes undergoing bleb revision following XEN[®] Gel Stent implantation augmented with 0.02% subconjunctival mitomycin C. Technique included bleb dissection with fibrin glue closure into the subconjunctival and subtenon's space. Outcomes include bleb morphology, intraocular pressure (IOP) and visual acuity.

Results: Reduction in bleb size and subjective improvement in bleb dysesthesia were found in both cases following the procedure. Twelve weeks post-revision case one had an IOP of 18 mmHg and best-corrected visual acuity 6/12. Six weeks post-revision case two had an IOP 15 mmHg and best-corrected visual acuity 6/6.

Conclusion: We describe an adaptation of an existing surgical technique for dysesthetic bleb management applied to patients who have undergone XEN[®] Gel Stent implantation. The advantages of using fibrin glue to reduce the bleb size is that the procedure is technically simple and efficient with potential to maintain bleb function. This sutureless technique also optimises post-operative recovery and comfort.

Educating first-degree relatives of advanced glaucoma patients: Targeting at-risk individuals to prevent vision loss

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Purpose: One-third of first-degree relatives (FDR) of advanced glaucoma patients may have undetected signs of glaucoma. This prospective study evaluated a personalised educational program, encouraged eye-health examinations in FDRs and recorded FDR glaucoma screenings results.

Methods: Index cases were those with advanced primary open angle, pseudoexfoliative or pigmentary glaucoma, enrolled in the Australian and New Zealand Registry of Advanced Glaucoma. Family-tree forms requested names and glaucoma status of all FDRs and addresses of living FDRs. FDRs were mailed glaucoma-risk information, a Glaucoma Australia brochure and an invitation to provide



eye examination feedback. Data collected from FDRs included relationship to index and eye examination result.

Results: A total of 1898 index cases were invited to participate with 751 (40%) respondents. Contact and glaucoma information was provided for 2434 FDRs (3.5 per index) and glaucoma information for 2856 FDRs not participating (76% deceased). Feedback of eye-checks (N = 697) favoured children (53%) and siblings (41%), and 57% of FDRs were diagnosed with glaucoma or suspicious signs. Parents and siblings recorded comparable prevalence of signs of glaucoma (71.4% and 72.6% respectively), with children less prevalent (43.7%). Glaucoma status was unknown for a large number of FDRs (38% of those not available to participate).

Conclusion: FDRs of those with advanced glaucoma may have up to a 57% risk of developing signs of glaucoma. Parents and siblings are vulnerable and children's risk may increase with age. Effective communication between eye health professionals, those affected and their family members may elucidate better outcomes for individuals and families. Educational programs may be beneficial.

Laser focus: Evaluating the safety and efficacy of selective laser trabeculoplasty in a variety of glaucoma patients

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Method: A retrospective chart review of 122 eyes of glaucoma patients who had selective laser trabeculoplasty performed at Hawkes Bay Hospital between May 2020 and May 2021 was conducted.

Key outcomes evaluated:

- Change in the intraocular pressure.
- The number of prescribed glaucoma medications before and after the procedure.
- Any unintended effects of the procedure.

Data was collected on a total 122 eyes from 69 patients. Their ages ranged between 38 to 92 years with a mean 70 years. There were 37 females and 32 males.

Almost 50% of patients had a diagnosis of primary open angle glaucoma. This was followed by normal tension glaucoma (25%), ocular hypertension (19%), pigmentary glaucoma (5%) and narrow angles following laser iridotomy (2%). The severity of glaucoma ranged from mild (57%) to moderate (41%) and severe (2.0%).

Results: There was an average reduction of intraocular pressure from 19 mmHg to 16 mmHg and an average reduction of the number of glaucoma medications prescribed from 0.90 to 0.63 per patient.

There were no documented pressure spikes following treatment. One patient had a vasovagal syncope during the procedure but recovered without any sequelae. Two patients had severe light intolerance which resolved with a week of topical steroids.

Conclusion: Selective laser trabeculoplasty is a safe and effective alternative to medical management in mild to moderate glaucoma patients. Laser trabeculoplasty reduces risk of polypharmacy by reducing the number of glaucoma medications prescribed and thereby helps improve the quality of life for patients with glaucoma.

Associations between deep learning segmented macular optical coherence tomography cell layer thicknesses and primary open-angle glaucoma outcomes in the PROGRESSA study

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Purpose: Segmentation algorithms packaged with optical coherence tomography (OCT) softwares provide limited segmentation data for anatomical structures within the retina. This study sought to develop a deep learning segmentation algorithm to quantify cell layer thickness in multiple retinal cell layers using raw macular OCT cube images generated by the Zeiss CIRRUS 5000. This study secondarily investigated associations between individual cell layers and features of glaucoma progression using

segmentation data generated from baseline OCT scans of participants from the PROGRESSA study.

Methods: A fully convolutional neural network was designed for automated segmentation of the macula from single B-scans. After training and validation, this model was applied to 1,320 macula cubes from PROGRESSA participants with ≥ 3 years of follow-up. Backwards stepwise regression models were applied to determine correlations between individual cell layers and both structural and functional markers of primary open-angle glaucoma disease progression at three years of follow-up.

Results: Decreased ganglion cell-inner plexiform layer thickness (GCIPL) was associated with prevalent glaucoma at baseline ($p < 0.001$) and glaucoma progression at three years ($p < 0.001$). Decreased inner nuclear layer thickness was associated with self-reported diabetes ($p = 0.02$). Retinal pigment epithelium thickness negatively correlated with systolic blood pressure ($p < 0.001$). Outer plexiform layer thickness positively correlated with diastolic blood pressure ($p < 0.001$).

Conclusions: This deep learning segmentation tool provides additional structural measurements, beyond the ganglion cell-inner plexiform layer thickness and retinal nerve fibre layer thickness, which may lead to more detailed understanding of the pathophysiological impacts of glaucoma within the retina.

Glaucoma surgical management practices in Australia and New Zealand

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Purpose: To evaluate the spectrum of glaucoma surgical and post-operative follow-up practices undertaken by Australian and New Zealand Glaucoma Society members.

Method: An online survey was emailed to all 232 members of the Australian and New Zealand Glaucoma Society in 2020. Questions assessed the demographics of respondents; preferred glaucoma surgical procedures and related anaesthesia; and typical post-operative follow-up practices.

Results: A total of 56 Australian and New Zealand ophthalmologists participated in the survey (response rate 24%). Eighty-two percent of respondents identified themselves as glaucoma subspecialists. Almost all ophthalmologists surveyed indicated trabeculectomy (98%) augmented with mitomycin C (95%) as their primary established glaucoma procedure for primary open angle glaucoma. iStent inject was the most commonly undertaken Minimally Invasive Glaucoma Surgery (MIGS),

performed by 80% of responders in the past two years. The most frequently reported glaucoma procedures performed in combination with phacoemulsification cataract surgery were iStent insertion (79%) and trabeculectomy (63%). Overall, a large breadth of glaucoma procedures were reported to be regularly undertaken: in addition to trabeculectomy, 57% performed Glaucoma Drainage Implants, 20% performed one type of MIGS; 18% performed at least two types and 40% at least three types of MIGS.

Conclusion: There was a diverse range of glaucoma surgical procedures undertaken by the surveyed ophthalmologists. Trabeculectomy augmented with mitomycin C was the most frequent preferred procedure, but uptake of MIGS is widespread. Redistribution of the survey in coming years will allow for evaluation of evolving trends in the glaucoma surgical landscape across Australia and New Zealand.

The lifeblood of glaucoma: Characterising isometric exercise induced changes to blood flow in the optic nerve head using optical coherence tomography angiography

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Purpose: Altered autoregulation may be pathogenic in normal tension glaucoma (NTG) progression. This study aimed to use optical coherence tomography angiography (OCTA) to quantitatively characterise changes in ocular blood flow induced by isometric exercise in patients with; and to compare results with healthy controls.

Methods: Prospective, repeated measures design. Baseline demographic and health data was recorded. Repeat measurements of blood pressure, heart rate, intraocular pressure and OCTA of the optic nerve head were undertaken at 10 and 20 minutes prior to a sustained isometric hand grip test performed to elevate ocular perfusion pressure. Measurements were repeated during the handgrip test, then five and ten minutes after exercise. OCTA images were quantitatively analysed using a validated image binarisation protocol. The primary outcome was change in peripapillary relative intensity at 10 minutes post exercise.

Results: Data collection is ongoing but preliminary analysis of one NTG patient shows a reduction in peripapillary vascular density ten minutes post exercise (-38.61%). Results in NTG patients will be compared to



our previous, unpublished work, in eleven healthy controls. Healthy controls demonstrated no significant alteration to vessel density during isometric exercise, but all participants showed a significant decrease in vascular density ten minutes after cessation of exercise compared to baseline (peripapillary retina mean difference: -29.47%; 95% confidence interval -32.00%, -26.90%).

Conclusion: Characterising and comparing the perfusion differences between healthy controls and NTG with OCTA and a simple handgrip test may contribute to the development of a novel, pragmatic, diagnostic or prognostic tool.

Central corneal thinning in primary open-angle glaucoma may occur independently of topical prostaglandin therapy

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Purpose: Corneal biomechanics have been demonstrated to be clinically relevant to disease progression in primary open-angle glaucoma. Although corneal thinning is known to occur with prostaglandin therapy, it is unknown whether corneal thinning also occurs as part of the primary open-angle glaucoma disease process. This study investigates associations between glaucoma status and central corneal thickness (CCT) changes in PROGRESSA participants, a prospective longitudinal cohort study of glaucoma suspects and early glaucoma cases.

Methods: Rates of CCT changes were calculated through linear regression of right eye data collected from 801 PROGRESSA participants who had ≥ 6 CCT measurements over ≥ 36 months follow-up. CCT thinning rates were compared between eyes classified as 'more advanced glaucoma', 'early-manifest glaucoma', 'pre-perimetric glaucoma' or 'glaucoma suspect'. Pairwise comparisons were made between these groups and 'glaucoma suspects' using independent paired t-tests. To adjust for known prostaglandin therapy CCT thinning, post-hoc analysis was repeated comparing prostaglandin

naïve participants, to current or historical prostaglandin therapy participants. To assess whether CCT thinning occurred independently of prostaglandin therapy, corneal thinning rates were analysed in 'more advanced glaucoma' cases naïve to prostaglandin therapy.

Results: Corneal thinning was observed in all glaucoma groups when compared to 'glaucoma suspect' eyes and was most apparent in glaucoma eyes with more advanced field loss ($\beta = 0.95 \mu\text{m}/\text{year}$; $p = 1.0 \times 10^{-3}$). CCT thinning was also observed in prostaglandin-naïve 'more advanced glaucoma' eyes ($\beta = 1.51 \mu\text{m}/\text{year}$), suggesting CCT thinning in glaucoma may occur independently of prostaglandin therapy.

Conclusion: Glaucoma is associated with corneal thinning, and may occur independently of prostaglandin therapy.

Selective laser trabeculoplasty in Brisbane's Metro South Health Service: A three year review

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Purpose: Selective laser trabeculoplasty (SLT) is a common treatment option for the management of glaucoma and ocular hypertension (OHT). Studies supporting the efficacy of SLT describe safe and reliable reduction of intraocular pressure (IOP). We assess the real-world efficacy of SLT for patients in a tertiary centre.

Methods: A three-year retrospective study of all patients who received SLT for glaucoma or OHT at the Princess Alexandra Hospital (Brisbane) between the 1 January 2017 to the 31 December 2019. Patients were identified from laser clinic records. Patient demographics, procedure details, and clinical outcomes were compiled from the medical record.

Results: A total of 108 eyes from 69 patients were identified. 69.4% had primary open angle glaucoma, 13.9% had normal tension glaucoma, and 8.3% had OHT. 29.6% were treatment naïve.

There was a significant reduction of the mean IOP at 1-, 3-, 6-, and 12-months post SLT ($p < 0.001$) with a decline in effect at 18 months ($p = 0.11$). There was no significant change in quantity of hypotensive agents used post-SLT. 39-51% of eyes from 3-12 months post-SLT demonstrated less than a 20% reduction in IOP. IOP reduction in treated and naïve patients were similar. Only two cases had an increased IOP ($>30 \text{ mmHg}$) within 30 minutes of treatment - both responded to medical management.

Conclusion: SLT appears to be a safe treatment option, with few significant complications, that reliably reduces IOP in both naïve and previously treated patients.

Though, only half of treated eyes achieved pressure reductions greater than 20% post SLT.

Reduction of intraocular pressures and drug burden by the new and improved MIGS: iStent Inject W

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Purpose: To evaluate the intraocular pressure lowering and medication lowering effect of iStent inject W with concomitant cataract surgery in glaucoma patients.

Method: This retrospective cohort study comprised of a variety of glaucoma patients ranging from mild to severe glaucoma who underwent combined phacoemulsification with iStent inject W implantation from July 2020 to Jun 2021. The pre-operative intraocular pressure (IOP) and number of IOP lowering drops were recorded and compared with the post-operative values.

Results: Twenty-three eyes of open and narrow angle glaucoma patients following laser iridotomy were included. Average intraocular pressure was reduced by 6 mm Hg (38 %) on the first follow up and a further 5.6 mmHg (36%) during the second follow up. Number of IOP lowering drops reduced by an average of 1 on the first and second follow up visit. Most common reason for early post-operative intraocular pressure hike was steroid response. 63% (7 of 11) of eyes with moderate glaucoma had a mean pressure drop of 3.3 mmHg. Three out of 4 patients with angle closure glaucoma achieved an average IOP reduction of 4.

Conclusion: iStent inject W is a safe and beneficial alternative to medical management in a variety of glaucoma patients.

Hyperlipidemia predicts structural and functional disease progression in primary open-angle glaucoma

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Purpose: To investigate the association between hyperlipidemia and disease progression in early glaucoma.

Methods: Serum lipid profiles were measured using baseline blood samples collected from 1258 participants from the PROGRESSA study. Participants were then characterised as having either a normal lipid profile, a borderline elevated lipid profile, or hyperlipidemia. Baseline analyses investigated the associations between lipid profile groups and spectral domain optical coherence tomography parameters at recruitment. Progression analyses were performed investigating lipid profile associations using longitudinal spectral domain optical coherence tomography and Humphrey Visual Field data collected over a mean follow-up period of 6.65 ± 1.18 years.

Main Outcome Measures: Baseline and longitudinal macular ganglion cell/inner plexiform layer (mGCIPL) thinning, peripapillary retinal nerve fibre layer (pRNFL) thinning, and Humphrey Visual Field progression.

Results: Participants with hyperlipidemia had a thinner mGCIPL (β : $-1.45 \mu\text{m}$ [$-2.51, -0.39$] $p = 0.007$) and a thinner pRNFL (β : $-3.72 \mu\text{m}$ [$-6.10, -1.34$] $p = 0.002$) than participants with normal lipid profiles at enrolment. Participants with hyperlipidemia exhibited faster rates of mGCIPL thinning (β : $0.09 \mu\text{m}/\text{year}$ [$0.02, 0.16$] $p = 0.015$), faster rates of pRNFL thinning (β : $0.12 \mu\text{m}/\text{year}$ [$0.006, 0.23$] $p = 0.034$), and greater likelihood of longitudinal visual field progression (hazard ratio 1.28 [$1.02, 1.62$] $p = 0.037$) than participants with normal lipid profiles. Finally, participants who reported statin use during monitoring had a slower rate of average mGCIPL thinning than those who did not (β : $-0.09 \mu\text{m}/\text{year}$ [$-0.17, -0.01$] $p = 0.024$).

Conclusion: Hyperlipidemia is a risk factor for disease progression in glaucoma. Treatment of hyperlipidemia may be important to reduce longitudinal progression in early primary open-angle glaucoma.

Unsupervised deep embedded clustering of Humphrey visual field salient features

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Purpose: The interpretation of visual field (VF) loss is, at present, purely manual and requires ophthalmic expertise, despite data collection being machine automated for some years. Developments of deep learning algorithms, however, provide an opportunity to automate the characterisation of field defects, helping with diagnosis and alerting of change. In this study we investigated unsupervised clustering algorithms to identify and characterise VF salient features.

Methods: A fully connected auto-encoder was trained to learn low dimensional representations of two dimensional grey scale images of hand written numbers; then a custom clustering layer using a k-means algorithm was applied at the latent layer (fcACwCL). 60,000 labelled MNIST images were used for training (hyper-parameter fine tuning used 10,000). The final model was trained (200 epochs, 256 batch-size) using stochastic gradient descent. From 43,235 unlabelled Humphrey 24-2 images (10,719 patients), 50 individual patterns of VF loss were produced, and clinically validated by four ophthalmologists (three were glaucoma subspecialists).

Results: Of the six initial models assessed using the MNIST data, the fcACwCL was best (95.38% clustering accuracy). Broad semantic agreement (86%) by the independent assessors confirmed the veracity of the visual half field data clustering by the fcACwCL. Of the seven clusters that produced poor agreement, five were essentially normal variants, two had subtle field constriction. The consensus evaluation by three assessors together produced 11 different groups of visual field loss.

Conclusion: The fcACwCL model ($k = 50$) returned valid clinically significant clusters, demonstrating ability to learn distinguishable salient features of low dimensional representations of high dimensional visual half field images.

NEURO-OPHTHALMOLOGY

The role of tocilizumab as a rescue therapy in patients with glucocorticoid resistant giant cell arteritis

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Purpose: To describe the possible role for tocilizumab as a rescue therapy in glucocorticoid resistant giant cell arteritis (GCA).

Method: We conducted a retrospective review of consecutive patients with glucocorticoid resistant GCA treated with tocilizumab at the Royal Adelaide Hospital, Australia between 1 June 2019 to 1 March 2021. Glucocorticoid resistant GCA was defined by clinical progression of optic nerve compromise or persistently elevated inflammatory markers despite intravenous methylprednisolone treatment in patients with a histological diagnosis of GCA.

Results: Five patients were identified in this case series, all of whom presented with acute monocular vision loss. Three patients (60%) experienced an improvement in visual acuity in at least one eye following initiation of tocilizumab therapy. No adverse effects associated with tocilizumab treatment were observed during follow-up.

Conclusion: Our case series serves to demonstrate that there is a role of the use of tocilizumab as “rescue” therapy for glucocorticoid-resistant GCA, where severe vision loss would otherwise be imminent. There is insufficient evidence to determine what proportion of visual recovery is due to the effect of tocilizumab alone.

Correlation between retinal ganglion cell layer thickness measured using optical coherence tomography and neuropsychological test scores in healthy ageing participants

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Purpose: To evaluate correlations between retinal ganglion cell layer thickness and various domains of neuropsychological testing (Mini Mental State Exam, MMSE and Symbol Digit Modality) in healthy ageing subjects.

Methods: Ninety-five participants identified as healthy controls (age 68 ± 9.0 years; mean \pm SD) recruited from the Optic Nerve Decline and Cognitive Change study were included in this analysis. Participants undertook a battery of neuropsychological tests including MMSE used clinically to assess basic cognitive processes as well as Symbol Digit Modality used as a measure of Information Processing Speed. Ophthalmic evaluation was also conducted, and Spectral-Domain OCT scans acquired to assess the retinal nerve fibre layer (RNFL) thickness profile. The RNFL was classified as Global, Temporal, Nasal, superior-temporal, inferior-temporal, superior-nasal and inferior-

nasal. A partial correlation of thickness of these regions was measured and analysed against neuropsychological indices. Statistical analysis was performed using a generalised estimating equation (GEE) models and adjusted for age, gender and eye as within subject variables ($P < 0.05$).

Results: Our results demonstrate a correlation between MMSE and Global RNFL ($\beta = -1.358$, $p = 0.04^*$). The temporal RNFL thickness analysis showed a mild but significant correlation of ($\beta = -3.309$, $p = 0.008^*$). The Nasal superior region analysis also negatively correlated with Symbol Digit Modality ($\beta = 8.300$, $p = 0.002^*$).

Conclusions: This preliminary data supports the idea that the changes in retinal ganglion cell layer thickness may correlate with specific neuropsychological domains. Future research will unravel whether a stronger statistical relationship between RGCL thickness and specific neuropsychological domains exists in dementia and psychiatric disorders.

Significant retinal vein pulse amplitude difference detected with change in posture is associated with cerebrospinal fluid pressure difference

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Purpose: To investigate the relationship between venous pulsation amplitude difference and intracranial pressure change from different postures of sitting and lying prone.

Method: We estimated the difference in cerebrospinal fluid (CSF) pressure at eye level by measuring the distance from the eye vertically to the level of T2 vertebrae in two postures. The postures were sitting and lying prone. In these two postures photoplethysmography was performed using ophthalmodynamometer through which video recordings of the optic disc and vessels were obtained. Harmonic analysis of the recordings were done to analyse retinal vein pulsation. We used retinal vein pulse amplitude within 0.4 mm of the optic disc centre as the strength of the pulse signal rapidly attenuates. The difference in average amplitudes between sitting and lying positions for each eye were analysed along with their relationship with difference in CSF pressure at each posture.

Results: Thirteen normal subjects were examined (mean age 40 years old). As the presumed CSF pressure difference increased for each millimetre of mercury, the logarithm of the pulse amplitude increased by 0.036

units ($p = 0.0020$). The larger the CSF pressure difference, the greater the increase in pulse amplitude ($p = 0.018$). There is no correlation between blood pressure and venous pulsation amplitude at each posture ($p = 0.38$ and 0.63).

Conclusion: There is a statistically significant relationship between the presumed CSF pressure at each posture and the retinal venous pulse amplitude. The greater the increase in CSF pressure difference, the greater the difference in venous pulse amplitude.

Complete recovery of Charles Bonnet syndrome following resolution of posterior reversible encephalopathy syndrome

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Purpose: Charles Bonnet Syndrome (CBS) describes non-psychogenic, complex visual hallucinations in patients with visual impairment. These are thought to signify de-afferentation phenomena in the visual cortex. Posterior Reversible Encephalopathy Syndrome (PRES) describes headaches, vision loss, confusion or seizures in relation to posterior cortical hypoperfusion, with vasogenic oedema secondary to acute increases in blood pressure. This is the first documented report of complete resolution of CBS following the recovery from PRES.

Method: Report of the history, examination, relevant perimetry and MRI.

Results: A 49-year-old female presented to ED with worsening dyspnoea and chest tightness, with a blood pressure of 240/110 mmHg. She subsequently desaturated to 23% during a complicated intubation, and cardiopulmonary resuscitation was performed successfully. She was admitted to ICU. On day 10, her visual acuity was hand movements bilaterally, with large central field defects. She described complex visual hallucinations in the form of multicoloured raptors, dolls and small cars that were walking on the walls, consistent with CBS. T2 FLAIR MRI demonstrated hyperintensities in the occipital cortex, consistent with a diagnosis of PRES. By day 44, visual acuity had improved to 6/60 OU, and CBS had resolved. T2 FLAIR



MRI also demonstrated resolution of PRES, and perimetry revealed substantial improvement.

Conclusion: This is the first documented case of resolved CBS following improved PRES. Patients with CBS can be reassured that their hallucinations are not psychogenic. Given that the visual impairment related to PRES is reversible by definition, PRES patients can be reassured that their CBS will likely resolve.

Retrograde axonal degeneration leading to optic atrophy from perinatal ischaemia

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Purpose: Wallerian degeneration of the post-chiasmal visual pathways from ischaemic events can lead to optic atrophy. This has been rarely reported in the paediatric population.

Methods: A series of four paediatric patients were identified with optic atrophy and associated neuroimaging abnormalities. Detailed clinical assessment included optical coherence tomography of the peripapillary nerve fibre layer and neuroimaging.

Results: Four patients, all male, were diagnosed with optic atrophy at a mean age of 8 years (range 4-14). Two were referred to clinic with strabismus, one with poor visual field and one for routine assessment as part of developmental workup. Three had known perinatal/neonatal ischaemic vascular events with subsequent hemiplegic cerebral palsy. Average (\pm SD) visual acuity was right 0.20 ± 0.12 logMAR and left 0.17 ± 0.08 logMAR. Colour vision was full in two patients who could do the test. Three patients had predominantly temporal optic disc pallor with one marked generalised optic pallor. Two patients had homonymous hemifield loss on confrontation and two had no defect. Average optical coherence tomography nerve fibre layer was 83 ± 29 μ m. Three patients had known established magnetic resonance imaging abnormalities of perinatal infarcts. One patient without hemiplegia underwent neuroimaging which identified asymmetrical ventriculomegaly indicative of perinatal cerebral insult.

Conclusions: Patients with a history of perinatal stroke should be assessed for optic atrophy which can be present despite normal acuity and colour vision. The presumed pathogenesis is of retrograde degeneration from post-chiasmal lesions.

Anterior ischaemic optic neuropathy and eosinophilic vasculitis associated with atezolizumab immunotherapy for the treatment of metastatic lung cancer

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Purpose: To describe a novel ophthalmic immune-related adverse event associated with atezolizumab: a PD-L1 immune checkpoint inhibitor (ICI) increasingly used in the treatment of metastatic disease.

Methods: A case review was performed using clinical and histopathological information collected from an 82 year-old male of European ancestry presenting with sudden onset unilateral vision loss, headache, and jaw claudication. He was diagnosed with arteritic anterior ischaemic optic neuropathy (AAION) and eosinophilic vasculitis in the context of five months of preceding atezolizumab therapy for the treatment of metastatic lung disease.

Results: On ophthalmic examination, his best corrected visual acuity was no light perception in the right eye and 6/7.6 in the left eye. He had a right relative afferent pupillary defect with a diffusely swollen optic disc. Profoundly delayed multivessel retinal arterial filling was observed on fundus fluorescein angiography. Clinical findings were consistent with an AAION. Histopathology of a right temporal artery biopsy demonstrated transmural eosinophilic invasion without granulomas. Retrospective review identified a preceding trend of peripheral eosinophilia. Eosinophilia is not currently contraindicated in ICI therapy, however we do question the patho-aetiological relevance of eosinophilia to the eosinophilic vasculitis observed in this case.

Conclusion: This case highlights a unique presentation of vision loss resulting from AAION associated with eosinophilic vasculitis in a patient undergoing treatment with a PD-L1 inhibitor. Ophthalmologists

should be familiar with ICI therapeutics due to their increasing use and high association with ophthalmic immune related adverse events.

Clinical profile and management of sixth nerve palsy in paediatric patients (0-15 years) in Southern India – A hospital-based study

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Purpose: This study was done to evaluate the clinical profile in Paediatric patients (0-16 years) presenting with acute onset esotropia due to Sixth Nerve palsy.

Methods: A total of 12 patients presenting to our Paediatric Ophthalmology Outpatient Department with acute onset esotropia due to sixth nerve palsies were included in this retrospective study. All patients were observed for six months and managed with the prism and/or patching while waiting for spontaneous resolution and later managed surgically. Neuroimaging was done in all cases.

Results: The mean deviation of esotropia at presentation was 30.17 ± 5.7 Prism Dioptre (range 12-50 PD, 95% CI, SD 10.11). During the presentation, the mean age of the patients was 8.6 ± 2.4 years (range: 1-15 years, SD 4.27). Among the common causes of sixth nerve palsy in our study population were trauma and idiopathic intracranial hypertension, followed by tumour and miscellaneous causes. Only three patients underwent surgical correction of residual deviation after a waiting period of six months for self-resolution. The spontaneous resolution was observed in 41.6% of patients and surgical correction (unilateral resection-recession) was done in 25% of the patients with good surgical outcomes.

Conclusion: At one year of follow-up, the motor outcome was satisfactory except for one patient who had diffuse pontine glioma and had worsening neurological symptoms on follow-up.

Retrospective audit of acute zonal occult outer retinopathy

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Purpose: Acute Zonal Occult Outer Retinopathy (AZOOR) is a presumed inflammatory disorder with outer retinal dysfunction. Despite the literature examining various aspects of AZOOR, as a disease it remains ill-defined and poorly understood. We describe a cohort of AZOOR patients and review the diagnosis based on electroretinography and multimodal retinal imaging including spectral domain-optical coherence tomography (SD-OCT) and fundus autofluorescence.

Method: A retrospective audit of 17 eyes of 13 patients with a diagnosis of AZOOR was performed at the Save Sight Institute, Sydney, Australia.

Results: All patients presented with acute onset photopsia and/or visual field disturbance with preserved visual acuity. Clinical fundus examination demonstrated retinitis pigmentosa-like change in 31% (n = 4); the remaining patients had a normal fundus or a fundus with abnormalities unrelated to AZOOR. Mean age of presentation was 36.9 years with a female predominance (62%). Autoimmune systemic disease or systemic disorders with immune mediated aetiology were present in 30% of patients (n = 4). 31% (n = 4) were diagnosed with purely electrophysiology findings on mfERG and ffERG. 62% (n = 8) were diagnosed with both electrophysiology and retinal imaging criteria. 6% (n = 1) were diagnosed with purely retinal imaging findings.

Conclusion: AZOOR most commonly presents in young females; often with autoimmune or immune-mediated systemic diseases. It can be diagnosed with both electrophysiology and multimodal retinal imaging modalities. The patients who did not show retinal imaging changes need further study to see if these are delayed findings, or to ascertain if some patients never show the classic structural changes of AZOOR.

OCULAR ONCOLOGY

A case of conjunctival spindle cell carcinoma with osteoclast-like giant cells: A rare and potentially lethal entity

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Purpose: Spindle cell carcinoma (SPCC) is a rare and aggressive biphasic subtype of squamous cell carcinoma which rarely affects the conjunctiva. In this condition, neoplastic epithelial cells undergo epithelial to mesenchymal transition developing an invasive, migratory phenotype which morphologically resembles sarcoma. Osteoclast-like giant cells (OLGC) may be found in SPCC or within the metatypical carcinoma spectrum; both of which are more aggressive than conventional squamous cell carcinomas. We present a novel case of conjunctival SPCC with OLGCs to highlight that thorough immunohistochemical analysis and proactive clinical management are essential.

Methods: We report the first case of primary conjunctival SPCC with clearly described OLGCs.

Results: An 89-year-old male presented with rapid enlargement of an inflamed perilimbal lesion, which was treated with excisional biopsy and cryotherapy. Histopathological and immunohistochemical analysis favoured a diagnosis of SPCC with OLGCs; demonstrating spindle cells intermixed with conspicuous OLGCs, squamous differentiation in continuity with surface epithelium, positive p63 and cytokeratin immunostaining and absence of mesenchymal or melanocytic markers. Despite further surgical excision, rapid growth occurred over a 4-month period with macroscopic extension abutting the lacrimal gland and lateral rectus insertion. The patient ultimately underwent an exenteration and local radiotherapy was offered.

Conclusions: This case of locally aggressive primary conjunctival SPCC with OLGCs demonstrates how imperative proactive treatment and follow-up is once diagnosed with thorough histopathological and immunohistochemical analysis. Despite insufficient data in the literature to determine the prognostic influence of OLGCs, its frequency in SPCC outside of the conjunctiva may indicate it is a poor prognostic indicator.

Conjunctival myxoma - a rare masquerade with systemic associations

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Purpose: Conjunctival myxoma is a rare benign tumour with a reported incidence ranging from 0.001% to 0.1%. It has systemic associations with Carney Syndrome and Zollinger-Ellison Syndrome that have potentially life-threatening complications. We present the case of a positive excisional biopsy at the Royal Victorian Eye and Ear Hospital, Melbourne, Australia, following a one-week

history of an enlarging cystic mass in an elderly gentleman.

Method: Literature review and case report with clinical, surgical, histological, and follow-up data presented.

Results: A well-defined elevated gelatinous lesion measuring 13 x 10 x 4 mm with associated subconjunctival haemorrhage was excised from temporal conjunctiva of the left eye. Haematoxylin and Eosin staining showed multinucleated cells with rosette type nuclei, bland spindle cells and foamy macrophages. Tumour recurrence was not detected clinically at the post-operative one-week review. The patient received a post-operative echocardiogram and private physician referral for systemic work-up.

Conclusion: This case of conjunctival myxoma highlights a number of important systemic associations for ocular neoplasia and serves as a reminder for the utility of histopathological testing in apparently benign tumours.

Clinicopathological correlates of ocular surface squamous neoplasia

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Purpose: To examine the distribution of histopathological disease severity among a cohort of patients treated for clinically suspected ocular surface squamous neoplasia (OSSN), and to evaluate the relationship between various patient and clinical factors and severity of pathological grade.

Methods: A retrospective cohort study of demographic and clinicopathological factors of 150 patients clinically diagnosed with suspected OSSN who underwent excision of lesion with subsequent histopathological confirmation of diagnosis.

Results: A total of 124 patients were included in the study, mean age at diagnosis was 64 years, and 69% of patients were male. Seventy-four percent of cases were histopathologically confirmed to be OSSN. Pathological grading was as follows: CIN I (13/6%), CIN II (16.8%), CIN III (21.6%), CIS (21.6 %) and squamous cell carcinoma (2.4%). Lesion appearance was leukoplakic (18%), gelatinous (15%), dysplastic (11%), vascular (6%), papilliform (2%), nodular (2%). Lesion location was nasal (43%), temporal (42%), and superior or inferior (14%). Local spread was only documented in two cases (1.6%). Adjuvant mitomycin C was used in 35% of cases, interferon $\alpha 2a$ in 4%, and interferon $\alpha 2b$ in 9.6%. Recurrence occurred in seven cases (5.6%) with a mean time to recurrence of 825 days. No significant associations were found between clinical characteristics and pathological grade: sex ($p = 0.126$), eye ($p = 0.901$), quadrant location ($p = 0.402$).

Conclusions: OSSN is most commonly diagnosed in CIN III and CIS stages, and initial treatment outcomes are usually favourable, with very low rates of recurrence. This study provides an update of high-risk demographic and clinical features relating to the disease.

Mycosis fungoides: A case of T cell lymphoma in the eye

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Purpose: To present a case of intraocular mycosis fungoides and its diagnostic and treatment challenges.

Method: Case report.

Results: Generally indolent in nature, mycosis fungoides is the most common cutaneous T-cell lymphoma. Like other types of lymphoma, it is capable of intraocular manifestations, but such complication is extremely rare with fewer documented case reports.

We describe the case of a 25 year-old man with mycosis fungoides who presented with acute unilateral scotoma rapidly involving central fixation, causing a drop in vision from 6/6 to 6/60 over 10 days. Clinically the focal whitened retinal lesion at the macula showed full thickness hyper-reflectivity on optical coherence tomography. Following exclusion of infective causes, the patient was treated with a course of intra-vitreous methotrexate and intensive systemic chemotherapy, followed by stem cell transplant. Over three months, the retinal lesion reduced in size, thickness and optical coherence tomography hyper-reflectivity with remarkable visual recovery to 6/6.

Conclusion: Through this unusual presentation, we will discuss the implications of severe immunosuppression in infective screening, the risk-benefit ratio of macular biopsy in the context of known extra-ocular lymphoma, and the approach to treatment and follow up in this complex group of patients.

The MOLES system for planning the management of melanocytic choroidal tumours: Can optometrists apply it?

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Purpose: Choroidal naevi are found in approximately 6% of the adult White population. There has been no validated algorithm for their management, despite the clinical risk factors for tumour growth being well described. One of the authors (BD), therefore devised the MOLES scoring system, which indicates likelihood of malignancy according to: Mushroom shape, Orange pigment, Large size, Enlargement and Subretinal (MOLES) fluid. When applied by ocular oncologists, the system is accurate in distinguishing choroidal naevi from melanomas. The aim of the present study was to evaluate whether community optometrists can use the MOLES scoring system to appropriately manage patients with melanocytic choroidal tumours.

Method: Clinical images of 25 melanocytic choroidal tumours were presented in an online questionnaire. Imaging included colour fundus photography, fundus autofluorescence, optical coherence tomography and B-Scan ultrasound images. Using the MOLES system, 39 optometrists diagnosed these tumours as naevus or probable melanoma and decided between community monitoring and referral to an ophthalmologist. Responses were compared to ocular oncologists' MOLES grading of the tumours using the same clinical images.

Results: Using MOLES, optometrists correctly identified 389 of 406 probable melanomas (95.8% sensitivity) and 312 of 516 choroidal naevi (60.5% specificity). Optometrists correctly referred 773 of 778 tumours to an ophthalmologist (99.4% sensitivity) and correctly managed 80 of 144 lesions (55.6% specificity) in the community.

Conclusion: The MOLES scoring system was applied safely by optometrists in this survey. Further studies are indicated to reduce referral of naevi and to evaluate the use of the MOLES system in clinical optometric practice, where some imaging modalities may not be readily available.

Therapeutic human papillomavirus vaccination in the treatment of conjunctival papilloma and ocular surface squamous neoplasia

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Purpose: To explore the potential therapeutic effects of Human Papillomavirus vaccination on conjunctival papilloma (CP) and ocular surface squamous neoplasia (OSSN).

Methods: Retrospective case series of three patients with CP and three patients with OSSN who were each treated with a therapeutic three dose course of Gardasil-9 vaccination six weeks apart, either as sole treatment or in conjunction with conventional therapies such as topical interferon α -2b or mitomycin C.

Results: Gardasil-9 vaccination was observed to be of potential clinical benefit in five of the six cases reported. In one case, use of Gardasil-9 as a sole agent resulted in the complete resolution of recurrent CP lesions, which were previously refractory to conventional treatment. In four cases (3 OSSN, 1 CP), combined conventional therapy with Gardasil-9 was seen to result in either resolution or stabilisation of lesions. However, in a single case of CP, no benefit was derived from Gardasil-9 sole agent therapy.

Conclusions: We report the novel use of Gardasil-9 as a therapeutic vaccination in the treatment and prophylaxis of CP and OSSN. Given its well documented safety profile and efficacy in cancer prevention in other fields of medicine, the authors recommend consideration of its use in recurrent and/or recalcitrant cases of CP and OSSN.

Ocular surface squamous neoplasia: A 20 year review

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Introduction: Ocular surface squamous neoplasia (OSSN) encompasses epithelial dysplasias, conjunctival intra-epithelial neoplastic lesions and squamous cell carcinoma, and is more common in regions with high sun exposure. There has been a recent shift towards the use of topical chemotherapy in the management of OSSN. This study aimed to evaluate the effectiveness of OSSN management and identify the recurrence rate over the past 20 years at a tertiary referral ophthalmology centre in Sydney, Australia.

Methodology: Retrospective cross-sectional chart review of patients with OSSN from 2000 to 2020 at Westmead Hospital, Sydney, Australia. Patient characteristics, pre-

treatment findings, treatment information and post-treatment clinical course were obtained retrospectively.

Results: There were 25 cases of OSSN, predominantly in males (80%) with a mean age at presentation of 71 years. Commonly affected sites were the limbus (64%) and bulbar conjunctiva (24%). Treatment regimens included various combinations of excision, cryotherapy and ocular chemotherapy (mitomycin-C or interferon- α 2b). Adverse effects following treatment included irritation (4%), epiphora (4%) and endophthalmitis (4%). Recurrence occurred in 32% of cases. These patients were managed with excision, cryotherapy and mitomycin-C (50% of recurrences), biopsy and mitomycin-C (25% of recurrences), excision and cryotherapy (12.5% of recurrences) and excision and conjunctival autograft (12.5% of recurrences).

Conclusion: OSSN recurrence is a significant adverse outcome, which occurred most commonly following the excision, cryotherapy and mitomycin-C treatment regime. Study limitations include small sample size and use of retrospective data as older cases were managed purely surgically without adjunctive therapies, hence further prospective research is necessary.

OCULOPLASTIC/ORBIT

Conservative management of spontaneous intraorbital arteriovenous fistulas

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Purpose: To report on a case of spontaneous intraorbital arteriovenous fistulas (AVF) treated with non operative management.

Method: A case report of a spontaneous intraorbital AVF diagnosed with magnetic resonance imaging (MRI) and digital subtraction angiography (DSA).

Results: A 78-year-old woman presented with a four-month history of left eye periorbital oedema, proptosis, diplopia and blurred vision. There was no history of trauma or vascular abnormalities. Digital subtraction angiography of the carotid circulation showed arteriovenous shunting at the superior medial aspect of left orbit, from meningeal branches of the ophthalmic artery into the partially thrombosed superior ophthalmic vein. Immediate surgical intervention through transvenous embolization was withheld given the high risk for intra-operative stroke or blindness. Over a period of six months the patient's vision and symptoms improved with conservative management.

Conclusion: Spontaneous intraorbital arteriovenous fistulas are a very rare phenomenon that are typically difficult to treat. However, most documented cases suggest that patients typically go blind in the affected eye unless surgical intervention is done. Transvenous endovascular embolization is the most commonly used approach, however it comes at significant intra-operative risk. This is the second known case of spontaneous resolution of an intraorbital AVF and further highlights the potential for non-surgical management for a selection of patients with intraorbital AVF.

Diagnostic accuracy of Immulite® thyroid stimulating immunoglobulins immunoassay for thyroid-associated orbitopathy

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Purpose: Thyroid stimulating immunoglobulins (TSI) have been implicated in the pathogenesis of Graves' hyperthyroidism (GH) and thyroid-associated orbitopathy (TAO). The Immulite® TSI immunoassay is a relatively new commercial assay that has shown good diagnostic accuracy in GH. However, its clinical utility in TAO is less clear. The purpose of this study was to assess the diagnostic accuracy of the Immulite® TSI immunoassay for TAO and investigate the associations between TSI and other clinical measures.

Methods: One hundred and forty patients that had been diagnosed with GH within the previous 12 months were recruited. Identification and grading of TAO was performed at enrolment and serum samples were analysed using the Immulite® TSI immunoassay.

Results: Of the 140 participants recruited, 75 (53.6%) had TAO. Age, sex and time since GH diagnosis were similar between those with and without TAO ($p \geq 0.300$). TSI level tended to decrease with increasing time from GH diagnosis (Spearman's ρ -0.28, 95% confidence interval [CI] -0.43, -0.12). TSI levels were higher among those with than those without TAO (median 4.0 vs 2.7 IU/L respectively, $p = 0.037$). There was no correlation between TSI level and inflammatory index score ($p = 0.14$, 95% CI -0.03, 0.30) or clinical severity ($p = 0.527$) among those with TAO. TSI level showed

poor diagnostic accuracy for TAO (area under the receiver operating characteristic curve 0.60, 95% CI 0.51, 0.70).

Conclusion: Although Immulite® TSI level was higher in the presence of TAO, it showed poor diagnostic accuracy and no correlation with clinical markers of TAO severity or activity.

Surgical approach to repair of traumatic avulsion and external herniation of the levator palpebrae superioris

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Purpose: To report an unusual case and surgical repair of avulsion and external herniation of levator palpebrae superioris (LPS) muscle associated with a superior tarsal plate fracture in an eight-year-old girl.

Method: Case report and description of novel surgical repair.

Results: An eight-year-old Indigenous girl was brought in by ambulance to the emergency department with a 1.5 cm left-upper lid laceration and herniation of pre-septal contents following a motor vehicle accident. Computed Tomography imaging demonstrated a preseptal swelling extending into the lower left frontal scalp. Examination under anaesthetic identified a lateral fracture of the superior tarsal plate, and demonstrated that LPS was the externally herniating structure, having avulsed from the tarsal plate. Surgical management consisted of closure of the tarsal fracture with 6.0 Vicryl, a skin crease incision was made to explore and reattach LPS to the tarsal plate with 6.0 Vicryl, and closure was achieved in-layers to protect LPS. No ptosis was present one and six months after repair.

Conclusion: This case demonstrates the surgical repair of an unusual case of traumatic avulsion and external herniation of the LPS associated with superior tarsal plate fracture. This repair prevented further ptosis surgery and concomitant psychosocial implications in a paediatric Indigenous patient.

Nasal turbinate for management of contracted anophthalmic socket

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Purpose: Severe contraction of the conjunctival lining of an anophthalmic socket is uncommon following enucleation. In severe contraction there may be inability to wear a prosthesis, with total socket reconstruction needed to correct the conjunctival lining and restore acceptable cosmesis. Multiple different materials have been reported for lining augmentation and socket reconstruction in contracted anophthalmic sockets including buccal mucous membrane, amniotic membrane, hard palate, dermis fat, full-thickness skin and fascia lata. We report a case of contracted socket and failed amniotic membrane grafting that subsequently underwent successful total socket reconstruction using a novel nasal turbinate mucosa grafting technique.

Methods: A 67-year-old Caucasian male presented with severe socket lining contraction eight years after enucleation, dermis fat graft and successful ocular prosthesis fitting. Following two failed attempts at using amniotic membrane grafts to reform the socket lining, a total socket reconstruction was attempted using a novel nasal turbinate graft technique. This was performed in a staged fashion with lower fornix reconstruction followed by upper fornix reconstruction three months later. Nasal turbinate was used as it was surgically accessible, provided natural socket lubrication due to its mucosal surface, and avoided oral mucosa and its associated morbidity.

Results: Early in the post-operative course, the patient noted excess discharge that settled with prednisolone drops. One-year post-operatively the patient's progress and cosmesis were satisfactory.

Conclusion: Nasal turbinate mucosa is a potential, previously unreported total socket reconstruction material in contracted anophthalmic sockets. Further studies are needed to determine its safety profile, longevity, and rate of complications.

Normative data for dacryoscintigraphy:

A single-centre, prospective study of findings in asymptomatic volunteers and patients

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Purpose: To establish normative quantitative values for dacryoscintigraphy in older subjects.

Methods: Prospective study, 22 participants, aged 54 – 90 years (mean 72) without epiphora, clinical tear film instability, lid abnormality or lacrimal system impairment. Dacryoscintigraphic imaging: 45-minutes plus 45 minutes following sinus clearing and lid massage. Regions of interest activity encompassing pre-sac and whole eye quantified, half clearance times (HCT) pre- and post-massage determined.

Results: One participant declined post-massage scans. Inadvertently one had 30 minutes of pre-massage scan. 0-30 minute HCTs were determined. Four data points excluded (three with no clearance, one outlier). Pre-sac median HCT was 25.5 min ($\pm 1SD$, 20.5) pre-massage, 71.0 min (± 63.9) post-massage. Whole eye median HCT was 40.0 min (± 38.6) pre-massage, 55.5 min (± 35.5) post-massage. Qualitatively 68% (15/22) had at least 1 abnormal regions of interest pre-massage, 13 improved post-massage.

Conclusion: Qualitatively a significant false positive rate noted, corrected with lid massage. Post-massage HCTs were higher, possibly due to lower residual activity. In the older population, our study provides a quantitative reference for dacryoscintigraphy interpretation that could improve test specificity.

Hughes flap in the management of lower lid retraction

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Purpose: We present a retrospective case series on the use of Hughes flap in managing acquired cicatricial lower lid retraction.

Methods: This was a multicentre, retrospective case series. Data was collected from medical records across different sites within Australia (Adelaide, Melbourne, Sydney) and New Zealand (Hamilton).

Results: Fourteen patients were identified. The aetiology of cicatricial lower lid retraction included: previous lid lesion excision and reconstruction, eyelid trauma, orbital fracture repair, orbital radiotherapy, and lateral canthal dystopia

from previous lid surgeries. Four of 14 (29%) cases had undergone other surgery to correct the retraction prior to the Hughes flap. Pre-operative lagophthalmos due to lower lid retraction was noted in 11/14 (79%) cases with a median 2 mm (range: 1-5 mm). Exposure keratopathy was present in 7/14 (50%) cases. There were no peri-operative complications during Hughes flap reconstruction. One patient had post-operative upper eyelid retraction that did not require any further intervention. One patient had persistent lagophthalmos and exposure keratopathy that is being managed conservatively. One patient had wound dehiscence and further lid retraction following flap division, which required further surgery. Median length of follow up was 15 months (range: 0.5 to 84 months). At final review, improvement or resolution of symptoms was seen in 13/14 (93%) cases.

Conclusions: A Hughes flap is an effective surgical technique for the management of cicatricial lower lid retraction.

Reversible Charles Bonnet syndrome secondary to upper lid ptosis

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Purpose: To describe the first reported case of Charles Bonnet syndrome (CBS) in a patient with upper lid ptosis

Method: We report a case of CBS in an elderly female with marked ptosis, which was exacerbated following a knee replacement surgery under general anaesthesia.

Results: Her CBS symptoms persisted until surgical correction of the ptosis, with a rapid and dramatic resolution of her hallucinations.

Conclusion: Complex visual hallucinations can occur in visually impaired individuals with no underlying psychiatric disorder. This phenomenon is known as CBS. It is more common in elderly patients who are suffering from impaired vision due to ocular or neurological disease processes, resulting in sensory deprivation. Although CBS is typically a chronic condition, unusually in this case it was acute and reversible.

Orbital cellulitis as a masquerade of infective scleritis in previous beta-irradiation treated pterygium

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Purpose: Scleritis is a rare sight-threatening condition often associated with systemic diseases. Infective scleritis is even rarer. The clinical diagnosis of scleritis may be complicated by an atypical presentation that can include the involvement of surrounding ocular structures, leading to a delayed diagnosis. We describe two cases of infectious scleritis secondary to previous beta-irradiation pterygium surgery, masquerading as orbital cellulitis.

Method: A retrospective case review of two patients presenting with infective scleritis masquerading as orbital cellulitis to the Royal Victorian Eye and Ear Hospital. Electronic medical records were collected as part of routine care.

Results: Two patients presented with near identical history of unilateral ocular pain, periorbital oedema, conjunctival chemosis and reduced vision. A clinical diagnosis of orbital cellulitis was made with commencement of broad-spectrum intravenous antibiotics. After minimal improvement, an alternative diagnosis was sought. The diagnosis of infectious scleritis complicating previous pterygium excision with beta-irradiation was made. Both patients made an uneventful recovery over 12 months of follow-up in the community.

Conclusion: Predisposing factors in infective scleritis include trauma and prior surgery, including pterygium surgery and treatment with beta-irradiation. Although, beta-irradiation is no longer recommended in the management of pterygia, this case series highlights the importance of recognising the complications associated with its use, which may present many years later.

OTHER

The documentation of eye examination findings in patients presenting to the emergency department with ocular trauma

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Background: Ocular injuries are frequently encountered in the emergency department (ED). Research suggests that the quality of eye examination and subsequent documentation of ocular injuries has been problematic for junior doctors. This audit aimed to evaluate the quality of



documentation of ocular eye examination findings in patients presenting to the ED with ocular trauma.

Benchmarking/Standard: Developed from the Eye Emergency Manual (New South Wales). Standard 1 was that 100% of adult patients with injury to the eye/orbit will have their visual acuity (with pin-hole), pupillary assessment, eye movements, slit-lamp examination and ocular diagram documented in their progress note. Standard 2 was that 100% of patients with ocular foreign body will include documentation of eyelid eversion.

Methods: Using the hospital database, the retrospective data of 50 consecutive cases between 1 September to 30 November 2018 was collected. The examination findings documented in the progress notes were reviewed. Outcome measures were “yes” or “no” for all components of the eye examination, plus “not applicable” for pinhole, fluorescein and tarsal plate eversion.

Results: The documentation for >70% of the cases included information about the visual acuity (74%), slit lamp findings (75%), fluorescein administration (75%) and ocular drawing (87%). Lid eversion was the lowest (31%). Nurse practitioners had the highest overall adherence to the standard compared to ED Resident Medical Officers and Registrars.

Recommendations: Introduction of an ophthalmology proforma for patients presenting to the ED with ocular trauma (implemented), nurse practitioner-led education and additional education/assigned number of ophthalmology cases for junior doctors.

What is multi-source feedback and how does it apply to Medical Board of Australia's professional performance framework: Implications for CPD

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Purpose: Multi-Source Feedback (MSF) is a workplace-based activity where doctors receive structured feedback on their interpersonal/communication skills and professionalism from patients, peers and co-workers, and it also involves a self-assessment. MSF is highly recommended as part of the Medical Board's Professional Performance Framework and requirements for their proposed new CPD framework.

Method: A MSF trial was undertaken with a small group of Fellows to determine the impact of receiving such feedback with the emphasis being on both patient and colleague feedback. Each Fellow received feedback from at least 30 patients and 12 colleagues (peers and co-workers). Fellows were provided with comprehensive

benchmarked reports and a reflection template to help them better understand their strengths and areas that they may require improvement or changes.

Results: The MSF process was considered by Fellows as a simple and non-burdensome way of receiving meaningful feedback to help shape their professional development. Ratings of Fellows were high on both patient and colleague feedback.

Conclusion: MSF is a feasible way of providing Fellows with structured feedback on their communication and professional skills, therefore demonstrating its usefulness as part of the upcoming new CPD requirements under the Medical Board of Australia's Professional Performance Framework.

A five-year retrospective case series of hypersensitivity reactions to hyaluronidase following peribulbar anaesthesia

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Purpose: To describe the demographics and clinical features of eight Queensland patients who suffered hypersensitivity reactions to hyaluronidase (HA) following peribulbar anaesthesia (PA).

Method: A review of all patients referred to the Anaesthetic Allergy Clinic at the Princess Alexandra Hospital, Brisbane, Australia with HA hypersensitivity reactions following PA between January 2013 and December 2019 was conducted. Patients were included if anaesthetic allergist opinion was that the patient had suffered a hypersensitivity reaction to HA.

Results: Eight cases were included in the study. Two patients suffered anaphylactic reactions with one requiring emergency intubation and admission to the Intensive Care Unit. One patient developed severe orbital inflammation, orbital compartment syndrome, and complete loss of light perception vision. Five patients presented with milder orbital inflammation and no long-term sequelae. Six patients had a positive intradermal skin test for HA hypersensitivity. One patient tested negative on allergy testing and one patient failed to present for allergy testing, both were considered likely to be sensitive to hyaluronidase and were advised to avoid future exposure.

Conclusions: Hyaluronidase hypersensitivity following PA, though rare, can be life and vision-threatening. Timely diagnosis and appropriate treatment are critical to prevent adverse outcomes. This case series demonstrates peribulbar HA hypersensitivity may manifest as either immediate-type or delayed-type hypersensitivity reactions which can be both life and vision-threatening. It is important for ophthalmologists to consider HA hypersensitivity to make an accurate diagnosis and instigate appropriate and timely treatment. Where HA hypersensitivity is suspected intradermal skin test should be performed to confirm sensitivity and guide future treatment.

Hypersensitivity reactions to periocular hyaluronidase, a literature review

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Purpose: To review the current literature on hyaluronidase hypersensitivity reactions and describe the demographics and clinical features of hyaluronidase used in anaesthetic eye blocks.

Method: PubMed and Web of Science were searched from 1984 to 2020. All publications describing the hypersensitivity reactions to hyaluronidase used in ocular anaesthetic blocks were included.

Results: Twenty-five papers were identified describing an aggregate of 55 cases where hypersensitivity reactions to hyaluronidase have been reported. The year of publication ranged from 1984 to 2021. Previous exposure to hyaluronidase was reported in 37 (67%) of cases, with 7 (13%) having no previous hyaluronidase exposure and 11 (20%) having their previous hyaluronidase exposure status unknown. Well documented variability in the timing of symptom onset with reports ranging from immediate (intra-operative), to early (within a few hours), to intermediate (within a few days), to late (within a few weeks). This variance implied type I and type IV hypersensitivity reactions. Intradermal skin testing (IDST) for hyaluronidase hypersensitivity was performed in 44 (80%) of reported cases with only three (5%) of patients having a negative allergy test. Periorbital inflammation is the most common reaction 49 (89%), followed by chemosis and extraocular muscle restriction each occurring in 21 (38%), proptosis 19 (35%) and decreased visual acuity 15 (27%). Fifty-two (95%) patients had a full recovery.

Conclusion: This review underscores the spectrum of hypersensitivity reactions patients may undergo when exposed to periocular hyaluronidase used as an adjunct to anaesthetic blocks and highlights its importance as a consideration when encountering uncharacteristically emphasised post-operative inflammation.

The 100 most frequently cited articles in ophthalmology journals over the last 10 years

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Purpose: The aim of this study was to review the 100 most-cited articles in ophthalmology journals over the last 10 years.

Methods: A literature search was conducted using the bibliographic databases of the ISI Web of Knowledge, limited to research papers published in all 60 journals dedicated to ophthalmology and its subspecialties (identified from the Journal Citation Reports 2019 database) between 1 January 2010 and 31 December 2020.

Results: Seventy-two percent of the top 100 most-cited articles were published in three journals: *Ophthalmology* (n = 49), *Progress in Retinal and Eye Research* (n = 12) and *Investigative Ophthalmology Visual Science* (n = 11). The most-frequent studied disease categories were myopia (n = 16) and age-related macular degeneration (n = 15) in T100-Eye and diabetic retinopathy (n = 24) and glaucoma (n = 16) in T100-General. USA, Germany and France contributed most (n = 78, n = 19, n = 14). The majority of articles being published in 2011, 2012 and 2010 (n = 27, n = 20, n = 19) with none being published in 2018 or 2019.

Conclusions: The number of citations an article receives is a direct indicator of its impact on the scientific community. This study provides insight into important factors for ophthalmologists looking to publish research in ophthalmology journals and may help with journal selection to maximise the impact of their publications.

Ophthalmology involvement in ocular trauma at an Australian trauma centre

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Purpose: Trauma is a leading cause of significant ocular morbidity. With specialist management, simple injuries may be managed in outpatient settings. However, with significant injuries, complex inpatient management is required. Royal North Shore Hospital receives thousands of trauma presentations annually. A review of all patients admitted with ocular trauma was conducted to determine the epidemiology, aetiology and ophthalmology involvement in ocular and adnexal trauma.

Methods: A five-year retrospective case series was conducted on all the patients admitted to Royal North Shore with ocular and/or adnexal trauma. Patients were identified using International Classification of Disease, Tenth Revision codes to search diagnostic and procedural coding data. Records were reviewed to identify ocular and/or adnexal injury, demographics, mechanism of injury, best corrected visual acuity and ophthalmology involvement.

Results: Over the five-year period 590 patients were admitted with ocular trauma. Injuries ranged from minor corneal abrasions to complex orbital fractures and ruptured globes. Injuries occurred in isolation and as a component of multi-trauma. Notably in the acute assessment, 38% did not have a visual acuity and 10% did not have an eye examination. Ophthalmology consults occurred for severe ocular or adnexal injury, retrobulbar haematomas and often for changes in visual acuity.

Conclusion: Royal North Shore receives thousands of trauma presentations annually, ranging from simple trauma to significant injuries in multi-trauma patients. The assessment of simple ocular trauma may be completed by critical care staff; however, involvement of specialist care is vital to assess and manage severe and/or sight threatening injuries.

Ocular burns at a quaternary referral centre

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Background: Ocular burns can cause significant morbidity with potentially life long consequences. Unfortunately, delayed diagnosis of ocular burns may occur as

they can be associated with life threatening injuries that demand immediate management. We aim to determine the initial ocular assessment and management of ocular and adnexal burns at a quaternary referral centre.

Method: A retrospective case series was performed of patients admitted to Royal North Shore Hospital between January 2015 and December 2019. Patients were identified using International Classification of Disease, Tenth Revision codes to search diagnostic and procedural coding data. Records were reviewed to identify location of injury, mechanism of injury, best corrected visual acuity and ophthalmology involvement.

Results: Eighty-three patients were admitted to Royal North Shore Hospital who had suffered ocular and/or adnexal burns with the most common cause being flash fire burn. Most patients (90%) had simple ocular injuries that could be managed with eye drops however, 10 patients had significant injury requiring intensive specialist intervention. Ophthalmology were consulted in 71 of the cases, however, there were two cases where ocular burns were missed due to lack of initial assessment and ophthalmology involvement.

Conclusion: Ocular burns can lead to complications that lead to significant morbidity. Specialist ophthalmology involvement is vital in the initial assessment and for ongoing management to maximise recovery and minimise the risk of poor visual outcomes.

Stem cell therapies for eye conditions: A survey of Australian ophthalmologists

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Purpose: To investigate Australian ophthalmologists' understanding of ocular stem cell therapies, including their views, experiences, and preferred continuing education sources.

Methods: An invitation to an online survey was distributed via RANZCO e-news, email and social media from November 2020 to May 2021. Data were collected on demographics, stem cell knowledge, awareness, and experience.

Results: Of the 35 ophthalmologists who completed the survey most were metropolitan-based (49% in New South Wales), worked in independent practices (69%), mostly male (69%) and aged 46-50 years (50%).

Two-thirds were aware of ocular stem cell therapies for corneal disease in Australia ($n = 15$) or the United States (US; $n = 10$) with half aware of clinical trials in the US for corneal disease, age-related macular degeneration and inherited retinal disorders (seven for each condition).

One-third considered the quality of evidence as high for treating corneal conditions, 46% low for age-related macular degeneration, and 31% moderate for inherited retinal disorders. Of those who indicated concern, most (88%) mentioned efficacy and 69% safety issues.

Over half of respondents reported being asked by patients for advice about these therapies. Two-thirds felt either neutral or uncomfortable providing advice, due to lack of knowledge or the topic being beyond their scope of practice. Half (51%) were unsure if clinical management should change if patients had these therapies. Respondents preferred face-to-face accredited lectures at continuing education events.

Conclusion: Half of respondents were aware of ocular stem cell therapies or clinical trials, mainly for corneal conditions in Australia and the US, with concerns about efficacy and safety highly prevalent.

Improving the view on non-mydratic fundus photography implementation in the emergency department: A qualitative description study

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Purpose: Recent studies demonstrate the advantages of non-mydratic fundus photography (NMFP) screening in the emergency department (ED) environment. NMFP implementation can expedite patient diagnoses and management decisions, but behaviour change is notoriously hard to institute. We aimed to investigate the important facilitators and barriers to effective implementation of NMFP within the ED setting.

Method: Face to face, semi-structured interviews were conducted between August to November 2019. Thirteen participants were purposively sampled from a cohort of ED healthcare professionals with experience using NMFP screening, comprising a cross-section of doctors and

nurses. Thematic analysis took an inductive approach through the lens of the Capability, Opportunity, Motivation, Behaviour model for behaviour change.

Results: Four key themes emerged. Firstly, effective training which integrates repeated exposure to the technical performance of NMFP and interpretation of fundus images improves confidence in NMFP implementation. Secondly, uptake would be facilitated by a standardised model for NMFP application ED-wide including: set inclusion criteria for imaging; IT integration; and remote ophthalmologist review of images. Thirdly, the involvement of nursing staff in patient screening would optimise implementation. Finally, culture change is required to break down established clinical assessment practises that bypass ocular fundus assessment.

Conclusion: Mandating regular training with a standardised NMFP screening protocol incorporating nursing staff would provide the platform to develop the momentum and departmental culture change important for sustained and effective implementation of NMFP. Our findings reveal key components to successful NMFP implementation, and can inform the development of screening protocols using this technology throughout EDs.

Surgeon only eye experience test

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Purpose: To explore the surgeon experience of performing “only eye” surgery. Better understanding should lead to improved surgeon training, preparedness and risk reduction strategies during this high-stakes type of surgery.

Method: A mixed methods convergent parallel design was implemented in order to develop a conceptual model of only eye surgery. A cohort of 211 Australian and New Zealand ophthalmic surgeons was recruited through professional conferences/webinars in 2019-2020. Quantitative data was obtained from a cross-sectional survey about personal experience with only eye surgery. Qualitative data was obtained from an open discussion, loosely structured around the survey questions, where participants were encouraged to comment freely about their own experience with only eye surgery. Quantitative and qualitative data were integrated during data interpretation.

Results: Strongest agreement was with the statements “I was worried about my patient losing vision from the surgery”, “I am worried about the surgical complications”



and “I had negative thoughts prior to the surgery”. The following qualitative themes were identified: differences in approach to consent, implementation of additional risk minimisation strategies, value of having a good support team, and enhanced psychological burden.

Conclusion: There are certain features, both practical and psychological, unique to only eye surgery. There is a need for formal guidelines on the provision of care for these high risk patients.

New Zealand's first practical demonstration of the telemedicine system specific to ophthalmology: MedicMind teleophthalmology platform

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Purpose: Ophthalmology is heavily dependent on image based diagnosis. Hence, in the field of ophthalmology, the effectiveness of current telemedicine platforms designed to support virtual consultations is limited to video consultation. The objective of this study is to conduct and validate an effective live teleophthalmology consultation between Dunedin (patient side) and Auckland (specialist side), using the latest 5G network in New Zealand and the smartphone-based innovative eye care diagnosis devices.

Method: Systematically three patients were assessed at Dunedin Hospital. Each patient had their pupils pharmacologically dilated 30 minutes prior to the consult. Live consults were initiated by the doctors at Dunedin Hospital, they were placed in a specialist's teleophthalmology portal account waiting list. Once the live consult requests were accepted by the specialist in Auckland, the patient's clinical history was discussed while the eyes were examined using the smartphone-based fundus camera and ophthalmoscope devices attached to a 5G compatible smartphone (Oppo Find X2 Lite) device.

Results: The teleophthalmology exhibition demonstrated a superior handover, assessment, clinical impression and patient care plan versus a conventional telephone consultation.

Conclusion: Research on other telehealth platforms would suggest rural health inequality reduction can be achieved with the use of teleophthalmology; reduced morbidity through improved quality of care, educational opportunities, costs and time spent travelling where it may have been un-necessary if teleophthalmology was not utilised. Reduced need for travelling will equate to a

reduced carbon footprint and other societal costs associated with this.

Ophthalmology teaching in Australian medical schools: A national survey

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Purpose: To survey the current methods of ophthalmology teaching and educational trends in Australian undergraduate and postgraduate medical schools.

Methods: Cross-sectional survey distributed nationwide to the 21 accredited Australian Medical Council university undergraduate and post-graduate medical schools from November 2020 to March 2021. The survey encompassed 35 questions on student demographics, teaching methods, core theoretical topics, clinical skills, and assessment methods in ophthalmology. Main outcome measures included the time allocated for and methods of teaching, ophthalmology staff and clinic space available, and challenges faced.

Results: Total response rate of 90.48% (19 of 21 medical schools) was received, with 73.7% of respondents based in metropolitan suburbs. Ophthalmology rotations were a requirement in 63.3% of medical schools only. Only 31.6% reported utilising the International Council of Ophthalmology curriculum. The number of ophthalmologists on staff varied from one to three (42.1%), four to six (15.8%), and ten or greater (15.8%). Total teaching time ranged from one to six hours (36.9%), and up to greater than two weeks (10.5%). All respondents reported at least one clinical day in ophthalmology, even if there was no mandatory formal rotation, with the majority of students spending three to six hours in clinic per day (57.9%).

Conclusion: Ophthalmology medical school teaching in Australia shows significant variation amongst universities. With the assistance and support of ophthalmologists, Colleges and medical educators, improvements can be achieved and teaching standardised.

Telehealth outcomes from an ophthalmology department in a COVID-19 hotspot

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Purpose: The Victorian COVID-19 outbreak in the winter of 2020 required ophthalmology departments to rapidly shift from face-to-face provision of care to remote modalities. To provide continuity of care to vulnerable and elective patients, a teleconsults program was rapidly developed. A prospective audit was performed to assess the clinical appropriateness of this program.

Methods: A prospective audit of a telehealth program at a tertiary hospital was developed with telephone-only consults. A total of 207 patients were included in the audit. Inclusion criteria was adapted from RANZCO guidelines for both new and review patients. Key outcomes included productivity of the consult, patient satisfaction, minimising the need for face-to-face consults, and if patients experienced adverse events. The first three outcomes were assessed at the time of the consult, and patients were followed up to assess if they had experienced an adverse event following the telehealth consult. Data was analysed qualitatively and quantitatively using descriptive statistics in Microsoft Excel.

Results: The majority of consults were rated as productive, saved the need for face-to-face consults, had high levels of patient satisfaction, with no adverse events recorded.

Conclusion: Telehealth provides a safe adjunct to face-to-face consultations to help provide continuity of care to vulnerable and elective patients in the context of a COVID-19 outbreak.

Vitrectomy for management of endogenous fungal endophthalmitis after cardiac transplant

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Disseminated invasive aspergillosis post solid organ transplant resulting in endophthalmitis is an uncommon complex clinical challenge requiring a multidisciplinary management strategy. We report the case of a 74-year-old pseudophakic female three weeks post cardiac transplant with *Aspergillus lentulus* endogenous endophthalmitis with a solitary subretinal lesion despite prior therapeutic itraconazole for invasive pulmonary aspergillosis. The patient achieved a favourable visual outcome with bi-weekly intravitreal voriconazole

injections, intravenous voriconazole and anidulafungin infusions accompanied by a deferred pars plana vitrectomy for biopsy and removal of the fungal lesion. The decision to defer vitrectomy was made to reduce the risk of vitreous seeding until the lesion demonstrated progression despite accompanied antifungal treatment. To our knowledge this is the first documented case of *A. lentulus* endophthalmitis.

Diagnostic errors in ophthalmic presentations to emergency departments in Melbourne

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Purpose: To determine the nature and rates of diagnostic errors amongst ophthalmic presentations to emergency departments (ED) in Melbourne.

Methods: Multi-site, retrospective audit of 100 consecutive ophthalmic presentations at each of five general EDs and one specialty eye ED in Melbourne from the week commencing 6 May 2019.

Results: Six hundred presentations were analysed. The most common presenting symptoms were pain (42%) and/or red eyes (28%) and decreased vision (20%). The most common diagnoses were corneal abrasion (12.6%), corneal or sub tarsal foreign body (12%) and conjunctivitis (11.7%). There were 35 (5.8%) neuro-ophthalmic, 29 (4.8%) corneal and 29 (4.8%) vitreo-retinal presentations, and 26 (4.3%) chemical injuries.

Excluding patients seen in the specialty ED, 132 patients (26%) had an ophthalmology review (including phone advice) at the time of initial presentation. A further 50 patients (10%) were referred for outpatient review.

There were two presentations where an incorrect diagnosis was made. The first was at a general ED where conjunctivitis was diagnosed. HSV keratitis was observed at subsequent follow-up. The second presented to the specialty ED with a possible missed diagnosis, when a posterior vitreous detachment was diagnosed. A review one week later revealed a retinal detachment.

Forty-one (6.8%) patients had an unplanned re-presentation. No patient had a change in the diagnosis at the second presentation.

Conclusion: Based on this audit, patients present to EDs with ophthalmic conditions with a low risk of a



misdiagnosis. For more serious presentations, hospitals are well supported by ophthalmology units in ensuring patients are diagnosed appropriately.

Where do ophthalmologists practice and how long do they work there? An analysis using modified Monash model rurality classifications

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Purpose: To investigate ophthalmologist workforce distribution and location stability in Australia.

Methods: Longitudinal analysis of AHPRA Primary Place of Practice and cross-sectional investigation of RANZCO sub-speciality data. Modified Monash Model (MMM) category was mapped to postcode of primary work location over a six-year period (2014 to 2019).

Results: The AHPRA data included 948 ophthalmologists. In 2019 75.9% worked in MMM1, 8.0% in MMM2, 5.5% in MMM3 and 0.5% in MMM4. 83% of ophthalmologists remained in the same MMM category continuously from 2014 to 2019. During the six-year study period, 84% of ophthalmologists remained working in MMM1, 83% in MMM2 and 76% in MMM3. Despite the small numbers, all of the ophthalmologists working in MMM4 stayed at least two years and 83% stayed three years. Sub-speciality workforce distribution could not be determined due to incomplete data (optional self-report).

Conclusion: Ophthalmologists are concentrated in metropolitan areas and have a high level of location stability. Investment in policy initiatives is needed to recruit and retain ophthalmologists in regional, rural and remote areas. Robust sub-specialist workforce data is needed at college level to accurately map sub-specialists' location.

Predicting performance with the virtual reality EyeSi surgical simulator: Assessing dominant and non-dominant hand dexterity

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Purpose: Utmost precision is required in ophthalmic surgery, which includes bimanual tasks. Predictors of dominant-hand (DH) and non-dominant hand (NDH) dexterity are assessed.

Methods: Members of the general public and ophthalmology non-vocational and vocational Resident Medical Officers completed a baseline ophthalmic examination and an introductory program on the Eyesi Surgical simulator (warm-up, practice on validated tasks twice with DH then NDH, then testing on the same validated tasks, once with each hand). Results reported as median[inter-quartile range].

Results: Preliminary data from 21 participants had good visual acuity (6/7.5 OU). When compared to other occupations, participants with laboratory or medical backgrounds (n = 14) had higher total scores (sum all 3 tasks, both DH (264 [51] vs. 163 [84], p < 0.001) and NDH (242 [60.5] vs. 149 [80], p = 0.002)). Resident Medical Officers with surgical experience (n = 7) had higher total scores for DH (266 [29] vs. 207 [120], p = 0.038) and NDH (250 [35] vs. 201 [120], p = 0.006). History of playing a musical instrument (n = 14, 246 [60]), video games (n = 6, 187 [183]) or sports (n = 17, 230 [82]) had no effect on DH individual or total task scores (p > 0.08). Participants had higher NDH total scores if they participated in art (246 [25] vs 199 [133], p = 0.016) or did not play video games (242 [68] vs 146 [99], p = 0.005).

Conclusion: Surgical experience and occupations with laboratory or medical backgrounds are correlated with higher scores with both DH and NDH on virtual reality surgical simulators. NDH dexterity can be predicted by previous participation in art and no history of playing video games.

Re-imagining ophthalmic teaching for medical student undergraduates

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Purpose: The decline of ophthalmic education in medical schools is reflected in the low confidence of junior doctors and general practitioners in basic ophthalmic knowledge and skills. We aimed to investigate the most effective teaching methodologies for undergraduate ophthalmic education by engaging student and post-graduate stakeholders on their views of current ophthalmic teaching at UNSW.

Method: A mixed methods approach was taken to sample final-phase UNSW medical students and PGY1-3 UNSW graduates. An online quantitative survey was emailed out, and participants could opt-in for a semi-structured interview. Interviews were guided by concepts from adult learning theory and analysed thematically.

Results: Interim data ($n = 30$) from our quantitative survey found students reported receiving “very little” (79.3%) ophthalmic teaching time, and its effectiveness was considered “poor” by over half (55.2%). Teaching methods deemed most effective were clinically based learning, hospital-based tutorials/workshops, spiralled learning, and problem-based learning. However, didactic lectures were the most common teaching method, rated “average” (69.0%) in effectiveness. Four themes emerged from early interview data ($n = 5$); learning objectives should be clearly outlined; online modules are helpful for developing ophthalmic knowledge; experience practicing skills is essential; and assessment must be proportional to teaching.

Conclusion: Criticisms from the survey identifying shortcomings in medical school ophthalmic education were in keeping with previous literature. Insights for how ophthalmology teaching could be improved include providing clear course outlines, creating online resources for basic knowledge, and integrating class time with clinical skills and experience. Our findings can inform curriculum reform for ophthalmic education at medical school.

A novel head stabilisation technique: Simplicity, safety and security during slit lamp procedures

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Purpose: To describe a novel head stabilisation technique (HST) utilised for minor slit lamp procedures. Head stabilisation is essential in directing safe ophthalmological management for a host of slit lamp procedures, preventing iatrogenic ocular trauma, and relieving patient anxieties. It is particularly applicable when trained assistants such as Orthoptists are unavailable in the clinic, but head stabilisation is needed.

Method: Description of technique.

Results: Patients may be difficult to stabilise on the slit lamp due to anxiety, blepharospasm, photophobia, or an exaggerated photic sneeze reflex. Procedural indications for HST include lash epilation with forceps, corneal debridement, or removal of foreign bodies or sutures.

The patient's family member or companion stands to the side of the patient. The hand ipsilateral to that side is placed on the patient's occiput, applying firm pressure forwards and downwards. The other hand is placed over the patient's vertex, forehead and forehead rest. This aims to prevent posterior forehead movement, detect vagal responses such as sweating, and ensure there is complete intraprocedural contact between the patient's head, and chin and forehead rests.

Preliminary survey data will be reported at the presentation. Outcome measures include the degree of participant satisfaction, security and comfort, as measured using five-point Likert scales.

Conclusion: Particularly in resource-limited settings when a trained assistant is unavailable, the HST offers the opportunity to capitalise on the assistance of a patient's companion through its simple, easy-to-teach, and safe technique. The HST should benefit Ophthalmologists, emergency department physicians and general practitioners alike.

Influencing future regional, rural and remote ophthalmology services: A qualitative report on the impact of the specialist training program

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Purpose: The Specialist Training Program (STP) is a Commonwealth Government Department of Health initiative that aims to support and extend the vocational training provided to trainees by specialist medical colleges in the private sector and non-metropolitan areas. Exposing trainees to private and non-metropolitan settings is expected to help influence future workforce distribution towards areas of need. The purpose of this study was to explore the career aspirations of ophthalmology trainees after completion of a STP rotation and investigate workforce renewal at non-metropolitan STP posts.



Methods: Semi-structured interviews with ophthalmology trainees ($n = 8$) who had completed a STP rotation and supervisors ($n = 9$) of STP supported posts across Australia.

Results: Most trainees reported a change in career aspirations after completing a STP rotation. Trainees previously interested in future subspecialty training expressed a desire to be comprehensive ophthalmologists. For others who sought subspecialty training, their choice of subspecialty was influenced by their experience in their training post. Most trainees wanted to contribute to rural service provision post-qualification after seeing first-hand the inequity in access to ophthalmic care in non-metropolitan settings. Supervisors at non-metropolitan STP posts reported instances of workforce renewal where previously rotated trainees had returned once fully qualified to practise in either a locum or ongoing capacity.

Conclusion: STP rotations can help ruralise ophthalmology trainees' horizons and positively influence their future career aspirations towards clinical and geographical areas of workforce need. Continued investment is needed to expand STP supported training posts in areas of workforce shortage to support future ophthalmology workforce development.

Effectiveness of novel approaches to ophthalmology education in medical schools: A systematic review and meta-analysis

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Purpose: To investigate and analyse novel techniques of ophthalmology teaching. Effectiveness in teaching was defined as comparative improvement in clinical skills or knowledge, and student acceptance.

Method: Systematic review of databases EMBASE and Medline were performed up to July 2021, for prospective or retrospective articles with data on novel educational techniques, and outcomes including medical student ophthalmology test scores and acceptance. Studies were grouped according to intervention and mean effect sizes were calculated to assess significance alongside Cochran's Q statistic to assess heterogeneity. Studies prior to 2011 were excluded.

Results: Database searching yielded a total of 2033 articles, of which 21 were eligible for review and meta-

analysis. Novel educational techniques described included e-learning, flipped classroom and team-based learning, ophthalmology intensive courses, artificial intelligence, augmented reality, peer teaching, virtual reality and novel technologies for teaching ophthalmic examinations. All modalities that reported student acceptance demonstrated high levels of student reported usefulness, accessibility, and recommendations for future use. Of these modalities, peer teaching was associated with the highest levels of enjoyment and accessibility. All modalities that reported test scores demonstrated improvements, of which flipped classroom teaching was the most effective, followed closely by ophthalmology intensive courses.

Conclusion: Flipped classroom, peer teaching and ophthalmology intensive courses have all demonstrated unequivocal superiority to traditional teaching methods in the domains of both test scores and student satisfaction. Given the declining levels of intern and junior doctor ophthalmic confidence, there must be further commitment towards implementing novel teaching techniques in ophthalmology.

"Seeing the difference": Comparing tertiary ophthalmology education in regional and metropolitan Australia

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Purpose: The importance and prevalence of ophthalmology teaching has been minimised in medical curricula worldwide. This paper serves to evaluate the perceptions of junior medical officers and final-phase medical students on ophthalmology teaching in rural locations. It will also serve to examine their self-confidence in key International Council of Ophthalmology-defined knowledge and skill areas, and offer comparisons to a control metropolitan cohort.

Methods: A cross-sectional survey of participants at consenting universities and hospitals in rural Australia was conducted. The questionnaire was modelled on and complements previously published research concerning a metropolitan cohort (Zhang, 2018). Factor analysis was performed on confidence scores.

Results: Eighty-seven final-phase students were included in Phase One data collection. Phase Two will significantly increase the study population size. Lectures were the

most-common teaching modality offered (56.4%), while small-group clinical tutorials were most preferred (50%) and mean teaching time was 11.37 hours. Mean confidence in ophthalmology-specific skills and knowledge for rural students was low (rural knowledge: 2.39/5, 95% confidence interval [CI] = 2.16 – 2.59; rural skills: 2.73/5, 95% CI = 2.25 – 2.95). Preliminary results indicate deficits in knowledge exist between studied rural and metropolitan cohorts (metropolitan knowledge: 2.88/5, 95% CI = 2.80–2.96; metropolitan skills: 2.66/5, 95% CI = 2.55–2.76). Given the opportunity, participants voiced frustration with online learning and existing deficiencies in ophthalmology teaching.

Conclusion: Rurally-based junior medical officers and final-phase students experience unique pedagogical challenges. Initial results suggest that, alarmingly, rural cohorts are offered less specialist teaching, and possess lower confidence in ophthalmic knowledge than their metropolitan-based counterparts.

Fundus Education

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Purpose: Fundoscopy can appropriately and beneficially change the course of patient management in the emergency department (ED). Non-mydriatic fundus photography has been shown to change patient management, and is more diagnostically accurate than traditional ophthalmoscopy in numerous studies. Interpreting fundus findings remains a significant challenge. This project aims to improve the interpretation of fundus pathology relevant in ED by non-ophthalmologists, through the use of an interactive e-learning tool.

Method: Prospective, randomised educational trial. Recruited emergency doctors and 4th to 6th year medical students will attend a funduscopy interpretation lecture,

then undergo randomisation to receive either an interactive e-learning tool or an electronic PDF on the subject. The e-learning tool will comprise a funduscopy curriculum determined by a collaborative ED, ophthalmology and optometry steering committee. Participants will complete a case-series assessment using consensus diagnosis cases scored by ophthalmologists at baseline and again at two and six weeks after the intervention. The primary outcome will be diagnostic accuracy in determining a normal or abnormal fundus image.

Results: The consensus steering committee has developed a curriculum for fundus education comprising anatomy, common pathology and the relevance of fundus findings in headache, vision loss, neurological presentations and hypertension. Further results will be available upon completion of the study later this year.

Conclusion: Fundus photography findings can optimise the management of appropriate ED patients. E-learning could supplement effective implementation of fundus photography by improving diagnostic accuracy of ED physicians.

Refocusing on eyes in Australian medical schools: A novel online interactive training tool for Australian medical students and junior doctors

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Purpose: To determine whether freely-available novel online interactive modules can improve medical student and junior doctor knowledge and confidence in ophthalmology, and supplement teaching to maximise effectiveness of clinical placements.

Method: Development of interactive modules with gamification of learning to enhance engagement. Module content was designed with a competency-based program based on the International Council of Ophthalmology's curriculum for medical students. Module effectiveness on improving knowledge and confidence will be assessed through pre- and post-module multiple choice questions, and Likert-scale questionnaires of students' self-rated confidence in their answers and clinical skills. Post-module Likert-scale testing and general feedback will assess usefulness, adequacy and enjoyability.



Result: Three modules are in development, with two currently available for use, with access details shared during this presentation. 'Foundations' teaches basic eye anatomy, ocular history-taking, and systematic examination. 'Red Eyes and Red Flags' teaches acute eye presentations, and must-know sight- and life-threatening ocular signs. The third module 'The Common and the Chronic' is currently in development, and will be available in 2022.

These modules are designed to be useful resources to teach basic knowledge and skills for medical students and junior doctors prior to ophthalmology clinical placements and rotations. Recruitment is ongoing, to determine effectiveness in improving knowledge, confidence, and clinical competence in ophthalmology. They are freely available online to all clinical schools.

Conclusion: This is an ongoing trial with active recruitment of medical students and junior doctors, investigating the effectiveness of novel interactive online modules in teaching basic ophthalmology knowledge and skills.

Eye injuries related to bird attacks: A three year snapshot

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Purpose: To examine the incidence of bird related eye injuries over the last three years in a tertiary teaching hospital in South-East Queensland.

Method: Emergency department presentations to the Sunshine Coast University Hospital coded as "bird attack" or "bird swoop" were analysed. Presentations that did not wait for assessment or did not have bird-related eye injury were excluded from analysis. Retrospective chart reviews were performed to determine demographic data, details of eye injury, ophthalmology review/involvement and subsequent management.

Results: There were 43 presentations of bird related eye injuries during the above period. The median age of patients was 54 years of age, (64.3% male: 35.7% female). Fourteen patients were reviewed by ophthalmology (32.6%), and two required surgical intervention (4.7%). One case (2.3%) received intravitreal injection of vancomycin and ceftazidime.

Conclusion: Numerous patients present to the emergency department with an eye injury resulting from a bird attack, with the majority managed conservatively. A third of the patients from our cohort required ophthalmology review with a small subgroup proceeding to

operative management. Visitors and residents of this region should be aware of the possibility of serious harm from bird attacks, and protective eyeglasses near bird habitats is recommended.

Systematic review of current tele-ophthalmology services in New Zealand compared to the four comparable countries of the United Kingdom, Australia, United States of America and Canada

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Background: Over 700,000 New Zealanders (NZ), particularly elderly and Māori, live without timely access to specialist ophthalmology services. Teleophthalmology is a widely recognised tool assisting in overcoming resource and distance barriers. The aim was to conduct a systematic review identifying, describing and contrasting tele-ophthalmology services in NZ with the comparable countries of Australia, USA, Canada and the United Kingdom, also assessing any changes to programs pre- and post-COVID-19 pandemic.

Method: The electronic databases Embase, Pubmed, Web of Science, Google Scholar and Google were systematically searched in August 2020, filtered to the countries above, then again in June 2021 to gather COVID-19 pandemic teleophthalmology literature.

Results: A total of 128 studies were identified describing 108 discrete teleophthalmology services. Articles spanned from 1997-2021. Models were categorised into general eye care (n = 16; 14.8%) emergency/trauma (n = 6; 5.5%) school screening (n = 13; 12%), artificial intelligence (n = 19; 17.5%) and disease specific models of care (n = 54; 50%). The most common diseases addressed were diabetic retinopathy (n = 22; 20.3%), retinopathy of prematurity (n = 12; 11%) and glaucoma (n = 9; 8.3%). Typically models involved local clinicians transmitting images or video, usually feed-forward. The second search yielded 14 COVID-19-based teleophthalmology services, involving significantly increased home monitoring, telephone/video live-consults.

Conclusion: Teleophthalmology will play a crucial role in the future of eye care. COVID-19 offers a unique opportunity for improvement and expansion of teleophthalmology. Feed-forward and increasingly, live-based teleophthalmology services have demonstrated feasibility and cost-effectiveness in similar countries internationally.

New Zealand's should invest in strategic partnerships and technology nationally to improve eye health equity.

Effect of time to primary repair on final visual outcome after general eye trauma

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Purpose: To evaluate whether the time to theatre (TTT) >6 hours in general eye admissions had a poorer visual outcome than the TTT <6 hours. The study also identifies potential barriers to achieve an earlier TTT.

Method: A retrospective audit of 184 confirmed or suspected open globe injuries seen at the Emergency Department and admitted under General Eye Unit at the Royal Victorian Eye and Ear Hospital, Melbourne and received a primary repair between the period of 1st June 2015 to 30th December 2020.

Results: The average final visual acuity (VA) at discharge for the group of TTT <6 hours was 1.13 LogMAR and 1.01 LogMAR for the TTT >6 hours. The TTT >6 hours was further divided into two subgroups based on whether they met our local clinical practice guideline for safe holdover. The holdover that occurred unintentionally had the average final VA of 1.14 LogMAR, whereas the holdover that occurred intentionally had the average final VA of 0.91 LogMAR. The unintentional holdover group also had a higher complication rate of 20.83% (vs 6.67%) and an average length of hospital stay (LOS) of 2.88 days (vs 1.87 days).

Conclusion: Patients that had TTT >6 hours and were unintentionally heldover demonstrated a trend to poorer visual outcome ($p = 0.20$), higher complication rate ($p = 0.075$) and a longer LOS ($p < 0.05$). Patients who were unexpected arrivals, from rural and regional locations and those with a higher nurse triage score showed a trend to have a TTT longer than 6 hours.

A review of human research ethics guidelines in ophthalmology journals

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Background: Human research ethics guidelines have become more comprehensive which has led to misconceptions. Hence, there are significant variations in human research ethics requirements amongst journals.

Purpose: To evaluate human research ethics guidelines in ophthalmology journals.

Method: A list of ophthalmological journals was obtained from Scimago Journal and Country Rank then cross-referenced with PubMed for indexing. Human research ethics committee (HREC) requirements and relevant data were extracted from each online journal and collated. These were categorised: 1) Journals that required HREC approval for all submissions; 2) Journals that required HREC approval or statement by the author that HREC was consulted and approval waived; 3) Journals that provided guidelines for authors regarding submissions that required HREC approval and those that did not; 4) Journals that mentioned human research ethics but did not provide adequate detail; and 5) Journals that did not mention human research ethics requirements.

Results: One hundred and fourteen ophthalmology journals were evaluated. The majority of journals required HREC approval for all submissions or consultation with HREC for approval (36.8% vs 31.6%). Seventeen journals did not mention requirements relating to human research ethics.

Conclusion: Reviews that summarise articles in the public domain do not require HREC approval. Case reports or series need patient consent but not HREC approval. All prospective studies require HREC approval. Retrospective audits do not change the outcome of treatment hence should not require HREC approval unless there is direct communication with a patient or if patient privacy is compromised.

Eyes on FHIR: Using the Fast Healthcare Interoperability Resource, a collaboration of ophthalmologists vendors and technologists has demonstrated a technically robust, clinically validated implementation of real-time, bidirectional data exchange between diagnostic imaging devices and diverse electronic medical record systems

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Background: Healthcare Level Seven's® (HL7's®) Fast Healthcare Interoperability Resource (FHIR®) is a next-generation standard for healthcare interoperability – where digital systems communicate in a common language via modern API-driven messaging protocols. FHIR's specification transmits contextual clinical content via configurable, modular 'resources'. These function synergistically with DICOM® standards, optimised for imaging-based workflows. Hence, FHIR can unlock and share siloed clinical data to catalyse biomedical research, improve healthcare quality and outcomes.

However, intrinsically, it has limited applicability to ophthalmology due to a lack of universal implementation guidance. Therefore, we developed international standards to define a comprehensive FHIR-based ophthalmic clinical lexicon.

Methods: Diverse stakeholders were engaged to collaboratively establish "FHIR For Ophthalmology". Fifteen ophthalmic interoperability scenarios were identified as semi-structured "use cases," which informed our technical assembly of a live, web-accessible implementation guide (IG). This process was formally coordinated within HL7 – the global healthcare communication standards organisation. We subsequently assessed this IG's capability to facilitate interoperable communication between diagnostic devices and electronic medical records.

Results: The project obtained requisite HL7 project support unanimously. The National Eye Institute formally endorsed the initiative. Vendors (e.g. Heidelberg Engineering® and Zeiss®) co-developed the IG, which contains specialty-specific considerations for FHIR extensions, and modifications. Collaborating implementers actively participated in a May 2021 FHIR connectathon, where the IG was technically and clinically validated, successfully demonstrating unprecedented, bidirectional exchange of clinical and imaging data.

Conclusion: This translational innovation showcases hard evidence of FHIR's capacity to facilitate a virtuous cycle of data-driven insights and clinical care enhancement in ophthalmology.

Higher education in ophthalmology: An overview for the aspiring eye surgeon

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Purpose: Today's ophthalmology trainees develop proficiencies in seven key roles that are assessed by RANZCO in the VTP selection process. Proficiencies in these roles are

achieved by engaging in a variety of endeavours, including higher degrees, to bridge areas and skills identified for further development. The value of lifelong continual education is reflected in the VTP selection process, whereby higher education qualifications are assigned points. A post-graduate qualification with an ophthalmology focus, remains highly relevant to the aspiring eye surgeon. Several courses with various components are available for enrolment.

Method: An online-based search was performed to identify higher degrees in ophthalmology. Higher degrees were included if they included ophthalmology units, and were available to Australian pre-VTP trainees for enrolment. Non-ophthalmological higher degrees, or those courses unavailable for enrolment by Australian candidates, were excluded.

Results: Seven higher education courses in ophthalmology available to Australian citizens, were identified. Five courses were delivered by Australian universities; two were international courses available to Australian candidates. All courses were available for part-time, and online study with a component of face-to-face intensive classes. All higher education courses included a research component. One degree was available for completion by research only.

Conclusion: Ophthalmology-focussed higher education degrees are valuable to the aspiring eye surgeon. They develop candidates' knowledge and experience in pre-clinical and clinical ophthalmic sciences. These higher education degrees also aim to foster skills in other areas such as research, communication, and professionalism – all roles contributing to developing competent, autonomous, and safe specialist ophthalmologists.

PAEDIATRIC OPHTHALMOLOGY

Comparison of unilateral versus bilateral lateral rectus recession for small-angle intermittent exotropia – outcomes and surgical dose-response

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Purpose: Unilateral lateral rectus recession (ULRR) is a valuable option in the management of small-angle intermittent exotropia (IXT). However, there are few studies comparing the surgical outcomes of ULRR to bilateral lateral rectus recessions (BLRR).

Methods: Retrospective cohort study of paediatric patients with an IXT of 16 to 20 prism diopters (PD) who underwent ULRR or BLRR at a single tertiary care paediatric hospital. The primary outcome was surgical success at 12 months after surgery. Secondary outcomes included a survival analysis of time to surgical failure and surgical dose response, as well as improvements in central fusion and stereopsis.

Results: At 12 months, successful outcomes were achieved in 13 of 27 (46%) of the BLRR group and 19 of 28 (70%) of the ULRR group, which was not a statistically significant difference ($p = 0.10$). Survival analysis showed a trend towards a higher rate of failure in the BLRR group compared to the ULRR group ($p = 0.04$). Mean surgical dose response was 1.7 PD/mm at 1 week and 1.0 PD/mm at 12 months for the BLRR group, and 2.0 PD/mm at one week and 1.4 PD/mm at 12 months for the ULRR group. There were no cases of long-term post-op lateral incomitance in either group.

Conclusion: Unilateral and bilateral lateral rectus recessions have similar success rates for small-angle intermittent exotropia after at least 12 months of follow-up. Randomised control trials in surgical management of IXT should consider ULRR as a treatment arm.

Recommendations for the evaluation of paediatric anisocoria: Utility of topical cocaine testing

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Purpose: To propose recommendations for the evaluation of children with asymptomatic unilateral miosis, based on an evaluation of the outcomes of topical cocaine testing at the Queensland Children's Hospital, Australia, over the past four years.

Methods: A retrospective review of children under the age of 16 tested using 5% topical cocaine. Data on demographic information, clinical findings, test outcomes, neuroimaging results, and the final diagnoses were collected.

Results: Eighty-seven patients (median age six months, interquartile range = 13.25) were included. 69 (79.3%) patients presented with anisocoria only and 18 patients (20.7%) presented with anisocoria alongside ptosis and/or iris heterochromia (anisocoria plus). There were no cases of malignancy detected. Overall 13 (14.9%) children tested positive, 11 had idiopathic Horner syndrome, one had recent neck surgery and

one had a traumatic birth. Children with anisocoria plus were more likely to have a positive cocaine test compared to anisocoria only (38.9% vs 8.7%, $p < 0.01$). 70 patients with a negative test had physiological anisocoria. 4 patients with an equivocal test were subsequently confirmed to have physiological anisocoria.

Conclusions: In children, referrals for asymptomatic unilateral miosis are mostly physiological anisocoria. Isolated anisocoria does not require any further investigation. The cocaine test should be used as first line investigation for children with anisocoria plus other features of Horner syndrome. Children with a positive test should undergo neuroimaging and those with a negative test should have educational information on warning signs and clinical follow-up.

Relationship between brain structure and function in children with cerebral visual impairment and cerebral palsy

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Purpose: To examine the relationship between brain structure and function in children with cerebral visual impairment (CVI) and cerebral palsy (CP).

Method: A cross-sectional study, children, aged three months - ≤ 14 years with or at high risk of CP or neurodevelopmental delay and a clinical magnetic resonance imaging already performed were recruited. All children enrolled underwent a complete ophthalmic examination including visual acuity, refraction, and dilated fundus examination. Visuo-perceptual assessment included visual attention, clutter, and recognition. The location, extent and presumed timing of the brain lesions were assessed using a semi-quantitative Fiori magnetic resonance imaging scale and qualitative Krageloh Mann Classifications.

Results: Seventy-one children, M:F = 1.6:1, age range 8 months-13.4 years, bilateral CP, $n = 49$ (66%) the most



common motor distribution. Classification of CVI (suspected and definite) was significantly associated with Gross Motor Function Classification Scale ($p = 0.001$) and mixed pattern of CVI seen in 18% cases. Periventricular leucomalacia seen most in dorsal stream dysfunction. Among unilateral CP, five participants had bilateral brain lesions.

Conclusion: In our cohort, all children with CP showed evidence of CVI which varied in its clinical presentation. Only 85 percent demonstrated a brain lesion accounting for both the motor and visual impairment. This study highlights the importance of understanding the relationship of brain lesions, its severity, extent, location, presumed timing of injury on vision and visual behaviour. Determining these relationships enables recognition of visuo-perceptual dysfunction to inform rehabilitation strategies.

Visual acuity outcomes and complications for aphakic children managed with rigid gas permeable contact lens wear at Queensland Children's Hospital 2014 - 2021

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Purpose: To assess the visual acuity outcomes and complication rates of aphakic children who are managed with rigid gas permeable contact lenses following lensectomy.

Method: A single centre retrospective chart review of all children undergoing lensectomy from 1 January 2014 to 1 January 2021. Cases were identified from theatre coding and electronic medical records.

Results: One hundred and fifteen aphakic eyes were included, 79 were bilateral while 36 were unilateral. The average age at time of surgery was 26.8 months (range 4 weeks – 9 years). The average LogMAR pre-operative visual acuity, where recordable, was 0.67 ($n = 24$, interquartile range [IQR] 0.4-0.9) while the average post-operative acuity was 0.47 ($n = 74$, IQR 0.2-0.6). For bilateral cases the average post-operative acuity was 0.41 ($n = 57$, IQR 0.2-0.6) while unilateral cases had a visual acuity of 0.67 post-operatively ($n = 17$, IQR 0.4-1.2). The visual acuity was significantly better in the bilateral group compared to the unilateral group ($p = 0.016$). For children under six months undergoing lensectomy ($n = 61$), 25 unilateral and 36 bilateral. The average postoperative visual acuity was 0.55 ($n = 29$, IQR 0.3-0.7), 0.81 for unilateral ($n = 9$, IQR 0.5-1.2) and 0.45 ($n = 19$, IQR 0.25-0.6) for

bilateral. The visual acuity for bilateral cases was again significantly better than unilateral cases ($p = 0.026$).

Microbial keratitis occurred in 3.4% of patients ($n = 4$). Five children (4.3%) required secondary intraocular insertion due to contact lens intolerance.

Conclusion: Visual acuity is better for aphakic children who have bilateral cataracts when managed with RGPs. The rate of microbial keratitis and secondary intraocular lens insertion is low.

A study of referral pattern to paediatric ophthalmology department in a tertiary eye-care centre in Southern India (The REPO Study)

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Purpose: The study aimed to determine the current pattern of referrals to Paediatric Ophthalmology Outpatient Department in a tertiary eye care hospital and identify the discrepancy of referral, if any, which would help modify and enhance the practice guidelines.

Methods: The study was conducted by retrospectively collecting data from all referral letters which were already uploaded in the Electronic Medical Report against all patients from June 2019-December 2019. All paediatric patients in the age group 0-16 years were included in the study. The practicing field of referring clinicians was noted along with the maximum information collected from the referral letter and was thus assessed for quality, accuracy, and timely referral.

Results: Out of 77 referrals received in the study period, six letters neither had any mention of the designation of the referring clinician nor any specific diagnosis or details. So only 71 patients were included for further study. The referring clinicians were mainly ophthalmologists (Oph), paediatrician, general practitioners and others (cardiologists, neurologists). Maximum patients were referred by ophthalmologists (76%) but visual acuity was noted only for 30% of these patients. Almost half of the referral diagnosis was accurate. Paediatrician referrals were found to be more detailed and précised.

Conclusion: There is a need for the standardised hospital-specific format of referrals being received and also need of basic training to primary care providers on some simple tests (light reflex tests) for identifying the red flags in paediatric eye examination and thus enhancing the quality and timely referral per se.

PREPP-I Study (Primary Eye Care in Paediatrics Population – I Study): Demographic and clinical profile of paediatric patients treated in six major vision centres of a tertiary eye care facility in Southern India

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Aim: The study intends to evaluate the demographic & clinical profile of Paediatric patients (0-18 years) attending six vision centres (VC) of a tertiary-eye-care facility in Southern-India.

Materials and Methods: It's a cross-sectional study at six major peripheral VC of tertiary eye hospital in South-India from June to December 2020. All children presenting at VCs under base hospital in Pondicherry, were included. Data were entered by the ophthalmic assistants in VC and cross-checked by the principal investigator at the BH.

Results: Total of 250 paediatric patients (Mean age 8.2 ± 4.5 years, range 0-18 years) with predominantly males (60.8%) reported in VCs during the study-period. Half of them were staying within 5 km from VCs. 53.6% of patients were in their primary school while 28% had no schooling started. Visual acuity (VA) could be assessed only for school-going and older ones, due to the lack of age-matched VA assessment tools. Most children (91.3%) had uncorrected VA better or equal to 6/18 in the better eye, and approx. 3% had VA worse than 6/60. All patients had a best-corrected VA of 6/6-6/18 after cycloplegic refraction. Most children reported to VC for allergic conjunctivitis (25%) followed by routine check-ups (13%) and refractive error (10.4%). Urgent referral to BH was given for 47 children.

Conclusion: PREPP-I showed that most children can be treated at VCs and only one-fifth requires active intervention at higher referral centres. Further study on satisfaction of services provided for paediatric patients in these VCs and barrier of not reporting to BH when referred is considered for PREPP-II study.

PREPP-II study (Primary eye care in paediatrics population – II study): Study of satisfaction of vision centres (VC) services and barriers for not reporting to base hospital on referral among paediatric patients treated in six major VCs of a tertiary eye care facility in Southern India

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Aim: Study is continuation of PREPP-1 aimed to assess parents' satisfaction with paediatric-eye-care services across six vision centres of a tertiary eye hospital in Southern-India & to evaluate reasons for not attending base hospital on referral.

Methods: Standard-Validated-Satisfaction-Questionnaire was used to assess patient satisfaction. Responses were assessed on 5-point Likert - scale: 0 (very dissatisfied) to 4 (very satisfied) against each response. Responses were expressed as percentages with 0 (very dissatisfied) and 100% (very satisfied). Patients were referred with a form mentioning reasons of referral (urgent/non-urgent). All referrals were evaluated by principal investigator. In case of failure to reporting, parents were enquired about the barrier based on the validated-barrier-questionnaire over telephonic conversation.

Results: All 250 patients of PREPP-1 study were included in the Satisfaction study. Different domains were evaluated using Validated-Satisfaction-Questionnaire (accessibility of VC, waiting-hours, financial aspects, spectacle dispensing service and teleophthalmology). Overall satisfaction was 75%. Most common reason for dissatisfaction was lack of meeting the ophthalmologist in person followed by waiting time. 38 patients wanted to visit BH to consult paediatric ophthalmologist in person (57%). Fourteen out of 47 referrals didn't report, & were evaluated using validated-barrier-questionnaire (knowledge, physical, time & financial barriers). Majority had financial barrier (43%) followed by knowledge (28.6%) and time barrier (14%).

Conclusion: PREPP-II demonstrated that 3/4th of paediatric patients are happy to be treated at VCs with teleophthalmology services. But significant percentage (25%) wants to consult specialists at BH. One-fourth of total referrals didn't report to BH due to financial constraints & lack of awareness of child's condition.

A case series of unilateral treatment failure in bilateral intravitreal bevacizumab injections for retinopathy of prematurity and its implications for neurodevelopment

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Purpose: We present three cases of unilateral delivery and treatment failure despite bilateral intravitreal bevacizumab (IVB) injections for management of retinopathy of



prematurity (ROP). Subsequent unilateral re-injection led to successful regression of ROP. Such cases have not previously been reported in the literature. We hypothesise that the unilateral lack of response was due to failure of medication delivery despite effective IVB in the other eye, proposing that serum levels of bevacizumab were not high enough to cross the blood-retinal barrier into the contralateral eye.

Methods: Retrospective observational case series conducted at Queensland Children's Hospital.

Results: Three premature infants of gestational age <25 weeks and birth weight <900 g received bilateral IVB for ROP. Within the following week the three infants had an adequate response in one eye, but treatment failure in the contralateral eye, requiring repeat IVB. There were no documented neurodevelopmental consequences following the second dose of IVB.

Conclusion: IVB has been increasingly used off-label to treat ROP. Its anti-vascular endothelial growth factor property directly targets the pathogenesis of ROP, limiting vascular proliferation of the retina. There are, however, concerns for systemic absorption of IVB with crossing of the blood-brain barrier and proposed neurodevelopmental sequelae. Our hypothesis, that serum levels of bevacizumab following IVB are not high enough to cross the blood-retinal barrier to affect the contralateral eye, is supported by our three reported cases. These cases contradict previously published case reports on apparent contralateral effect of unilateral IVB, and provides alternative evidence on an increasingly relevant topic that requires further research and discussion.

Ocular screening for candidaemia in a paediatric quaternary neonatal intensive care unit

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Purpose: To determine the rate of ocular manifestations of systemic candidaemia in newborn infants. The study is based at the Royal Children's Hospital neonatal intensive care ward. This is classed as a level 6B unit. It has 40 cots with an average annual admission number of 850 infants.

Method: Retrospective review from November 2016 to February 2021 of all ophthalmology referrals to screen for ocular candidiasis based on the presence, or suspected presence, of candida in blood, urine or endotracheal tubes.

Results: Over a five year period, there were 39 individual referrals for an ophthalmological examination due to the

presence of candida in blood (eight patients), urine (11 patients), cerebrospinal fluid (one patient), endotracheal tube (two patients) or clinical suspicion (17 patients). Some infants were re-referred at a later date with recurrent presence of candida. Some infants had their referral combined with their regular retinopathy of prematurity check. The median gestational age at birth of the infants was 28.85 weeks, the median birth weight was 1653.85 grams and the median chronological age at time of exam was 13 days. No ocular manifestations of systemic candida were identified in any infant.

Conclusion: Ophthalmological screening in neonates for manifestations of candidiasis based on the presence or suspicion of candida in blood, urine and/or endotracheal tubes may be an unnecessary procedure for these fragile infants to endure.

Optic disc morphology in juvenile myopia

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Purpose: To monitor myopic children to determine how disc morphology correlates with juvenile myopia progression.

Method: A prospective longitudinal study of myopic children presenting to clinical practice. Baseline assessment included vision, refraction, fundus examination, axial length (AL) and optical coherence tomography. Optical coherence tomography images were used to determine disc torsion, Bruch's membrane opening area (BMOA), disc ovality and optic disc tilt (ODT).

Result: Twenty-eight myopes, mean age 10.68 (6-15 years) completed baseline assessment: mean SE -3.44D OD (SD 2.22), -3.56D OS (SD 2.24). Mean AL, RNFL, C/D ratio, disc torsion, BMOA, ovality and ODT were calculated.

Both eyes displayed a high correlation between SE and AL (OD: $r = -0.67$, $p < 0.0001$, OS: $r = -0.55$, $p = 0.0035$), RNFL and SE (OD: $r = 0.52$, $p = 0.0052$, OS: $r = 0.60$, $p = 0.0016$), RNFL and AL (OD: $r = -0.38$, $p = 0.0526$, OS: $r = -0.40$, $p = 0.0501$), and C/D ratio and BMOA (OD: $r = 0.50$, $p = 0.0081$, OS: $r = 0.67$, $p = 0.0003$).

Additional correlations between ODT and AL ($r = -0.41$, $p = 0.0300$), ODT and torsion ($r = 0.41$, $p = 0.0311$), disc torsion and BMOA ($r = 0.45$, $p = 0.0151$) and C/D ratio and disc torsion ($r = 0.44$, $p = 0.0218$) were observed in the right eye.

Conclusion: Consistent with other studies, this study reports RNFL thinning was associated with increased AL and myopic SE but not age. Furthermore, maximum disc tilt was found to correlate with AL. Ongoing monitoring

of this cohort will provide insights into the morphological changes that occur in progressive childhood myopia.

Paediatric orbital cellulitis: A retrospective review over 16 years

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Purpose: Post septal cellulitis is a potentially sight threatening and life-threatening condition. In children, the importance of correct diagnosis and swift management is heightened. This retrospective analysis review's the presentation's seen in these cases, and the diagnostic and management processes undertaken.

Methods: A retrospective chart review of 207 patients diagnosed with orbital cellulitis who were admitted to a single quaternary children's hospital in Sydney Australia over a 16 year period was performed.

Results: Symptomatically, 86% of patients presented with a history of eye swelling, 12% had an associated headache as their most concerning symptoms. Seventy percent describe recent URTI symptoms, and 20% had a history of trauma. The average duration of symptoms prior to presentation was just over two days. The most commonly grown organisms were staph aureus, MRSA and strep Milleri. Most patients were prescribed cefotaxime and flucloxacillin, with clindamycin and lincomycin being used also. Of the patients with post septal cellulitis 63% had ethmoidal sinus involvement, and 53% had pansinusitis. Similarly, 54% of these patients progressed to surgical drainage, with an average wait time of 1.3 days between presentation and drainage. Ninety-one percent of these patients had a resolution of their condition with 8% having a complication or requiring re-drainage.

Conclusion: Various management techniques have evolved over the course of the analysis, however early surgical drainage of orbital abscesses based on clinical suspicion remains a cornerstone of treating this condition. Using these insights, it may guide the ongoing management of this condition and help provide clearer guidelines for clinicians.

Comparison of optic in the bag vs optic out of the bag in paediatric cataract surgery

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Purpose: To compare surgical outcome of posterior optic capture of intraocular lens (IOL) without anterior vitrectomy and endocapsular IOL implantation with anterior vitrectomy in children undergoing cataract surgery.

Methods: In this prospective randomised interventional study consecutive children with bilateral congenital/developmental cataract who were operated over a period of one year were included. One eye of all patients underwent IOL implantation with optic capture through a primary posterior continuous curvilinear capsulorhexis without vitrectomy while in the other eye of the same child IOL was implanted in the bag after a posterior continuous curvilinear capsulorhexis and anterior vitrectomy. Intra-operative challenges and postoperative complications till a follow up of two years were noted.

Results: Twenty six eyes of 13 children out of 16 patients were included for analysis. Thirteen eyes had posterior optic capture of IOL and 13 had bag implantation. At a mean follow up of 25.69 ± 1.06 months; all eyes in both groups maintained a clinically centred IOL with no significant visual axis obscuration. The rate of fibrinous complications (IOL deposits and synechiae) were more in the eyes with IOL in the bag (6/13) vs eyes where posterior optic capture was done (1/13); $p = 0.039$. Glaucoma was not observed in any eye. Intra-operative difficulties were comparable and insignificant in either technique.

Conclusion: Posterior optic capture is a safer alternative to conventional paediatric cataract surgery in terms of inflammatory sequelae and lens epithelial cell proliferation. However the two methods work equally well in preventing visual axis obscuration over a long follow-up.

Study of the refractive changes and ocular biometrics in preterm and term infants

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Purpose: Annually around 15 million neonates are born premature worldwide. Full term neonates have axial hyperopia at birth and preterm neonates are born with myopia, hyperopia or astigmatism. Most studies have focussed on refractive and ocular parameter changes after ocular stability and emmetropisation. This study compares refractive and ocular biometrics between preterm and term infants.

Method: A prospective cohort study was conducted in a tertiary care centre with 90 neonates, 45 preterm and 45 term, in two groups each. Growth and ocular parameters



were recorded at birth, three months, six months and one year of age. Data was analysed with chi-square test and p value of <0.05 was taken statistically significant.

Results: Ocular parameters of preterm infants and term infants showed a mean axial length of 15.84 ± 0.84 mm and 16.84 ± 0.43 mm respectively, at birth. Mean spherical equivalent at 1 year of age among preterm and term infants were -0.6D and +1.1D, respectively. Emmetropisation was attained in 15.6% of preterm and 28.9% of term infants at 1 year of age. Spherical equivalent showed positive correlation with gestational age ($r = 0.45$, $p < 0.001$) and birth weight ($r = 0.49$, $p < 0.001$) with different regression formulas.

Conclusion: Preterm infants progressed to myopia and term infants to hyperopia by one year of age. There is no significant difference in emmetropisation among preterm and term infants at one year of age. A routine screening for all preterm infants for refractive status will help in early detection of refractive errors and amblyopia.

Time for change in the assessment of children with a vision impairment

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Background: Children with a vision impairment are supported within the classroom environment based on clinical measures of visual acuity. However, these clinical measures may not fully represent a child's visual function within the classroom.

Purpose: To evaluate the relationship between clinical measures of distance visual acuity and various reading metrics, in children with a vision impairment.

Method: Seventy-one children (44 male: 27 female), median age 11.0 (range five to 18 years) were recruited from South Australia's state-wide support service for children with a vision impairment. Distance visual acuity was compared with reading metrics, including minimum print size (reading acuity) and Critical Print Size (smallest print size before reading speed reduced) using the MNREAD[®] application.

Results: There was a weak positive correlation for visual acuities 0.5 -1.5 LogMAR (6/19 - 6/190) with minimum print size ($r = 0.282$) and Critical Print Size ($r = 0.107$) which were not significant $p > 0.10$.

Conclusion: Standard distance visual acuity measurements correlate poorly with reading vision metrics in

children with a vision impairment. Therefore, more relevant tests are required to determine visual performance within the classroom for these students. Determination of functional visual ability within the classroom environment will facilitate enhanced support throughout their educational years, develop independent accessibility skills and improve health related quality of life at school.

Novel case of paediatric acute corneal hydrops in Kabuki syndrome

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Purpose: To describe a rare and previously unreported case of acute corneal hydrops in Kabuki Syndrome.

Methods: The authors present a clinical case report, followed by a literature review of reported ophthalmic manifestations of Kabuki Syndrome and a further discussion involving the association between corneal hydrops, intellectual disability and eye rubbing.

Results: Kabuki syndrome is a rare genetic condition with increasing evidence of a variety of multi-system manifestations. The aetiology of a proportion of acute corneal hydrops is eye rubbing and there is a high documented prevalence of eye rubbing in patients with intellectual disability. This correlation assists in recognising the potential for the ophthalmic manifestation of corneal hydrops in Kabuki syndrome as intellectual disability is one of the five cardinal features of this rare genetic disease.

Primary ocular features of Kabuki Syndrome outlined by National Organization for Rare Disorders include long palpebral fissures, thick sparse eyelashes, ptosis, blue sclerae, broad arched eyebrows, strabismus and eversion of lateral third of lower eyelid. Other ophthalmic signs of Kabuki Syndrome within the literature include cataract, retinal hyper- and hypopigmentation, microphthalmia, amblyopia, nystagmus, coloboma, refractive anomalies and ophthalmoplegia. There are only limited case reports of corneal pathology associated with Kabuki Syndrome, which include megalocornea, microcornea, Peters anomaly, corneal opacities and peripheral corneal nodules.

Conclusion: To our knowledge, this is the first report of acute corneal hydrops in Kabuki Syndrome. It is of

clinical relevance as it contributes to the existing knowledge of ophthalmic manifestations in Kabuki Syndrome.

REFRACTIVE SURGERY

Visual, refractive, dry eye and corneal clarity outcomes of small incision lenticule extraction

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Purpose: To report the visual, refractive and densitometric outcomes of small incision lenticule extraction (SMILE).

Methods: Prospective study on eyes that underwent SMILE for mild to moderate myopia (<6 dioptres) and myopic astigmatism. Main outcome measures at one month included uncorrected visual acuity in logMAR, spherical equivalent (SE) in dioptres (D), wavefront higher order aberrations and tear film osmolality. Corneal densitometry at 0–2 mm, 2–6-mm zones at anterior 120 μ m, mid-cornea and total corneal values were measured.

Results: This study included 49 eyes of 25 patients, the mean patient age was 31.80 ± 5.83 years.

Post SMILE, 95.91% of treated eyes had a post-operative logMAR uncorrected visual acuity of 0.0 or better. Mean pre-operative SE was $-3.61D \pm 1.11D$ with mean post-operative refractive error of $-0.07 \pm 0.29D$ ($p < 0.0001$). The mean pre-operative refractive cylinder of 0.50 ± 0.58 D pre-operatively was reduced to $0.15 \pm 0.25D$ ($p < 0.0001$). Post-operative SE within ± 0.50 D and within 1.00 D was noted in 93.9% and 100% eyes respectively.

There was no statistically significant difference in tear film osmolality from pre-operatively 299.42 ± 12.18 to 295.05 ± 10.20 mOsm/l post-operatively ($p = 0.08$). A significant increase in higher order aberrations was noted from 0.33 ± 0.09 to 0.68 ± 0.90 ($p = 0.009$). No significant changes in Corneal densitometry were noted except for a significant increase in the total mid-corneal layer ($p < 0.0001$).

Conclusions: Early post-operative results indicate that SMILE is effective in correcting mild to moderate myopia and myopic astigmatism with good visual outcomes and favourable dry eye profile.

Improving corneal astigmatism measures for keratoconic eyes

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Purpose: To evaluate multiple potential measures of corneal astigmatism and assess how well they correspond to manifest refractive cylinder for keratoconic eyes of varying severity.

Setting: Retrospective case series, NewVision Clinics, Cheltenham, Australia.

Methods: Potential measures of corneal astigmatism are derived from raw total corneal power data derived from a corneal tomographer. The measures of corneal astigmatism are evaluated according to their vectorial difference from the manifest refractive cylinder at the corneal plane, which is the ocular residual astigmatism (ORA). The lower the standard deviation of the ORA (ORAsd), the higher the correlation between the corneal astigmatism measure and the manifest refractive cylinder. The lower the mean of the ORA (ORAméan), the more accurate is the corneal measure.

Results: ORAsds and ORAméans are calculated for all possible corneal astigmatism measures, which are derived from varying inner and outer annular extents, and centred on corneal vertex, thinnest point, front apex, and back apex, as well as pupil centre. For each different annulus centre, the annular extent that minimises the ORAsd is reported. Results are stratified by keratoconus severity.

Conclusions: Corneal astigmatism measures centred on thinnest point tend to correspond more closely with manifest refractive cylinder than other measures centred on corneal vertex, corneal apex (front or back), or pupil centre. As keratoconus severity increases, so do both ORAsd and ORAméan. None of the corneal astigmatism measures correspond closely with manifest refractive cylinder for severe keratoconus.

Real-world visual performance and patient satisfaction of a novel presbyopia-correcting intraocular lens, with a non-diffractive design, implanted in patients with posterior segment concerns (EVOLVE study)

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Purpose: EVOLVE is a multicentre, ambispective registry study to investigate the real-world clinical visual outcomes of AcrySof IQ Vivity™ extended depth-of-focus intraocular lens (IOL; models DFT015 and DFTX15-Toric) bilaterally implanted in subjects. Here, we report



the outcomes for the subgroup of subjects with posterior segment concerns.

Method: This is the first interim analysis of subjects participating in the study. After a minimum of three months of follow-up, visual performance of subjects comprising binocular uncorrected visual acuities at distance, intermediate (66 cm) and near (40 cm), was measured. Patient-reported levels of spectacle independence, satisfaction and visual disturbances were also collected.

Results: To date, 14 subjects with posterior segment concerns have been implanted with IOL models DFT015 or DFTX15-Toric. Posterior segment concerns include glaucoma ($n = 8$), ocular hypertension ($n = 2$), age-related macular degeneration ($n = 1$) and others ($n = 3$). Binocular mean logMAR (standard deviation) uncorrected visual acuities at distance was 0.024 (0.096), uncorrected visual acuities at distance 0.105 (0.128) and uncorrected near visual acuity 0.311 (0.123). Most of the patients never or rarely needed to wear spectacles at all distances assessed. All patients were very or fairly satisfied with their sight and 84.6% reported no difficulty with their sight during everyday life. Furthermore, 92.3%, 84.6% and 84.6% of subjects reported no halos, starbursts or glare, respectively.

Conclusion: The initial results of this real-world assessment of subjects with posterior segment concerns and bilaterally implanted with DFT015 and DFTX15-Toric IOL showed good distance, intermediate and near uncorrected vision, very high levels of patient satisfaction, good levels of spectacle independence and very low levels of visual disturbances.

Real-world visual performance of a novel presbyopia-correcting intraocular lens with a non-diffractive design: Results for subjects implanted in Australia

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Purpose: This is a sub-analysis of the multicentre, ambispective registry EVOLVE study to report real-world clinical visual outcomes of subjects bilaterally implanted with AcrySof IQ Vivity™ extended vision IOL (models DFT015 and DFTX15-Toric) in Australia.

Method: After a minimum of three months of follow-up, subjects underwent visual performance analysis of binocular uncorrected visual acuities at distance, intermediate (66 cm) and near (40 cm). Patient satisfaction, spectacle independence and visual disturbances were also assessed.

This is the first interim analysis of subjects participating in this study in Australia. The study is currently ongoing in ANZ, Europe and the UK.

Results: In total, 23 subjects have been implanted with IOL models DFT015 or DFTX15-Toric among three different sites in Australia. Binocular mean (standard deviation) logMAR uncorrected visual acuities at distance was 0.024 (0.076), uncorrected visual acuities at distance 0.073 (0.121) and uncorrected near visual acuity 0.319 (0.172). This Australian sub-population showed clinically consistent outcomes as the overall study cohort ($N = 129$). Most subjects never or rarely needed to wear spectacles at distance and intermediate, and 95.3% of subjects were satisfied with their sight. In addition, 95.2%, 95.2% and 85.7% of subjects were not at all bothered by halos, starbursts or glare, respectively.

Conclusion: In this assessment of subjects bilaterally implanted with DFT015/DFTX15-Toric IOLs in Australia, we have observed good distance, intermediate and functional near vision. Subjects in Australia also reported high levels of satisfaction with their vision, good levels of spectacle independence and low levels of visual disturbances.

Practising refraction in ophthalmology: Instructive or outdated?

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Purpose: Although there are numerous studies on visual acuity in ophthalmology, there is no study to date on the practice of refraction by ophthalmologists. This study evaluates the practice patterns of ophthalmologists in current practice, specifically ophthalmologists' perceptions about the importance of refraction in clinical practice and their perceived barriers to performing refraction, alongside their methodology and frequency of performing refraction.

Methods: This cross-sectional study was conducted at the Annual Scientific Congress of the Royal Australian and New Zealand College of Ophthalmologists in 2017. All attending ophthalmologists and ophthalmology trainees were invited to participate. Participants completed a 17-variable questionnaire on the practitioner's

perceptions about refraction and their practice of it. Data were analysed using Microsoft Excel and IBM SPSS Version 24.

Results: At this Congress, 213 attendees completed the survey, with most being consultant general ophthalmologists (85%). Twenty-six percent of participants either 'really loved' or 'liked' refracting patients. Those who reported feeling competent with refraction were more likely to perform it themselves ($p = 0.001$). Individuals most commonly reported taking 3-5 minutes to refract a patient (38%). Participants under the age of 65, and participants practising ophthalmology, were more likely to perform a refraction.

Conclusions: The literature indicates that this is the first study to describe the practice patterns of refraction by ophthalmologists. Although ophthalmologists found refraction important, the majority preferred patients to be refracted by others. Key barriers to ophthalmologists performing refraction included the time required to perform refraction, a busy clinic and the availability of alternative providers.

Influence of ocular surface hydration on intra-operative aberrometry measurement and toric intraocular lens recommendation

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Purpose: To examine the influence of intra-operative ocular hydration stability on intra-operative aberrometry (IA) measurement and the accuracy of toric intraocular lens selection.

Method: Fifteen consecutive patients were selected and 45 Optiwave Refractive Analysis System videos were reviewed. Inclusion criteria included uncomplicated cataract surgery and normal macula function. Exclusion criteria included previous refractive surgery, inflammations of the eye, keratoplasty, corneal scars and zonular weakness. To determine a methodology to automate stable refractions, video recordings of IA measurements were processed through an optical recognition software. A moving average of cylinder (cyl) readings at 40 frames (88 ms), 50 frames (110 ms) and 60 frames (132 ms) were determined. The difference vectors (DV) for these frames intervals and IA measured cylinder were compared. The IA digitalised live refractions from IA videos were graphed and assessed by the surgeon retrospectively for stability. DVs between stable and unstable groups were

compared and paired t tests were used to determine significance.

Results: The DVs at all frame intervals were not statistically significantly different from IA. In 15/45 (33.3%) cases, the IA active refraction traces were stable and the DV of this group ($0.27D \pm 0.15D$) was significantly less compared to the unstable group ($0.49D \pm 0.31D$). Additionally, 14 (93.3%) of the stable runs would have led to a lens recommendation resulting in $<0.5D$ post-operative cyl. There was no significant difference in spherical equivalent.

Conclusions: Intra-operative ocular hydration stability influences the accuracy of intraocular lens recommendations during intra-operative aberrometry. Including the active refraction trace graph during surgery assists in improving outcomes.

Real-world outcomes of a novel presbyopia-correcting intraocular lens with a non-diffractive design implanted in patients with altered ocular surface (EVOLVE study)

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Purpose: To report the real-world clinical visual outcomes of AcrySof IQ Vivity™ extended depth-of-focus IOLs (models DFT015 and DFTX15-Toric) implanted in a subgroup of subjects with altered ocular surface.

Method: This is the first interim sub-analysis of the multicentre, ambispective registry EVOLVE study conducted in Europe, the UK and Australia. After a minimum of three months of follow-up (defined by local clinical practice standards), binocular uncorrected and best-distance corrected visual acuities (VA) at distance, intermediate (66 cm) and near (40 cm) were measured. Patient satisfaction were also reported using validated questionnaires, as well as non-prompted visual disturbances.

Results: To date, 20 patients with altered ocular surface have been implanted bilaterally with DFT015 or DFTX15-Toric IOL in this study. Altered ocular surface includes dry eye ($n = 10$), post-LASIK ($n = 5$), corneal dystrophy ($n = 4$) and others ($n = 3$). Binocular mean Snellen distance VA was 6/6, intermediate VA was 6/7.5 and near VA was 6/9.5 for uncorrected and best-distance corrected. Moreover, high levels of subject satisfaction were reported: 85% of subjects reported they were fairly or very satisfied



with their sight. In addition, no halos, glare or starbursts were reported by 90%, 80% and 90% of subjects, respectively.

Conclusion: This real-world assessment of subjects with altered ocular surface and bilaterally implanted with DFT015 or DFTX15-Toric IOL has shown good distance, intermediate and functional near visual outcomes, as well as high patient satisfaction and low levels of visual disturbances.

RETINA

Better visual outcome associated with early vitrectomy in the management of endophthalmitis

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Aims: To examine the role of early vitrectomy in the management of endophthalmitis from all causes.

Methods: Retrospective study of 290 consecutive subjects diagnosed with endophthalmitis at Auckland District Health Board between 1 January 2006 and 31 July 2019. Main outcome measure was visual acuity at nine-month follow-up and proportion of subjects with severe vision loss ($\leq 20/200$).

Results: Median age at presentation was 70.4 years and 151 subjects (52.1%) were women. Cataract surgery was the most common cause of endophthalmitis in 92 subjects (31.7%) followed by intravitreal injection in 57 (19.7%), endogenous endophthalmitis in 48 subjects (16.6%), non-surgical trauma in 42 subjects (14.5%), glaucoma surgery in 24 subjects (8.3%), vitrectomy in 22 subjects (7.6%) and corneal in five subjects (1.7%). Culture was positive in 136 (46.9%) with gram-positive organisms most common (76.5%). Early vitrectomy was performed in 82 subjects (28.3%). Median visual acuity at nine months was 20/100 (IQR 20/30 to light perception), and severe vision loss occurred in 100 (43.5%). Retinal detachment occurred in 35 eyes (12.1%) and 26 eyes were enucleated. On multivariate analysis, younger age, poor presenting visual acuity and culture-positive endophthalmitis were associated with worse outcomes, and early vitrectomy was associated with better outcomes.

Conclusions: Early vitrectomy (within 24 hours) is associated with better visual outcomes at 9 months, while younger age, poor presenting visual acuity and culture-positive endophthalmitis are associated with poorer visual acuity outcomes.

Between-eye symmetry in Bietti crystalline dystrophy

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Purpose: Understanding between-eye symmetry in Bietti Crystalline Dystrophy (BCD) is important for prognosis counselling and to facilitate therapeutic clinical trials using the contralateral, untreated eye as an internal control. We evaluated the interocular symmetry of anatomical features and visual function among individuals with BCD, with a focus on the number, area and distribution of the unique retinal crystalline deposits.

Method: Thirteen Australian and New Zealand participants with confirmed biallelic CYP4V2 mutations and a characteristic BCD fundus appearance consented for the study. Crystals visible on colour fundus photography were manually counted. Spearman's correlation coefficients (ρ), intra-class correlation coefficients (ICC) and Bland-Altman plots were used to assess anatomical and functional between-eye symmetry.

Results: Median participant age was 48 years, nine (69%) were female and five (38%) were of East Asian descent. Distance visual acuity ranged from 6/4.8 to light perception. Interocular correlation was high for fundus crystal area ($\rho = 1.00$; ICC = 0.97), fundus crystal count ($\rho = 0.98$; ICC = 0.97), and hypoautofluorescent area ($\rho = 0.88$; ICC = 0.98). Average foveal volume was moderately correlated between eyes ($\rho = 0.73$; ICC = 0.85).

No significant correlation was found for foveal crystal count and area, average or central foveal thickness, best corrected visual acuity, and average macular or central foveal sensitivity.

Conclusion: Fundus crystal area, fundus crystal number and hypoautofluorescent area displayed strong interocular symmetry in this study. The anatomical symmetry shown in these data may influence the choice of outcome measures of future BCD trials, and provides valuable information for clinicians caring for patients with BCD.

Laser-activated corneal adhesive: Retinal safety in rabbit model

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Purpose: To investigate whether laser irradiation, used to activate an adhesive for sealing penetrating corneal incisions, causes any ophthalmoscopically or histologically visible retinal changes.

Methods: Baseline fundus assessment was conducted prior to laser irradiation of eyes of pigmented Dutch-belted rabbits. Treatment group consisted of 18 eyes with the corneal adhesive activated in situ by a near infrared laser (125 mW for 45 seconds). A positive control group of 18 eyes were irradiated for 60 seconds with the same laser at 375, 500, 625 and 750 mW at different retinal locations. Unexposed regions of the retina were used as negative internal control. Ophthalmoscopic assessment was conducted immediately after laser exposure and prior to euthanasia. Retinas were histologically assessed at 0, 3, 72 and 168 hours after treatment.

Results: There were no ophthalmoscopically or histologically visible retinal changes observed in the treatment group immediately, nor up to 168 hours after laser irradiation. In the positive control group, the incidences of ophthalmoscopically visible retinal lesions increased with irradiation power: 5.6% at 375 mW, 16.7% at 500 mW, 44.4% at 625 mW and 50% at 750 mW. Histologically, retinal damage in the form of coagulative necrosis in all layers of the neural retina, including the retinal pigment epithelium, was observed, corresponding to the ophthalmoscopic findings.

Conclusion: The laser irradiation process used in the corneal adhesive technology did not cause any ophthalmoscopically or histologically visible retinal changes in the in vivo pigmented rabbit model. Prolonged exposure with this laser and at higher power can cause coagulative necrosis to the retina.

Cone photoreceptor rescue with laser photobiomodulation in murine and human retinal dystrophy

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Purpose: To investigate the effect of a novel slip lamp-delivered photobiomodulation (PBM) laser on cone rescue in murine and human retinal dystrophy.

Methods: We assessed the effect of a prototype PBM 670 nm laser on retinal cells under oxidative stress and mitochondrial compromise and then investigated the effect of this laser treatment on cone survival in a murine model of retinitis pigmentosa (the rd1 mouse). We then conducted a phase I trial (ACTRN12618000651280) of this PBM laser in 2 cohorts of patients with advanced retinitis pigmentosa (n = 6 per group).

Results: PBM laser rescued photoreceptors in vitro and in the rd1 mice. Foveal laser treatment was safe in humans with retinitis pigmentosa and temporarily recovered, on average, five letters of visual acuity.

Conclusions: Slit lamp-delivered 670 nm retinal laser warrants further investigation as a therapy to attenuate secondary cone degeneration.

Characterisation of cone photoreceptors in a rat model of retinal detachment

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Purpose: In humans, short-wavelength cones (S-cones) are more susceptible to damage from retinal detachment than medium and long-wavelength cones (M/L-cones). We investigated the temporal profile of cone loss in a rat model of retinal detachment to determine if it modelled the human pathological profile.

Methods: Retinal detachments were induced in Sprague-Dawley rats and the eyes underwent spectral domain optical coherence tomography and were processed at various time points from 1 day to four weeks as follows: Retinal wholemount immunohistochemistry (n = 31); qPCR: (n = 22); Transverse section immunohistochemistry (n = 52).

Results: S-cones displayed a striking vulnerability to retinal detachment. The S-opsin messenger ribonucleic acid



level in the detached portion of the retina was reduced to < 20% of the level in the intact retina by 1 day after surgery and was significantly lower than the M/L-opsin mRNA level at all time points. Loss of S-opsin+ immunolabelling was apparent earlier than loss of M/L-opsin+ immunolabelling and the S-cones were affected to a greater extent than M/L-opsin+ cones throughout the duration of experimental detachment. The loss of S-cone+ immunolabelling encompassed both a reduction in the overall number of segments as well as a reduction in individual segment size. The acute susceptibility of S-cones to separation from the RPE/choriocapillaris was best illustrated by visualisation of the boundary of the intact and detached portions of the retina, which was technically feasible in both whole mounts and retinal cross-sections.

Conclusions: S-cones are particularly affected by retinal detachment in a rat model which mimics the human situation.

Detecting rate of macular cell loss in rod-cone dystrophy using serial optical coherence tomography derived total macular volume: A prospective study

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Purpose: Rod-cone dystrophy (RCD) is characterised by progressive centripetal photoreceptor loss in the macula. This study investigates the feasibility of serial total macular volume (TMV) measurements as a biomarker of disease progression in RCD.

Methods: This prospective, single-centred observational cohort study included patients with clinical diagnosis of RCD and excluded those with cystoid macular oedema, epiretinal membrane, macular holes or recent cataract surgery. Baseline examination included best-corrected visual acuity and 25° × 30° spectral domain optical coherence tomography (61 slices, manual segmentation correction) with the Heidelberg Spectralis. Imaging was repeated six monthly for two years minimum. Linear regression was applied to TMV over time to determine TMV progression rates and the median time for this to decline by the retest variability threshold (RVT, 0.16 mm³) was calculated.

Results: Of 132 RCD patients, 42 with two-year follow-up were analysed. Twenty-seven (64%) were excluded leaving 30 eyes of 15 subjects for TMV progression analysis. Five

of 15 patients showed a negative trend in TMV ranging from -0.03 to -0.14 mm³/year. Time to reach RVT varied from 1.13 to 4.74 (median = 1.81) years. No patient had significant best-corrected visual acuity change (>10 letters) in the study period. TMV change was symmetrical in all except one patient, due to asymmetric gliosis resulting in localised retinal thickening.

Conclusion: Coexisting cystoid macular oedema, epiretinal membrane and macular holes often confounds TMV measurements and even after their exclusion, TMV decline was only detectable a third of the remaining patients. In selected cases, TMV can decline by RVT within two years.

Diabetic retinopathy in the postpartum in women with type 1 and type 2 diabetes in metropolitan Melbourne

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Purpose: Diabetic retinopathy (DR) in the postpartum remains poorly understood. Understanding this can indicate whether sight-threatening DR is best treated during pregnancy or can be deferred until after delivery.

Method: Subgroup analysis of a prospective cohort study of pregnant women with type 1 (T1DM) or type 2 (T2DM) diabetes in Melbourne. Women had ≥1 eye examination during pregnancy and up to 12 months

postpartum. Two-field retinal photography, or clinical assessment when unavailable, was used to determine DR severity. Progression was defined as worsening DR severity, the development of diabetic macula oedema (DMO), or the need for laser treatment.

Results: Eighty-seven pregnancies from 86 women were included; 48 had T1DM and 38 had T2DM (median duration 18.0 and 4.0 years respectively). Mean age was 33.4 years. DR prevalence at ≥ 27 weeks postpartum was 23.6 (95% confidence interval 16.6–32.4) per 100 eyes. Between late pregnancy and 12 months postpartum, 20/160 (13%) eyes developed progression while 10/160 (6%) regressed. Progression was associated with pre-existing baseline DR, T1DM, and a duration of diabetes >10 years. Of 13 eyes that progressed during pregnancy, five (38%) regressed after delivery. Regression occurred in 0/5 eyes with proliferative DR (PDR), while 9/17 (53%) eyes with DMO resolved spontaneously post-delivery.

Conclusion: Postpartum progression was twice as common as regression, underlining the importance of postpartum eye screening. Most eyes that progressed during pregnancy did not regress post-delivery, particularly eyes with PDR. PDR treatment thus cannot be delayed during pregnancy. However, DMO treatment can be safely delayed in most cases.

The use of photodynamic therapy in inner retinal vasculopathies with recalcitrant secondary cystoid macular oedema

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Purpose: To explore the potential use of photodynamic therapy for recalcitrant cystoid macular oedema (CMO) refractory to standard treatments in vasculopathies of the retinal circulation.

Methods: Retrospective case review of patients with chronic CMO due to various vasculopathies of the inner retinal circulation for whom maximal conventional therapies had failed and who underwent the combination therapy of photodynamic therapy (PDT), intravitreal anti-vascular endothelial growth factor and intravitreal steroid. Clinical assessment, visual acuity, optical coherence tomography and central macular thickness measurements were acquired for three visits prior to PDT and three visits post PDT to evaluate the activity of CMO.

Results: Four patients (six eyes) were included in this series. CMO was due to diabetic retinopathy in two patients, and branch retinal vein occlusion in two patients. Multiple intravitreal steroid and anti-vascular

endothelial growth factor injections had been trialed in all patients, two patients had undergone micropulse macular laser and three patients had undergone vitrectomy with epiretinal membrane peel, without resolution of CMO. The inactivity of CMO (full and partial) was seen in all patients as determined by optical coherence tomography. Best corrected visual acuity improved in three patients (mean: 0.46 logMAR units). One patient experienced a decline in best corrected visual acuity despite bilateral PDT (mean: 0.57 logMAR units). Central macular thickness reduced in all cases (mean: 128 microns).

Conclusions: There is a potential role of photodynamic therapy in managing recalcitrant cystoid macular oedema secondary to inner retinal vasculopathies, despite being an older therapy originally devised for use in choroidal and sub-retinal vasculopathies.

22q.11 microdeletion (DiGeorge) syndrome with microvascular maculopathy

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Purpose: To describe a novel retinal finding of 22q.11 Microdeletion Syndrome.

Methods: Retrospective chart review of a single patient.

Results: A 32-year-old man with genetically confirmed 22q11.2 microdeletion syndrome was found to have bilateral tortuous retinal vessels and right microvascular microangiopathy with microaneurysms, hard exudate and cystoid macular oedema. Other underlying causes for this including diabetic and hypertensive retinopathy were excluded. No treatment was required as he was asymptomatic and the visual acuity remained 20/30 in that eye with over one year of follow-up.

Conclusion: 22q.11 Microdeletion Syndrome can be associated with microvascular microangiopathy.

Assessment of retinal pigment epithelial detachment treatment response and impact of size on outcomes in neovascular age-related macular degeneration from the OSPREY study

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Purpose: Evaluate outcomes of neovascular age-related macular degeneration eyes with moderate to very-large retinal pigment epithelial detachment (PED) in the OSPREY trial.

Methods: A post-hoc analysis of the OSPREY phase II trial comparing brolucizumab 6 mg and aflibercept 2 mg in nAMD. Forty-one treatment-naïve nAMD eyes with PEDs were evaluated in: 1) all PEDs with a maximum height $\geq 150 \mu\text{m}$; 2) very-large PEDs with a maximum height $\geq 250 \mu\text{m}$. Spectral domain optical coherence tomography scans were analysed in a machine-learning novel platform for multi-layer volumetric assessment to categorise PED size and provide volumetric measures, including IRF and SRF.

Results: In PEDs $\geq 150 \mu\text{m}$, the mean change in best-corrected visual acuity was +7.3 letters in the brolucizumab group ($p = 0.02$) and +6.6 letters in the aflibercept group ($p = 0.05$). In the very-large PED cohort, mean change in best-corrected visual acuity was +5.6 letters ($p = 0.26$) and -0.4 letters ($p = 0.94$) in the brolucizumab and aflibercept groups, respectively. In both cohorts, brolucizumab and aflibercept demonstrated significant reductions in PED maximum height ($p < 0.05$). In very large PEDs, the mean reduction at Week 4 was $-122.7 \mu\text{m}$ with brolucizumab compared to $-84.1 \mu\text{m}$ with aflibercept. At Week 56, the mean reduction was $-167.0 \mu\text{m}$ with brolucizumab compared to $-153.2 \mu\text{m}$ with aflibercept. Both treatments showed significant reductions in sub-RPE volume across all PED cohorts. At Week 56, both cohorts showed reductions in mean IRF and SRF with both agents.

Conclusion: Both agents demonstrated significant improvement in PED features. In very-large PEDs, functional response was more limited. Exploratory in nature, this analysis suggests a possibly more rapid improvement in exudative parameters and possibly greater functional response in the very-large PED group with brolucizumab.

Cuticular drusen in age-related macular degeneration: Association with progression and impact on visual sensitivity

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Purpose: Cuticular drusen, a pattern of small, uniform drusen, can be seen in age-related macular degeneration (AMD) and may confer a greater risk of progression. This study aims to investigate the association between the presence of cuticular drusen and AMD progression in a cohort with bilateral large drusen and examine their association with visual sensitivity using microperimetry.

Method: Two hundred and eighty eyes from 140 participants were included. Multimodal imaging and microperimetry were performed at baseline, then 6-monthly for 3 years. Baseline multimodal imaging were graded for cuticular drusen and pigmentary changes, and used to calculate drusen volume. The association between cuticular drusen and progression to late AMD, as well as the impact on visual sensitivity were examined, with and without adjustment for confounders: age, pigmentary abnormalities and drusen volume.

Results: Seventy eyes from 35 (25%) individuals had cuticular drusen at baseline. Cuticular drusen were not significantly associated with an increased rate of progression to late AMD, with and without adjustment for confounders ($p \geq 0.808$ for both). Each confounder was independently associated with an increased rate of progression to late AMD ($p \leq 0.002$ for all). In an adjusted model, cuticular drusen were not associated with lower baseline visual sensitivity ($p = 0.743$) nor with a faster rate of visual sensitivity decline over time ($p = 0.183$).

Conclusion: In a cohort with bilateral large drusen, cuticular drusen were not independently associated with an increased rate of progression to late AMD over three years, nor with an increased rate of functional decline prior to the development of late AMD.

Comparison of retinal optical coherence tomography angiography parameters between patients with different causes of chronic kidney disease

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Purpose: To explore the potential usage of optical coherence tomography angiography (OCTA) in chronic kidney disease (CKD) patients.

Methods: Single centre cross-sectional study on 232 patients divided into 4 groups: control, diabetic, hypertensive and autoimmune-related glomerulonephritis CKD. OCTA parameters, namely foveal avascular zone (FAZ), vascular density (VD), perfusion density (PD) and macular volume were measured and recorded. CKD profile consists of fasting blood sugar, glycosylated haemoglobin (HbA1c), low density lipoprotein, total cholesterol, triglyceride, urea, creatinine, and urine protein creatinine index were taken. Statistical analysis was performed to compare between groups.

Results: The right eyes of 232 patients were included for final analysis. DM group showed statistically significant lower VD and PD when compared to control and other groups (hypertensive and nephritis), with all $p < 0.001$. All CKD groups were significantly different with lower macular volume value than control group (p ranged from <0.001 to 0.042). Foveal avascular zone of all CKD groups, together with VD and PD of hypertensive and autoimmune-related nephritis groups, have no significant difference compared to control group. While analysis between OCTA parameters and CKD profiles, only FBS and HbA1c had fair statistical correlation with VD ($p < 0.001$, r : -0.350 ; $p < 0.001$, r : -0.483 respectively) and PD ($p < 0.001$, r : -0.313 ; $p < 0.001$, r : -0.450 respectively).

Conclusion: This study showed a significant reduction of VD and PD particularly in diabetic CKD patients. However, the use of OCTA to screen or predict the occurrence of CKD in patient living with diabetes, hypertension or autoimmune nephritis was not showed to be useful from this study.

Two year safety and stability results from our 44 channel suprachoroidal retinal prosthesis clinical trial

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Purpose: The success of our prototype clinical trial (NCT01603576) of a suprachoroidal retinal prosthesis led us to develop a 44 channel fully implantable device with the aim of providing navigational information to profoundly visually impaired patients.

Methods: Four patients with end-stage rod - cone dystrophy were implanted with a 44 channel array in the suprachoroidal space (2018: NCT03406416). Follow-up included clinical examination, fundus photography and optical coherence tomography (OCT) to assess recovery and impact on the eye. OCT imaging was used to assess movement of the array relative to baseline. Impedance testing was used to verify functionality. Primary outcome measure was safety as assessed by device related serious adverse events and secondary measure efficacy.

Results: The surgical procedures were uncomplicated. Post-operative recovery was uneventful. Fundus imaging and OCT imaging confirmed the position of the devices. At two years post switch-on, 97% of all electrodes were functional (reduction of 0 to 3 electrodes per subject). No serious adverse events occurred during the two years of the study. OCT imaging showed some early minor movement of the device for all four patients.

Conclusions: A 44 channel retinal prosthesis can be safely implanted in the suprachoroidal space, with no serious adverse events recorded for all four patients. Over two years of follow-up clinical findings and imaging confirm safety and stability of the suprachoroidal approach with only slight movement on OCT imaging. The devices were functional for the 24 months of the study and continue to be used in the home environment.

Nanosecond laser treatment alters systemic immune cell function in intermediate age-related macular degeneration patients

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Purpose: Migration of circulating leukocytes to the sub-retinal space is a characteristic feature of age-related macular degeneration (AMD) development. Therapies that can modulate innate immune cell function, specifically phagocytosis, may influence progression of AMD. This study aimed to determine if short pulse laser treatment, being trialled in intermediate AMD patients, could alter phagocytosis function of circulating monocytes/macrophages.

Method: Twenty-one intermediate AMD patients in this prospective treatment study received a single session of unilateral nanosecond (2RT[®], Ellex) laser treatment (100 spots, 0.24 mJ/spot) at their baseline visit. Peripheral blood monocytes were collected at baseline (prelaser) and at subsequent follow-up time points (two weeks, three months, six months and 12 months). Monocyte phagocytosis function was quantified using real-time flow cytometry of ingested fluorescence Yellow-Green beads.

Results: A single unilateral application of the nanosecond laser induced a significant reduction of phagocytosis function in all three monocyte subpopulations. Classical monocytes showed a lowered phagocytosis capacity ($40\% \pm 22\%$) at three months ($p < 0.01$), while the reduction in phagocytosis in intermediate and non-classic monocytes occurred at six and 12 months respectively ($41\% \pm 18\%$, $55\% \pm 15\%$, respectively, $p < 0.05$). Additionally, monocyte populations that had a reduction at earlier time points did not show recovery to prelaser levels after one year, indicating a prolonged laser-induced effect.

Conclusions: This study demonstrates that a low-energy ophthalmic laser which does not rupture Bruch's membrane or cause any collateral damage to the neural retina, is able to induce a profound and extended alteration to systemic innate immune cell function lasting up to nine months post-treatment.

Real world 10-year outcomes of anti-vascular endothelial growth factor therapy for neovascular age-related macular degeneration: A meta-analysis

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Purpose: The efficacy of anti-vascular endothelial growth factors (VEGF) for neovascular age-related macular degeneration has been well documented. However, there is limited clinical evidence on the long-term efficacy of anti-VEGF therapy. This meta-analysis aims to present the long-term efficacy using evidence generated from a pooled analysis of real-world studies.

Methods: A comprehensive search of PubMed, EMBASE and Cochrane electronic databases was conducted for studies published reporting 10-year outcomes of anti-VEGF treatment for neovascular age-related macular degeneration. Baseline patient characteristics, study design, sample size, and 10-year change in visual acuity (VA) were pooled in a meta-analysis. Data was then stratified by treatment regimen.

Results: Nine observational studies were identified, with a total of 3226 eyes were included. There were 1059 eyes with 10-years of follow-up. The most significant change in VA was identified in Year 1 after the initiation of anti-VEGF therapy. At 10 years, the mean change in VA was -5.01 letters (95% confidence interval -9.16 to -0.86, $p = 0.018$). In four studies, VA ultimately returned to patients' baseline vision at year-10 and in five studies, vision decreased well below the baseline vision. There was a positive trend demonstrating that a higher frequency of injections demonstrated better maintenance of VA. In subgroup analyses, mean VA change was greater for T&E regimen compared to PRN.

Conclusion: This meta-analysis indicated that eyes on anti-VEGF therapy had a variable course after two years which appeared to be dependent on the treatment protocol and/or frequency of injections. Eyes treated using T&E regimens had better outcomes than those treated PRN.

Long-term anti-VEGF therapy for neovascular age-related macular degeneration in Australian patients. The LATAR study report 4: Outcomes by choroidal neovascular type

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Purpose: To evaluate long-term functional and anatomical outcomes of choroidal neovascular membranes

(CNV) in patients, continuously treated with anti-vascular endothelial growth factors (VEGF) for neovascular age-related macular degeneration (nAMD).

Methods: Consecutive nAMD patients who initiated anti-VEGF treatment between November 2006 and December 2009 were retrospectively assessed. The type of neovascularisation and clinical activity were assessed by clinical examination, fluorescein angiography and spectral domain optical coherence tomography. Functional and anatomical outcomes by CNV subtype were observed.

Results: Of the 1202 eyes who initiated ranibizumab, 376 eyes completed 10-years of follow-up. The prevalence of type 1 CNV was 42% ($n = 158$), type 2 was 45% ($n = 168$), type 3 was 6% ($n = 24$), and polypoidal choroidal vasculopathy (PCV) was 7% ($n = 26$). Mean baseline visual acuity was 57.4 ± 15.9 for type 1 lesions, 54.7 ± 16.1 for type 2, 56.2 ± 17.1 for retinal angiomatous proliferation (RAP) lesions, and 54.0 ± 17.5 for PCV. After 10-years of treatment, those with RAP exhibited the greatest mean change in visual acuity, followed by type 1 CNV. PCV subgroup had the poorest outcomes. All these changes were statistically significant ($p < 0.05$).

Conclusion: We present 10-year real-life outcomes in treatment-naïve patients with four types of CNV in the neovascular form of AMD. Eyes with RAP lesions demonstrated the greatest improvements in vision whereas, eyes with PCV type demonstrated a poorer functional and anatomical response to treatment. The CNV subtype may be a long-term predictor of response to anti-VEGF treatment.

Implications of discontinuing anti-vascular endothelial growth factor therapy in neovascular age-related macular degeneration

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Purpose: To analyse outcomes in patients suspending treatment with vascular endothelial growth factors for neovascular age-related macular degeneration.

Methods: The medical records of neovascular age-related macular degeneration eyes were searched for eyes that suspended treatment for a minimum of 6 months. The visual acuity (VA) and retinal thickness at treatment suspension were compared with VA at one and two years post suspension in treatment.

Results: A total of 187 eyes were identified and observed for up to two years post-suspension in treatment. The mean

number of injections before discontinuing treatment was 13.8 ± 3.5 (95% confidence interval [CI] 8.4-17.2). Eighty-one (42%) eyes resumed therapy with a mean loss of 6.4 ± 7.2 (95% CI -1.2 to -0.6; $p < 0.01$) letters from their last injection before suspension. These patients recovered +2.1 and +1.4 letters at years-1 and 2, respectively, resulting in a net loss of -5.0 letters [95% CI 2.9-7.2; $p < 0.01$] from treatment suspension and +4.9 letters (95% CI -1.9 to 7.8; $p < 0.01$) from diagnosis. The 106 eyes that permanently discontinued therapy had gained 6.2 letters (95% CI 4.3 to 8.1; $p < 0.01$) after 1-year of treatment and lost 0.8 letters (95% CI -0.21 to 0.5; $p < 0.01$) at discontinuation. After discontinuation, these patients lost a further 3.4 and 7.0 letters at one and two years post-discontinuation, respectively. These eyes had a mean -1.6 letter loss (95% CI -4.5 to 1.3; $p < 0.01$) from diagnosis.

Conclusion: Marked deterioration in VA was noted in patients discontinuing therapy. The eyes that resumed treatment were able to regain some vision and maintain this for up to two years post-suspension; however, the vision is mostly irreversible.

Focal scleral nodules with atypical features

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Purpose: To report a case of focal scleral nodule (FSN) with atypical features on multi-modal imaging including pigmentation and hypoautofluorescence.

Method: Retrospective case review.

Results: A 61-year-old asymptomatic diabetic woman was referred following an incidental finding of raised fundus lesion in her right eye. Fundus examination of the right eye showed a 3 mm diameter partially pigmented circular lesion located at the superior margin of the optic nerve head. The lesion was partially hypoautofluorescent on fundus autofluorescence. Enhanced depth imaging optical coherence tomography demonstrated a dome-shaped elevation of the lesion within the sclera, with overlying choroidal thinning.

Conclusion: Features in this case that are consistent for FSN include its solitary nature, peripapillary location, slight elevation, size around 1-disc diameter and scleral thickening and choroidal thinning on enhanced depth imaging optical coherence tomography. However, the pigmentation within our lesion is a novel finding in FSN that has not been described before. Encountering a pigmented lesion raises the possibility of other



differentials including choroidal naevi, choroidal melanoma and congenital hypertrophy of retinal pigmented epithelium. However these lesions are quite different from our case. It is likely that our case was a typical FSN that then became pigmented, with melanosomes involving the flanges of the lesion where thin choroid remains. The aetiology of FSN remains elusive. This case will be followed-up long term to identify changes in its nature, particularly the pigmentation. The understanding that FSN can be partially pigmented may eventually help unravel the origins of this poorly understood lesion.

Choroidal thickness – Normative data of Indian population using swept source optical coherence tomography

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Purpose: To provide normative database for subfoveal choroidal thickness in Indian eyes using swept-source optical coherence tomography.

Methods: This is a cross-sectional study based at a tertiary eye care centre in Northern India. A total of 238 eyes of 119 healthy subjects were examined in terms of axial length, spherical equivalent, and choroidal thickness. Inclusion criteria included age 19–60 years, no retinal or choroidal disorder, and patients with clear media and good fixation. Patients with high hypermetropia (>4 D) or myopia (>6 D) or any systemic disease likely to affect choroidal thickness were excluded. Twelve radial line scans were obtained centred on the fovea that were used to calculate choroidal and retinal thickness in nine early treatment diabetic retinopathy study zones.

Results: The mean age of all the subjects was 28.70 ± 11.28 years; mean axial length was 23.63 ± 1.96 mm, and mean spherical equivalent was -0.92 ± 3.08 D. The mean subfoveal choroidal thickness was 299.10 ± 131.2 μ and mean foveal thickness was 239.92 ± 48.16 μ . A negative correlation was found between subfoveal choroidal thickness and age ($r = -0.0961$, $p = 0.1392$) and axial length ($r = -0.3166$, $p < 0.001$). A statistically significant positive correlation was found between subfoveal choroidal thickness and refractive error ($r = 0.2393$, $p = 0.0002$) (all values as mean \pm 2SD).

Conclusion: This study provides normative database for subfoveal choroidal thickness and foveal thickness using swept-source optical coherence tomography in Indian population.

Nationwide trends in vitreoretinal procedures within Australia

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Background: Nation-wide data on vitreoretinal procedural trends has not been previously reported in Australia.

Methods: Nationwide study of vitreoretinal procedures in Australia over 18-year period from 2001–2019 using publicly available Australian Institute of Health, Welfare and Ageing hospitalisation database. Age- and gender-specific trends in selected vitreoretinal procedures in Australian public and private hospitals were reviewed including retinal detachment repair by vitrectomy and scleral buckle, intravitreal injections, and pars plana vitrectomy. Negative binomial regression models were fitted to assess trends in procedures numbers over time. Medicare Benefits Schedule data was included for comparison with inpatient injection rates.

Results: Between 2001 to 2019, there was an increase in age and gender standardised numbers of all selected vitreoretinal procedures with the exception of retinal detachment repair by scleral buckle. Negative binomial regression analysis revealed a statistically significant increase in the rates of retinal detachment repair by vitrectomy (IRR 1.047, CI 1.030–1.066, $p < 0.001$), pars plana vitrectomy (incidence rate ratio [IRR] 1.066, confidence interval [CI] 1.054–1.079, $p < 0.001$) and therapeutic intravitreal injections (IRR 1.214, CI 1.199–1.229, $p < 0.001$), and a significant decrease in scleral buckle procedures (IRR 0.994, CI 0.938 – 0.950, $p < 0.001$) over time. There was significant interaction among age groups over time for all procedures ($p < 0.001$) except retinal detachment repair by vitrectomy ($p = 0.32$).

Conclusion: We found a decreasing rate of scleral buckling procedures in favour of vitrectomy for the repair of retinal detachment, and a dramatic increase in the rate of intravitreal injections in Australia over the last two decades.

Optical coherence tomography angiography features of retinal cavernous haemangioma

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Purpose: Retinal cavernous haemangioma (RCH) is a rare, benign, congenital vascular anomaly that is often diagnosed incidentally in asymptomatic patients. RCH may accompany cutaneous and central nervous system angiomas. Optical coherence tomography angiography (OCTA) is a novel, non-invasive imaging technique that generates volumetric angiography images within seconds, without requiring contrast agent injection.

Method: Characteristics of RCH on OCTA image are rarely reported. We used OCTA to characterise and assist in the diagnosis in a paediatric patient with a unilateral vascular lesion.

Results: A four-year-old female was referred by her optometrist with an incidental finding of a right vascular malformation. The patient was asymptomatic, and there was no significant medical background. Visual acuity was 6/6 bilaterally. Anterior segment examination of both eyes and fundus examination of the left eye showed no other abnormalities. The right eye fundus disclosed two discrete clusters of saccular aneurysms, along the superotemporal arcade and superiorly to the disc, resembling a 'bunch of grapes' with associated surface fibrosis. Spectral domain-optical coherence tomography revealed a cystic haemangioma beneath the internal limiting membrane, with multiple hypo- and hyperreflective signals. OCTA confirmed low flow circulation in the vascular saccules, and the combined analysis with cross section optical coherence tomography B-scan localised the hamartoma in the inner half of the retina.

Conclusion: OCTA is a non-invasive diagnostic tool allowing dynamic retinal vasculature analysis. In our case, OCTA revealed multiple nodular grape-cluster aneurysms within the lesion. Further studies are required to confirm the sensitivity and specificity of OCTA as a diagnostic strategy in RCH.

Nocturnal hypoxia in age-related macular degeneration

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Purpose: Photoreceptors are highly metabolically active, especially at night, and are vulnerable in age-related macular degeneration (AMD). We aimed to explore the

possible role of nocturnal hypoxia, a potential novel risk factor for AMD.

Method: Nocturnal oxygen levels were measured in a cohort of 20 late AMD cases and 20 age-matched controls using a pulse oximeter. AMD status was confirmed using multimodal retinal imaging. Oxygen desaturation index (number of oxygen desaturations of $\geq 4\%$ from baseline for ≥ 10 seconds per hour), basal arterial oxygen saturation (SpO_2), minimum SpO_2 , and percentage of time spent below 90% and 85% SpO_2 were compared between groups after averaging recordings taken over three consecutive nights.

Results: Mean age of the late AMD group was 77.1 ± 6.7 (standard deviation) years and mean age of the control group was 74.5 ± 6.5 years ($p = 0.22$, t-test). The average oxygen desaturation index for late AMD was 8.13 ± 13.07 and 5.13 ± 4.91 ($p = 0.34$) for controls. The percentage of time spent below 90% SpO_2 was $15.4 \pm 28.3\%$ and $10.50 \pm 16.63\%$ ($p = 0.51$) for the AMD and control groups respectively. Similarly, the percentage of time spent below 85% SpO_2 was $2.71 \pm 6.73\%$ and $0.57 \pm 1.27\%$ ($p = 0.17$) for the AMD and control groups respectively. There was no difference in the basal SpO_2 or the minimum SpO_2 between the groups ($p > 0.67$).

Conclusion: In this pilot study, there were several indices of nocturnal hypoxia which were more pronounced in the AMD group compared to the control group. Increasing the cohort size will be important as we explore this novel, potentially modifiable risk factor for AMD.

Does quantifying macular hyperpigmentary abnormalities improve accuracy of predicting progression in age-related macular degeneration?

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Purpose: To evaluate the potential added value of quantifying hyperpigmentary abnormalities (HP) for predicting progression of age-related macular degeneration (AMD).

Methods: 140 participants with bilateral large drusen were followed six-monthly for up to 36 months. They underwent multimodal retinal imaging to determine late AMD development. Colour fundus photographs at baseline were graded for the presence of pigmentary



abnormalities and HP were manually annotated, and then quantified. Two predictive models that included age and presence of pigmentary abnormalities, one with and one without the amount of the HP present, were compared.

Results: The quantity of HP within the central 3 mm region ($p = 0.036$), but not outside ($p = 0.361$), was independently associated with progression to late AMD. The addition of the HP quantity within the central 3 mm to a predictive model including presence of any pigmentary abnormalities and age did not significantly improve its performance (area under the receiver operator characteristic curve = 0.81), compared to the model without it (area under the receiver operator characteristic curve = 0.80; $p = 0.23$). The sensitivity of these two predictive models were 54% and 46% respectively at 90% specificity ($p = 0.32$).

Conclusions: The extent of HP within the central 3 mm was associated with AMD progression at the population level. However, its addition to a model based on presence of any pigmentary abnormalities and age did not result in an improved predictive performance at the individual level in our cohort. Further analysis of spatial patterns of HP, would provide additional parameters to improve the model.

Functional vision with the second generation suprachoroidal retinal prosthesis: Obstacle avoidance task

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Purpose: The second-generation (44-channel) suprachoroidal retinal prosthesis clinical trial (NCT03406416) followed on from the initial proof of concept study (NCT01603576). We assessed functional vision outcomes in the laboratory with an obstacle avoidance task.

Method: The second-generation suprachoroidal retinal prosthesis was implanted unilaterally in four participants with advanced retinitis pigmentosa in 2018. Following visual rehabilitation training, participants were assessed at weeks (W); W17, W20, W32, W44, W56, W68, W80 and endpoint (~2 years). The participants traversed a hallway with five randomly seeded high-contrast obstacles. Obstacles seen and contacted were recorded, plus time to complete the course. Participant data were pooled and compared between device on and device off via negative binomial (objects seen/contacted) and Cox regression (time to complete course) with effect modification by visit robust standard errors to account for within-participant correlation.

Results: The incidence rate for detecting obstacles was over 11 times higher with device on compared to off (overall $p = 0.007$, $p \leq 0.021$ until W80, $p = 0.091$ at endpoint). The incidence rate for contacts with obstacles was estimated to be 42% lower with device on ($p = 0.015$ overall, $p \leq 0.013$ at W17, W20, W44 and W80). Time taken to complete the course was estimated to be 88% slower with device on, due to additional visual input and time taken to avoid obstacle, ($p < 0.001$ overall, $p \leq 0.037$ at each visit).

Conclusion: The functional vision data with the second-generation suprachoroidal retinal prosthesis show improved detection and avoidance of seeded obstacles. The device adds visual information to improve avoidance of obstacles when navigating.

Establishing a new public hospital vitreo-retinal surgical service, during COVID; our experience

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Purpose: To assess the clinical impact and surgical outcomes of a new public vitreo-retinal (VR) service established at Liverpool Hospital, a tertiary trauma referral centre in Sydney, in the context of the COVID-19 pandemic.

Method: A retrospective surgical audit of all patients who had VR surgery at Liverpool Hospital from January 2020 to January 2021.

Results: During the inception year of the new service, two surgeons performed 106 operations. Specifically, during the COVID-19 related suspension of elective surgery 22 emergency vitrectomy operations were performed.

Of all operations performed, $n = 40$ (38%) were emergency procedures. The most common pathology was retinal detachment $n = 32$ (30%), 12 of which had proliferative VR at presentation. This was followed by diabetic vitrectomy $n = 20$ (19%) and non-diabetic vitreous haemorrhage $n = 12$ (12%). Eight patients had dropped nuclei (five referred from other peripheral hospitals) and three patients had endogenous endophthalmitis. Indications for vitrectomy were compared to the UK National Ophthalmology Database Study. Our service performed more operations for diabetic vitrectomy, non-diabetic vitreous haemorrhage and endophthalmitis compared to the UK cohort, while rates of surgery for retinal detachment were similar.

At one month post-operatively, uncorrected visual acuity had improved to 6/12 or better in 41 patients (39%). 12 patients (11%) had uncorrected visual acuity worse than 6/60 at the same post-operative period, with limitations identified as proliferative VR re-detachment (5), silicone oil (4), aphakia (2) and corneal scar (1).

Conclusion: The results of the inaugural year of this VR service demonstrate its viability, despite COVID-19, and clinical results comparable to international standards.

An audit of wet age related macular degeneration during the COVID era

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Background: The COVID-19 pandemic has affected many ocular services including timely treatment for age related macula degeneration (ARMD).

Standard: To assess if the service provides timely treatment for wet ARMD patients as set out in the Royal college recommendations (two week time frame between the receipt of referral and treatment time); to assess the number of patients and visual outcomes of patients in the 'COVID-protocol'; and to compare our visual outcomes with those in the CATT trial (15 letters gained/lost/stable).

Methods: Newly diagnosed ARMD patients who were given a first anti-VEGF injection, were selected between 1 August 2019 to 31 September 2020. In addition, a random sample of 17 patients were selected during this

period for analysis. A second cycle was carried out during December 2020.

Results: During the COVID era specifically, 222 patients were given 468 injections. The visual acuity of this cohort became more stable from the time after the first injection. Of the 17 patient sample, only one patient had a time delay greater than two weeks from referral to a clinic appointment. Only three patients had a time delay greater than two weeks from clinic visit to first injection. Fourteen out of the 17 patients had stable vision with no patients having serious adverse events.

Recommendations - During the Christmas period, bank holidays should prioritise wet ARMD even if it means being overbooked. OCT assessment should be used in all patients with suspected macular disease or unexplained central vision loss/changes.

Electronegative electroretinogram (ERG) value in modern imaging era

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Purpose: The electronegative electroretinogram (ERG), reflecting inner retinal dysfunction, can be utilised to help pinpoint the anatomical and functional site for the visual dysfunction. The aim of this study was to discover the frequency and aetiology of an electronegative ERG in a tertiary referral centre.

Methods: Retrospective review of International Society for Clinical Electrophysiology of Vision standard ERGs from January 2011 to December 2020. The b:a ratio was analysed in Dark Adapted 3.0 or 12.0. Patients with ratio of ≤ 1.0 were included.



Results: A total of 4421 patients had an ERG in the study period, of which 139 (3.1%) patients had an electronegative ERG. The median age at referral time was 37 (0.7-90.6) years. Photoreceptor dystrophy was the major aetiology with 48 patients (34.5%) followed by Congenital Stationary Night Blindness with 33 (23.7%), retinal ischemia with 18 (12.9%), retinoschisis with 15 (10.8%), and Paraneoplastic Autoimmune Retinopathy (PAIR) and nonPAIR with 14 patients (10.1%). Four patients (2.9%) had a diagnosis of Batten disease and similarly four patients had a diagnosis of inflammatory retinopathy (including birdshot chorioretinopathy). There were three unclassified patients.

Conclusions: The frequency of electronegative ERG in our centre was 3.1% with photoreceptor dystrophy as the major aetiology followed by CSNB, retinal ischemia, retinoschisis, and PAIR and nonPAIR. Many of these cases had a normal fundus appearance, highlighting the value of an ERG despite the modern imaging era.

Mer-Tyrosine Kinase retinopathy biomarkers aiding future therapy

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Purpose: Mer-Tyrosine Kinase (MERTK) gene mutation results in a primary defect in the RPE affecting photoreceptor outer segment phagocytosis initiation. The aim of this study was to determine the most applicable MERTK retinopathy biomarkers to measure disease progression to optimise intervention timing.

Methods: Best corrected visual acuity (BCVA), spectral domain-optical coherence tomography, ultra-widefield fundus autofluorescence patterns, kinetic perimetry (KP) and electroretinography (ERG) parameters were analysed. Baseline (BL) and last follow up data were compared.

Results: Five MERTK retinopathy patients were included with mean age of 17.7 ± 14.4 years old (6.7-42.3) at BL and mean follow up of 8.4 ± 5.1 years. Mean BCVA at BL and last follow up were 0.84 ± 0.86 LogMAR and 1.14 ± 0.86 LogMAR respectively. BCVA reduced by 0.05 ± 0.03 LogMAR/year. Ellipsoid zone (EZ) were quantifiable in eight eyes with mean BL length of $1293.75 \pm 421.07 \mu\text{m}$ and reduction of $140.95 \pm 69.28 \mu\text{m}/\text{year}$. Mean BL central macular thickness of $174.2 \pm 37.52 \mu\text{m}$ with $11.2 \pm 12.77 \mu\text{m}$ decreasing/year. Full-Field ERG and pattern ERG were barely recordable. Ultra-widefield fundus autofluorescence revealed central macular hyper-autofluorescence. KP (III4e and V4e) was normal in two eyes, restricted nasally in four eyes, superior wedge defect in two eyes and undetectable in two eyes. The four restricted nasally KPs worsen while the others stationary.

Conclusions: This study demonstrated early visual dysfunction, moderately rapid EZ reduction and macular hyper-autofluorescence. EZ, central macular thickness and BCVA were reduced at first review. Relative rapid reduction in these biomarkers as well as visual function suggests an early and narrow timespan for therapeutic intervention.

Effect of delayed intravitreal injections on outcomes in patients with neovascular age-related macular degeneration during COVID-19

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Purpose: During the early stages of the COVID-19 pandemic, an intravitreal injection (IVI) decision-support tool was implemented at our site to reduce patient exposure to potentially high risk clinical settings. This tool provided recommendations, based on the patients general health risk and ocular health risk, with regard to

postponing or extending IVI interval during this period. This study describes the outcomes of a cohort of patients managed with this tool.

Methods: Single site, retrospective chart review of all patients receiving intravitreal anti-vascular endothelial growth factor agents for neovascular age-related macular degeneration who were managed using this decision making tool from 1 to 30 April 2020. Primary outcome of interest was change in logMAR visual acuity (VA) three months later. Secondary outcomes of interest were change central macular thickness (CMT) measured with optical coherence tomography, and the rate of serious complications such as submacular haemorrhage.

Results: Thirty-three patients were included. Six had no change to their IVI interval, 14 had their interval extended and 13 had their IVIs paused for 3 months. LogMAR VA changed by a mean of +0.02 (standard deviation 0.15) and median of +0.1. CMT changed by a mean of +8.875 (standard deviation 55.20) and median of +8.5. No serious complications occurred.

Conclusion: In patients with neovascular age-related macular degeneration, a treatment delay in those whose risk of COVID-19 morbidity and mortality was deemed to outweigh their ocular risk did not appear to cause visual compromise over a three month period. This decision making tool could be useful to guide management in future lockdowns.

Localisation ability in three-dimensions with a second-generation suprachoroidal retinal prosthesis

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Purpose: Bionic vision with a retinal prosthesis allows localisation on the elevation and azimuth axes, but distance information is not provided in current device software. The aim was to compare object localisation accuracy in two- versus three-dimensions for recipients of the second-generation (44-channel) suprachoroidal retinal prosthesis.

Method: Four implant recipients (#NCT03406416) with profound vision loss performed localisation tasks with device ON (Lanczos2 filter) versus OFF. In Square Task (2-dimensional object), participants aimed to touch a randomly appearing high-contrast square optotype (10 degrees, 11.25 cm) on a touchscreen (107 x 71 cm) from arm's length (43 cm, 24 repeats per condition). In Table Top Task (3-dimensional objects), participants attempted to touch a high-contrast household object randomly placed on a 3 x 3 grid (109 x 81 cm, 20 repeats per condition).

Results: All participants performed better with Device ON than OFF ($p < 0.001$, mixed effects model). For three participants, mean pointing error with Device ON was comparable for Table Top versus Square tasks ($p > 0.05$). For one participant mean pointing error was higher with Table Top than Square task ($p = 0.006$). Pointing error with Device OFF was higher for Table Top versus Square Task for all participants ($p < 0.001$), likely due to the larger testing area for Table Top.

Conclusion: Localisation ability was comparable for two- versus three-dimensional objects for three of four recipients in a high contrast setting. A depth-sensing camera has potential to improve localisation ability especially in real-world settings and will be assessed in future trials.

Characterising changes in capillary density and alpha smooth muscle actin expression during the stepwise progression of diabetic retinopathy

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Purpose: To compare parafoveal microvasculature changes in diabetes, with and without retinopathy, to normal eyes.

Method: The parafoveal microvasculature was perfusion-labelled in six normal and 10 diabetic (four without retinopathy, six with retinopathy) human donor eyes for lectin, alpha smooth muscle actin and filamentous actin. Confocal microscopy and three-



dimensional visualisation strategies were used to identify the superficial vascular plexus (SVP), intermediate capillary plexus (ICP) and deep capillary plexus (DCP). Comparisons of capillary density and blinded assessment of alpha smooth muscle actin staining by observers in each capillary plexus were performed between the three groups.

Results: Alpha smooth muscle actin in the parafoveal microvasculature of normal eyes was expressed in the superficial vascular plexus and ICP, and only within the inflow arterioles of the DCP. In the DCP of diabetic eyes without retinopathy, alpha smooth muscle actin expression was increased but capillary density was normal. Within the DCP of eyes with diabetic retinopathy, alpha smooth muscle actin expression was increased and capillary density decreased compared to normal eyes and diabetic eyes without retinopathy ($p < 0.001$ and $p < 0.001$).

Conclusion: Increased expression of alpha smooth muscle actin occurs prior to the onset of diabetic retinopathy. In diabetic retinopathy, DCP capillary drop-out occurs earlier than the SCP and ICP. This finding may help to understand early microvascular changes in diabetes.

Role of retinal mapping with optical coherence tomography and Optos retinal imaging to optimise visual and anatomical outcomes of patients with ruptured retinal arterial macroaneurysm thrombolysed by tissue plasminogen activator

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Purpose: We aim to present a role of optical coherence tomography (OCT) and Optos retinal imaging to demarcate a safe, effective, and high yielding zone for injection of tissue plasminogen activator (tPA) combined with vitrectomy and gas for patients with ruptured retinal arterial macroaneurysm (RAM) causing submacular haemorrhage.

Method: All patients with ruptured retinal arterial macroaneurysm were treated with vitrectomy, sub-retinal tPA injection, SF6 gas and Avastin at Sir Charles Gairdner Hospital between September 2019 and February 2020. Patients who completed 4-months follow-up were included. Pre-op OCT and Optos retinal imaging were used to identify the tPA injection zone. Post-op retinal imaging was done to assess haemorrhage resolution. Baseline visual acuity of patients was compared to visual acuity at four month post operation.

Results: A total of six ruptured RAMs were identified among 6 patients who received vitrectomy, sub-retinal tPA injection, SF6 gas and Avastin injection with 4 months follow up. The identified injection zone was in the temporal perimacular region which was elevated with subretinal fluid/plasma. The presenting best corrected visual acuity was from hand movement to counting fingers at 1 m, while the best-corrected visual acuity at four months were between 6/6 to 6/12. OCT and Optos demonstrated resolution of subretinal haemorrhage at four month follow up.

Conclusion: We found the temporal perimacular zone to be a safe zone for subretinal tPA injection. This can be pre-operatively mapped through the use OCT and Optos for patients with ruptured RAM.

Case series of solar retinopathy: Role of multi-modal imaging and role of hyper-reflective spots on SD-OCT as a prognostic factor – A follow-up study

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Purpose: To document the visual acuity, spectral-domain optical coherence tomography (SD-OCT) findings with or without HRS, Multi-modal imaging (Multi-colour image, IR and FAF), and prognosis in 9 eyes of 5 patients with foveal damage from solar retinopathy & to evaluate the visual recovery and OCT changes on follow-up at 6 months.

Methods: This was a prospective, observational case series of patients with solar retinopathy at the Retina department, Aravind Eye Hospital, Pondicherry. All patients underwent visual acuity (VA) testing, refraction, dilated fundus examination – Red free fundus, Autofluorescence, and SD-OCT (spectral Domain ocular coherence Tomography) imaging and follow up for 6 months.

Results: The mean age was 19 years (range 9–32 years, both eyes are affected in 4 patients). The visual acuity of the affected eyes ranged from 0.4-0.9 on presentation. At presentation, Significant foveal pathology was identified on SD-OCT in all eyes, with disruption of the photoreceptor ellipsoid zone and the interdigitation zone and HRS. Follow-up at six months. 100% of cases showed improvement in OCT features but only 40% showed complete resolution with improvement in VA. The outer retinal hole persists in OCT in 60% of cases. Degree of resolution correlated with presenting visual acuity, younger age, degree of disruption of outer retina and presence of HRS in posterior

vitreous. On multi-modal imaging, Autofluorescence correlates best with the presence of persistent outer retina disruption on OCT and final VA.

Conclusion: Solar retinopathy has a good prognosis yet no improvement is noted after three months. Young age with poor VA at presentation and presence of HRS on SD-OCT might pose as poor prognostic factors.

Intravitreal injection rates in Australia during the era of COVID-19

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Purpose: To investigate the possible effects of COVID-19 on anti-vascular endothelial growth factor treatment for neovascular age-related macular degeneration (nAMD) and diabetic macular oedema (DMO) in Australia, comparing treatment rates in 2015-2020.

Methods: Aflibercept and ranibizumab prescriptions supplied via the Pharmaceutical Benefits Scheme for nAMD and DMO treatment in Australian States and Territories between 2015-2020 were retrospectively analysed. Changes in monthly prescription rates were explored descriptively and using Poisson models.

Results: Between January-April 2020 (during Australia's first wave of COVID-19), Australian nAMD and DMO treatment rates decreased by 17% (rate ratio [RR] = 0.83, 95% confidence interval, CI [0.82, 0.84], $p < 0.05$) and 16% (RR = 0.84, 95% CI [0.81, 0.87], $p < 0.05$) respectively. During these months, Australian nAMD and DMO treatment rates also decreased in 2018 and 2019 (RR range: 0.86-0.96), but increased or were unchanged in 2015-2017. Between July-September 2020 (Australia's second COVID-19 wave), Australian nAMD and DMO treatment rates decreased by 16% (RR = 0.84, 95% CI [0.83, 0.85], $p < 0.05$) and 8% (RR = 0.92, 95% CI [0.89, 0.95], $p < 0.05$) respectively. Victoria, the State with highest COVID-19 cases during these months, had relatively greater reductions in nAMD (RR = 0.73, 95% CI [0.70, 0.75]) and DMO (RR = 0.80, 95% CI [0.74, 0.86]) treatment. During these months in 2015-2019, Australian nAMD and DMO treatment rates increased or were unchanged.

Conclusion: Intravitreal injection rates for nAMD and DMO varied during 2020. Reduced treatment rates during the first and second COVID-19 waves in 2020 may be

attributable to the pandemic. Additional population-based studies at the individual level are necessary to further elucidate the effects of COVID-19 on intravitreal treatment.

Real-world outcomes in neovascular age-related macular degeneration: Eight-years of 44,304 ranibizumab injections

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Purpose: To evaluate real-world ranibizumab therapy for treatment-naïve eyes with neovascular age-related macular degeneration.

Methods: This electronic medical record study in Norfolk, UK, spans eight years. Early Treatment Diabetic Retinopathy Study visual acuity (VA) was measured at each visit. Previous injections or laser treatment were excluded. Clinicians used a loading phase of 3 monthly injections and a pro rata retreatment plan.

Results: Mean age at first treatment was 81.12. Female preponderance was 1.7:1. Baseline VA was 56 (2,716 eyes) which improved to 60.8 at month 24 (1,243 eyes). 40.1% (428) experienced >5 letter gain, 21.8% (233) >10 letter gain, and 11.0% (118) >15 letter gain. At month 96 (126 eyes remaining), VA was 54.4, of which 19.0% (16) experienced >5 letter gain from baseline, 9.5% (8) >10 letter gain, and just 6.0% (5) >15 letter gain.

Conclusion: Real-world visual outcomes achieved at a large number of centres across the United Kingdom did not match the results achieved in many randomised clinical trials, but they were delivered with substantially fewer injections and hospital visits. Most improvement with ranibizumab was seen initially, followed by slow decline.

Cost-utility analysis for pars plana vitrectomy and tap and inject for endophthalmitis

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Purpose: To perform a cost-utility analysis comparing primary pars plana vitrectomy within 24-hours (VIT) with primary non-surgical vitreous biopsy (TAP) for the management of endophthalmitis.



Method: Retrospective cost-utility analysis using decision-tree modelling. Data from the Victorian Endophthalmitis Registry was used to model outcome probabilities and cost from a third-payer perspective. Medicare data were used to calculate costs in a hospital-based setting (\$AUD). Cost-utility was based on preserved visual utility (VA) and cost per quality-adjusted life year (QALY).

Results: Two hundred and six eyes were identified between 1 January 2011 to 2021. Thirty-six eyes received VIT and 170 eyes received TAP. 17 eyes in the TAP group required delayed vitrectomy. Mean incident ages were 76.29 years (45% Female) in the VIT group and 74.28 years (53% Female) in the TAP group. The imputed costs were \$1523 and \$454 for VIT and TAP, with additional per-night admission costs of \$1177. The mean presenting vs discharge LogMAR VA of endophthalmitis was 2.24 vs 1.25 for the VIT group and 1.88 vs 1.03 for the TAP group. The mean duration of admission was 4.33 (VIT) and 4.04 nights (TAP). Total costs per admission were \$6929.41 and \$5361.22 for VIT and TAP respectively. Estimated lifetime QALYs gained were 2.23 (VIT) and 2.72 (TAP). The final costs derived per QALY were \$3107 (VIT) and \$1971 (TAP).

Conclusion: VIT and TAP are cost-effective per gained QALY, though TAP provided superior cost-utility. A prospective randomised trial is indicated to overcome baseline differences of worse presenting VA and prognosis eyes receiving vitrectomy.

Bleb-associated endophthalmitis secondary to *Gemella* species

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Purpose: To report the first known case of endophthalmitis secondary to *Gemella sanguinis* and to summarise current management practices from the experience of the vitreoretinal service at the Royal Victorian Eye and Ear Hospital (RVEEH).

Method: A 62-year-old gentleman presented to the Royal Victorian Eye and Ear Hospital emergency department with five days of left eye reduced central vision. Significant ocular history included primary open-angle glaucoma with a trabeculectomy and mitomycin C in 2013. Best-corrected Visual acuity on arrival was hand movements with an intraocular pressure of 42 mmHg. Blebitis with bleb leak

was noted, with a positive Seidel's sign and surrounding ciliary injection. A 2 mm hypopyon with 4+ cells and fibrin were noted in the anterior chamber. Fundal view was obscured through significant vitreous haze though multiple retinal haemorrhages were visible.

Results: An aqueous and vitreous biopsy with intravitreal antibiotics (0.1 ml Ceftazidime + 0.1 ml Vancomycin) was performed at presentation and repeated on day 2 of admission. Under guidance from infectious disease physicians oral Ciprofloxacin was substituted for oral Moxifloxacin 400 mg for two days and subsequently Linezolid 600 mg BD for a four-month total duration. Further sample culture and sensitivities isolated *Gemella sanguinis* with mean inhibitory concentration to ciprofloxacin at a level of 0.125 ug/ml and Moxifloxacin at 0.064 ug/ml. Final post-operative best-corrected visual acuity at four-months stabilised at 1/180.

Conclusion: This is the first case report of *Gemella sanguinis* endophthalmitis in the literature and highlights the importance of recognising its association with endogenous sources, and the need for longer targeted systemic antimicrobial therapy.

Real-world investigation of visual outcomes and retinal fluid in patients treated with anti-vascular endothelial growth factor for wet age-related macular degeneration

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Purpose: Clinical trials show that vascular endothelial growth factor inhibitors significantly improve visual outcomes in patients with nAMD. Real-world studies suggest that treatment outcomes can vary. While the purpose of treatment is to resolve retinal fluid, persistent sub-foveal subretinal fluid may still allow for good visual outcomes. A thicker choroid may exert a protective effect on photoreceptor integrity and some sub-retinal fluid may not lead to poorer outcomes.

This retrospective study investigated whether patients have similar visual outcomes reported in clinical trials; and whether presence and location of sub-retinal fluid has an effect on vision.

Methods: Data from two metropolitan private clinics were extracted from the Fight Retinal Blindness! registry. Treatment-naïve nAMD eyes with presenting visual acuity (PVA, analysed as early treatment diabetic retinopathy study letters) $\geq 6/96$ without significant ocular

comorbidities starting treatment with anti-vascular endothelial growth factor intravitreal injections between 2014–2018 were included. PVA was investigated over 24 months from first injection.

Results: Fifty eyes from 41 patients were included. Median baseline PVA was 70 letters. The majority (82%) were treated with aflibercept at the first visit. Mean number of injections was 16.3. Best PVA (76 letters) was achieved at 6.6 months after a median of five injections. At final visit, median PVA was 72 letters. 56% of eyes had no visual impairment ($\geq 6/12$), 8% had severe visual impairment ($< 6/60$); 36%, 18.0%, 12.0% had lost ≥ 5 , ≥ 10 , and ≥ 15 letters from baseline, respectively.

Conclusion: Outcomes comparisons with trials and real-world studies in addition to data and conclusions related to presence and location of sub-retinal fluid will be presented.

Day-to-day life assessment with a second-generation suprachoroidal retinal prosthesis

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Retinal prostheses are implantable devices that electrically stimulate residual retinal cells, providing some visual perception to recipients with advanced retinitis pigmentosa. This “bionic vision” is not yet enabling recipients to read visual acuity charts. Hence, functional

assessment of its effectiveness in day-to-day life is beneficial. Here, we report on the first day-to-day life assessment of the second-generation (44-channel) suprachoroidal retinal prosthesis.

The Functional Low-Vision Observer Rated Assessment (FLORA) instrument was administered to four recipients of the suprachoroidal prosthesis over a two-year clinical trial (clinicaltrials.gov #NCT03406416; 2017–2020). Performance was compared longitudinally between device ON and OFF. The instrument required participants to complete 35 functional vision tasks across 4 domains in uncontrolled environments. The ease with which patients completed a task was assessed by a qualified orientation and mobility specialist using a four-point scale, ranging from impossible (1) to easy (4).

At all time points, the mode ease of task score with the device ON was equal or higher than the device OFF in all domains. A learning effect was evident with device ON over the first 6 months, then ease of task scores stabilised. There was an overall positive impact of the retinal prosthesis on activities of daily living for all participants.

The suprachoroidal retinal implant improved the participants' abilities to complete functional vision tasks. This demonstrates potential utility in everyday life, adding to previously reported success in laboratory-based quantitative measures. Day-to-day life assessments, like the FLORA, are critical for future research to progress understanding of retinal prostheses in everyday environments.

Five-year update for the Phase III voretigene neparvovec study in biallelic RPE65 mutation-associated inherited retinal disease

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Purpose: To determine whether ambulatory navigation, light sensitivity and visual field (VF) improvements after voretigene neparvovec (VN) administration in patients with biallelic RPE65 mutation-associated inherited retinal dystrophy (IRD) are maintained at five years and review safety outcomes.

Methods: Patients were randomised to either original intervention (OI: $n = 20$) or delayed intervention (DI: VN after 1 year; $n = 9$). The primary endpoint was bilateral performance on the multi-luminance mobility test (MLMT). Additional endpoints were full-field light sensitivity threshold (FST) testing, visual acuity (VA), and Goldmann kinetic VF (GVF). Safety outcomes included adverse event reporting, laboratory testing and physical and ophthalmic examinations.

Results: For OI patients at Year 5 ($n = 18$) and DI patients ($n = 8$), the mean (SD) MLMT bilateral light level score change was 1.6 (1.1) and 2.4 (1.5) levels, respectively, compared with baseline. Mean change in white light FST in \log_{10} (cd.s/m²) averaged over both eyes was -2.02 (1.45) \log_{10} cd.s/m² for OI patients ($n = 17$) and -2.58 (1.04) \log_{10} cd.s/m² for DI patients ($n = 8$). Mean change in VA (Holladay Scale) averaged over both eyes (logMAR was -0.00 (0.64) for OI patients ($n = 18$) and -0.06 (0.26) for DI patients ($n = 8$). The mean change in GVF III4e sum total degrees averaged over both eyes was 166.6° (208.7) for OI patients ($n = 15$) and 178.8° (241.9) for DI patients ($n = 8$). There were two reports of cataract, one of ptosis and one of retinal detachment.

Conclusion: Improvements in ambulatory navigation, light sensitivity, and VF are maintained at five years after VN administration. The safety profile of VN is consistent with administration procedure.

Mapping retinal non-perfusion with hyperspectral imaging

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Purpose: We sought to establish whether retinal hyperspectral imaging together with deep learning methods could be used to accurately identify areas of retinal non-perfusion.

Method: We performed hyperspectral retinal imaging on 23 people with retinal ischemia due to diabetic retinopathy or retinal vein occlusion and 32 people without ischemia prior to fluorescein fundus angiography (FFA) imaging. Avascular retinal areas on angiogram images were annotated by a retinal specialist. Machine learning was used to co-register fluorescein fundus angiography and hyperspectral images. A convolutional neural network with output layers optimised for classification accuracy was developed. As the network was constrained to spectral data, the number of tuneable parameters was small (<16 k). Data were randomly split into 45 images for training (>3.1 M spectra) and 10 images for testing (>0.7 M spectra). The learning rate was tuned to maximise classification accuracy without overfitting the training set.

Results: Pixel-wise classification accuracy (perfused vs non-perfused) was 90.8% for the training set and 88.2% for the test set. The area under the receiver operator characteristic curve was 0.93 for training and 0.86 for testing, indicative of excellent performance.

Conclusion: These results indicate that hyperspectral retinal imaging can be used to generate high resolution maps of retinal perfusion that are comparable to those provided by angiography. Hyperspectral imaging is rapid, non-invasive, and can be performed without mydriasis. This advance paves the way to the detection of retinal non-perfusion in the context of diabetic retinopathy screening.

Alternating circumferential intravitreal injections; A simple and novel technique which may minimise complications of repeated, single-site injections

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Purpose: While no consensus exists on the most appropriate site for intravitreal injections (IVIs), the inferotemporal quadrant is often recommended for ease of access. However, repeated IVIs at the same site have recently been reported to result in significant architectural damage in the form of scleral thinning or dehiscence, and subconjunctival cysts. This novel technique describes the administration of IVIs circumferentially (ACI), and introduces a digital recording template. A representative case is described.

Method: Case report and description of a novel, site-specific technique (ACI) for performing and recording IVIs administered in a circumferential fashion.

Results: An 89-year-old female with 6/12 vision in her left eye from macular oedema following central retinal vein occlusion was treated with 2 mg intravitreal aflibercept from March 2018 to May 2020. The patient received a total of 26 IVIs, all administered via the pars plana, 3.5 mm from the limbus. Each subsequent IVI was administered no less than half a clock hour away from any previous injection. The 12, 3, 6, 9 meridia were avoided due to the presence of local anterior branches of the anterior ciliary arteries. A digital recording template for facilitating recording of circumferential IVIs is reported and will be included in this presentation. The patient did not have any complications during her treatment and her vision was maintained at 6/12.

Conclusion: Alternating IVIs in a circumferential fashion (ACI) is a novel and simple technique that may avoid repeatedly traumatising the pars plana sclera in only one location.

Long-term effect of voretigene neparvovec on the full-field light sensitivity threshold test of patients with RPE65 mutation-associated inherited retinal dystrophy: Post hoc analysis of Phase I trial data

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Purpose: To evaluate the durability of the effect of voretigene neparvovec on RPE65 patients enrolled in phase I trials over 7.5 years using FST as an outcome.

Methods: Twelve subjects received voretigene neparvovec in their worse seeing eye in study 101, 11 of whom were enrolled into the study 102 and received treatment in their second eye. Three different doses of voretigene neparvovec were tested in the first injected eye (1.5×10^{10} [n = 3], 4.8×10^{10} [n = 6] and 1.5×10^{11} [n = 3] vector genomes), while the second eye was only injected with the final approved dose (1.5×10^{11} vector genomes [n = 11]). Descriptive analysis was performed to assess the mean progression of FST in the first and second injected eyes.

Results: On average, there was a decrease (improvement) of FST for both eyes at the first measurement after treatment (day 14). The mean FST for the first injected eye was 6.1 (SE = 1.7) dB at baseline and -11.1 (SE = 3.8) dB at 1 year. For the second injected eye the mean was 1.7 (SE = 2.7) dB

at baseline and -16.6 (SE = 4.8) dB at 1 year. For the first and second injected eyes the improvements on FST were sustained up to 7.5 years and four years, respectively.

Conclusions: The results of the phase I trial analysis on FST are consistent with the phase III trial and support the sustained treatment effect of voretigene neparvovec. Given the high correlation between MLMT and FST in the phase III trial, these results suggest a sustained improvement in patients' functional vision over time.

Retinitis pigmentosa with recurrent vitreous haemorrhages – A case report

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Purpose: To present an unusual case of recurrent vitreous haemorrhages secondary to choroidal neovascularisation in a patient with retinitis pigmentosa and a rare genetic mutation.

Method: Case report

Results: A 37 year-old woman with presumed retinitis pigmentosa presented with a unilateral non-clearing vitreous haemorrhage. She was known to have rare mutation in the feline leukaemia subgroup C receptor related protein 1 (FLVCR1) gene, which has been implicated in retinitis pigmentosa, often syndromic with associated posterior column ataxia. Vitrectomy was performed but no convincing source for the bleed was found. Two years later she presented with a vitreous haemorrhage in the other eye which also required vitrectomy, and without an identifiable cause. Further vitreous haemorrhages occurred in each eye, treated with bevacizumab intravitreal injections. When these cleared, fundus fluorescein angiography was performed revealing foci of choroidal neovascularisation. These were treated with direct argon-equivalent photocoagulation with no further haemorrhages since.

Conclusion: Choroidal neovascularisation occurs rarely in the context of retinitis pigmentosa. In this case the patient was known to have a causative genetic mutation of the FLVCR1 gene, however no associations between this gene and choroidal neovascularisation have been reported.

Relationship between geographical location of patients and complications of diabetic retinopathy requiring vitreoretinal surgery

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Purpose: Diabetic retinopathy (DR) is a common complication of diabetes and a leading cause of blindness in the working age population. Much of this vision loss can be prevented with screening, early diagnosis and timely management. However, when diabetic retinopathy progresses without intervention, patients may require vitreoretinal surgery. This study aims to analyse differences in the incidence of diabetic complications requiring surgery across Victorian geographical locations.

Method: Single-centre study using data extracted from the ANZSRs Retinal Surgery Registry (2015-2019). All public operations for diabetic-related vitreous haemorrhage and tractional retinal detachment at the Royal Victorian Eye and Ear Hospital were included. Demographic data (including residential postcode), surgical intervention details and outcomes were collected.

Results: A total of 594 vitreoretinal surgeries for diabetic eye disease were identified. 80% of patients were identified to be in the 25-65 year old age group. 42% of patients were born outside of Australia. Geographically, in Victoria the primary health network with the highest number of cases was the north west metropolitan region. Twenty-three percent of patients were from regional and rural Victoria.

Conclusion: This work provides an early indication that certain geographical areas within Victoria have a higher number of patients requiring vitreo-retinal surgery for complications of diabetes. While this requires further investigation, it seems that these geographical areas, and possibly the associated demographic groups, have poorer access to eye care, and analysis of barriers to care is required.

Experience with hyperbaric oxygen therapy treatment for central and branch retinal artery occlusion

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Purpose: To review outcomes of patients presenting to the Royal Brisbane and Women's Hospital with Central or Branch Retinal Artery Occlusion (CRAO/BRAO) treated with hyperbaric oxygen therapy.

Methods: All patients presenting to the Royal Brisbane and Women's Hospital with CRAO and BRAO that received hyperbaric oxygen therapy between 2015 and 2021 were included in the retrospective audit. Visual acuity prior to treatment and after treatment was collected as was time to intervention and side effects. Patient records were analysed for risk factors for CRAO/BRAO including age, sex, hypertension, smoking history, hyperlipidaemia, and diabetes.

Results: Twenty-two eyes of 22 patients, were included, comprising 15 males and seven females with a mean age of 64. There was a median delay to treatment time of 13 hours with range three to 24 hours. The visual acuity ranged from no perception of light at presentation to 6/5 with central scotoma. Eight of 22 patients had objective improvement in their visual acuity utilising Snellen charts by senior medical staff. Recorded side effects were limited to haemotympanum and anxiety with use of hyperbaric apparatus.

Conclusions: This audit reviews the experience at the Royal Brisbane and Women's Hospital with hyperbaric oxygen therapy for the treatment of CRAO and BRAO. Visual acuity recovery was variable amongst this cohort but occurred in 36% of patients, whereas 18% experienced further loss of visual acuity and 41% experienced no change. Subjective improvement of increased colour perception, brightness perception and peripheral fields was also reported amongst participants.

Surgical repair of acute and chronic retinal detachments and visual outcomes: A single tertiary centre 12-month review

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Purpose: To evaluate the incidence, characteristics and outcomes of retinal detachment (RD) surgical repairs performed at a tertiary centre over 12-months.

Methods: A 12-month retrospective study on all vitreoretinal surgeries performed at the Princess Alexandra Hospital, Brisbane, Australia. RD repairs were identified via chart review. Age, gender, acuity, macula status, presenting best-corrected visual acuity (BCVA), surgical timing and type were collected. Outcomes measured were: BCVA at 1-, 6-, and 12-months post-repair, logMAR gained, re-detachment rates.

Results: Of 526 vitreoretinal surgeries performed, 154 were RD repairs. 73% of patients were aged 50-79; 66% were male. Eyes were pseudophakic in 66%. 58% were macula-off RDs. Seventy percent presented within four weeks of symptom onset. 75% of macula-on RD repairs occurred within 48-hours; 74% of macula-off RDs were repaired within seven days. Vitrectomy alone was most common (73%), followed by scleral buckle (17%) and combined vitrectomy-buckle (10%). Nineteen rhegmatogenous RDs re-detached within 12-months. Mean 1.2 logMAR was gained for acute macula-off RDs versus 0.8 for chronic. 71% with presenting BCVA $\geq 6/12$ retained this level at 12-months, compared to 22% of those presenting with BCVA $< 6/60$. Less logMAR were gained in macula-off RD repairs performed more than one-week after presentation, opposed to within 48-hours, but no difference by surgery type.

Conclusion: The majority of patients presenting with RD were males between 50- and 79-years. Most RDs were macula-off and presented within 4-weeks of symptom onset. Greater improvement in BCVA was achieved in acute RDs and those repaired within seven days, with no difference by type of surgery.

Cardiovascular risk factors and characteristics of patients with non-arteritic retinal artery occlusion, amaurosis fugax and incidental emboli of unknown aetiology

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Purpose: Retinal artery occlusion (RAO) is one of the leading causes of permanent visual impairment and is now recognised as a stroke equivalent. Ipsilateral carotid artery stenosis is the most common cause, however, there may be rarer causes particularly in the younger population. We aim to describe the clinical characteristics and outcomes of patients who present with RAO, amaurosis fugax and incidental embolus where no clear underlying aetiology was found.

Method: Multi-centre, retrospective case series. Any patients who suffered a non-arteritic, RAO (branch or central), amaurosis fugax and/or found to have an incidental embolus were included.

Results: One hundred and nineteen patients were included for analysis. 97 patients (81.5%) were found to have at least one cardiovascular risk factor prior to their event. Forty-seven patients suffered either central or branch RAO, 28 patients had amaurosis fugax, and 24 had incidental emboli. Hypertension was the most common cardiovascular risk factor (74, 63.2%) followed by hypercholesterolaemia (61, 52.1%), diabetes mellitus (42, 35.9%), ischaemic heart disease (21, 17.9%), and atrial fibrillation (16, 13.7%). This pattern was seen in all subgroups. 15 (14.8%) patients went on to suffer a further stroke event.

Conclusion: RAO, incidental emboli and amaurosis fugax have serious consequences on vision and can herald further cerebrovascular and cardiovascular events. Although these patients did not have a clear aetiology, hypertension, hypercholesterolaemia and diabetes mellitus were still the most common risk factors identified. This study highlights the importance of optimising all cardiovascular risk factors for any patients presenting with these conditions.

Alternative measures of visual function among patients with epiretinal membranes with good vision

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Background: Patients with epiretinal membrane (ERM) often report metamorphopsia before any significant reduction in Snellen visual acuity. Improved clinical tools are required to more accurately assess true retinal function in patients with ERM.

Methods: One hundred and twenty patients with ERM, presenting with good baseline visual acuity ($< 6/12$; better than 70 early treatment diabetic retinopathy study letters) who report significant symptoms from ERM underwent vitrectomy and membrane peeling surgery. Functional vision was assessed by macular microperimetry and validated visual function questionnaire (NEI VFQ-25). Functional measures were correlated with anatomical changes on spectral domain optical coherence tomography. A temporal relationship among all variables was evaluated at 1, 3 and 6-months post-operatively to assess the effect of vitrectomy and membrane peeling on functional visual recovery.



Results: Statistically significant improvements in visual function were found across patient self-reported symptoms (NEI VFQ-25 composite score difference 7.16, $p < 0.001$) and macula thickness profiles in all sectors ($p < 0.001$) following membrane peeling surgery. There was no significant improvement seen in visual acuity following removal of ERM in patients (mean gain of 5.8 EDTRS letters, $p = 0.076$). Individual microperimetry responses improved following removal of ERM (\bar{x} change 2.3 dB), however further correlation is required to ascertain the significance of the structure-function relationship of retinal recovery after membrane peeling.

Conclusion: Spectral domain optical coherence tomography and microperimetry mapping may better reflect true macula function compared to visual acuity change in patients with ERM. Microperimetry is a useful quantitative measure of the level of functional impairment which is consistent with qualitative patient-self-reported symptoms from ERM.

Impact on surgical outcomes of primary vitrectomy for rhegmatogenous retinal detachment with and without the use of 360 degree laser retinopexy

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Purpose: To determine surgical outcomes for primary vitrectomy in rhegmatogenous retinal detachment (RRD) with and without the use of 360 degree laser retinopexy.

Method: A single centre, retrospective study. Patients undergoing primary vitrectomy for primary rhegmatogenous retinal detachment. Primary outcomes were single surgery anatomical success (SSAS) and final anatomical success. Secondary outcomes included final logarithm of the minimum angle of resolution visual acuity, epiretinal membrane formation, cystoid macular oedema development, long term pupil dilation, corneal epithelial issues and number of subsequent vitrectomies.

Results: A total of 196 surgeries by five surgeons were included. One hundred and thirty underwent 360 degree laser retinopexy (360LR) compared to 66 who had laser retinopexy around retinal breaks (LRRB) only. Single surgery anatomical success was 86.2% in the 360LR Group compared to 77.3% in the LRRB Group. Mean final logMAR visual acuity was 0.9 in the 360LR Group compared to 0.6 in the LRRB Group. There was comparable epiretinal membrane/cystoid macular oedema development, pupil complications and corneal complications in each group.

Conclusion: In this cohort, 360LR was associated with improved single surgery anatomical success and Final logMAR visual acuity.

No significant associations between 360LR and single surgery anatomical success ($p = 0.44$), epiretinal membrane formation ($p = 0.14$), cystoid macular edema development ($p = 0.28$), or number of subsequent vitrectomies ($p = 0.41$) were found. Controlling for case complexity, 360LR was significantly associated with lower final anatomical success ($p < 0.001$) and worse final logarithm of the minimum angle of resolution visual acuity ($p < 0.001$).

Evaluating artificial intelligence decision support for diabetic retinopathy grading: A prospective study of eye health professionals

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Purpose: Artificial intelligence (AI) decision support systems for diabetic retinopathy (DR) aim to interpret images autonomously. However, little is known of the benefit of these systems to clinicians. This study aimed to examine how AI assistance affects accuracy, speed and diagnostic confidence when used by optometrists, orthoptists and trainees assessing DR on colour fundus photographs.

Method: A prospective, internet-based study of Australian optometrists, orthoptists, and trainees. Speed, accuracy and decision-making confidence were assessed for each of 45 retinal photographs graded by respondents. Images were presented as follows ($n = 15$ /group): 1) without AI assistance; 2) with AI grading data; and 3) with AI grading and heatmaps. An ophthalmologist-graded reference standard was used to calculate sensitivity and specificity for detection of referable DR, for each participant and image type.

Accuracy was compared between image types using a logistic generalised estimating equation.

Results: Preliminary results include 23 respondents. The odds of correctly detecting referable DR increased 9.4% with AI assistance without heatmaps and 18.7% with heatmaps (both $p < 0.001$ compared to unaided images). Overall sensitivity improved from 70.0% without assistance, to 83.1% with AI assistance without heatmaps, and 98.9% with heatmaps ($p < 0.001$). Overall specificity was 97%–100% for all image types. AI assistance was associated with mean time savings of 4.5 seconds per image presented without heatmap ($p = 0.001$) and 3.4 seconds ($p = 0.076$) with heatmaps. Confidence did not change appreciably ($p > 0.273$).

Conclusion: This study suggests that AI assistance increases the accuracy and speed of optometrists and orthoptists in identifying referable DR, with a minimal effect on confidence.

STRABISMUS

Simultaneous presentation of bilateral acquired idiopathic Brown syndrome

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Purpose: Brown syndrome refers to limited elevation in adduction due to abnormal function of the superior oblique tendon-trochlea complex, which may be congenital or acquired. Acquired causes include iatrogenic, traumatic, neoplastic, infectious and inflammatory processes, or rarely, idiopathic if a thorough work up is unrevealing. The aim of this poster is to present the rare case of a bilateral idiopathic acquired Brown syndrome of simultaneous onset, and its subsequent management and outcome.

Method: Case report of a 13 year old boy who presented with acute onset painful binocular diplopia with examination including forced duction testing consistent with an acute bilateral Brown syndrome (photos included). Old photographs demonstrated there was no history of prior strabismus. Extensive work up, including blood tests, MRI, electromyography was unrevealing, and thus an idiopathic aetiology was presumed.

Results: Our patient received a course of oral corticosteroids followed by two treatments of bilateral intra-trochlear triamcinolone injections with no

improvement. The option of surgery was proposed but at the parents' request a conservative approach was eventually adopted. Twelve months later his strabismus was unchanged.

Conclusion: To the best of our knowledge there have been no cases of a bilateral idiopathic acquired Brown syndrome with simultaneous presentation published in the literature to date. Idiopathic Brown syndrome has been reported to respond to steroids or occasionally recover spontaneously, however this did not occur with our case.

Seropositive ocular myasthenia gravis presenting as Brown syndrome in an adult

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Purpose: To report a case of ocular myasthenia gravis presenting as Brown syndrome.

Method: A case of a patient with protracted symptoms of presumed idiopathic Brown syndrome later diagnosed as ocular myasthenia gravis.

Results: A 45-year-old female first presented in 2017 with bilateral limitation of elevation in adduction as well as binocular vertical diplopia. Differentials of acquired Brown syndrome including systemic lupus erythematosus, mixed connective tissue disease, thyroid eye disease and idiopathic aetiology were considered. She was managed with high dose oral steroids and immunosuppression with no change to symptoms. The patient later developed intermittent left eye ptosis and limb fatigability which prompted myasthenia gravis testing. Anti-acetylcholine receptor antibody levels were elevated confirming seropositive ocular myasthenia gravis. After being treated with pyridostigmine, she had significant improvement in ocular symptoms.

Conclusion: Ocular myasthenia gravis may be considered as an important differential in patients where the clinical signs are consistent with Brown syndrome.

UVEITIS

Retrospective analysis of toxoplasmosis retinochoroiditis management in Auckland

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Aim: To examine the rate of recurrence of toxoplasmosis retinochoroiditis within a New Zealand population and to examine risk factors for recurrence.

Methods: Retrospective observational case series of all subjects with toxoplasmosis retinochoroiditis presenting to Auckland District Health Board Department of Ophthalmology between 2006 – 2019.

Results: A total of 115 subjects were included with a median age at initial diagnosis of 36.7 years (interquartile range 23.7 to 53.8). 16 subjects (13.9%) were immunosuppressed. 30.2% (26 subjects out of the 82 subjects who had serology performed) were IgM-positive at presentation. Mean follow up was 6.1 years per person. Seventy-three recurrences occurred during follow up in 36 subjects (31.3%). 88.4% of cases were treated with oral antibiotics. After treatment, most immunosuppressed subjects also received prophylactic antibiotics. Recurrence occurred in 14.8% in the first year (95% confidence interval 10.3% - 21.0%) and risk of recurrence was increased by 2× for every previous documented recurrence ($p < 0.001$). There was no statistically significant increased risk of recurrence with age, IgM-positivity, macular involvement or immunosuppression.

Conclusions: Toxoplasmosis had a 14.8% risk of recurrence in the first year, with each previous recurrence increasing the risk by 2×.

Occurrence of infectious uveitis following local triamcinolone and/or methotrexate injections: A case series

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Purpose: Infectious uveitis is one of the most visually devastating causes of uveitis worldwide and accounts for 19.6% of all cases of uveitis in New Zealand. With the burgeoning use of intravitreal injections, there has been a commensurate increase in the number of injection-related complications and reports of infectious uveitis following their administration in recent years. We present a case series of four patients with infectious uveitis after local injections.

Method: We retrospectively reviewed the data of four patients (mean age, 67.25 ± 7.58 years) who presented to the department of ophthalmology at Auckland District Health Board with infectious uveitis which occurred or

worsened after local triamcinolone acetonide (TA) and/or methotrexate (MTX) injections.

Results: Three patients received local TA and one patient received intravitreal MTX. All patients were immunosuppressed prior to treatment. Two patients had toxoplasma chorioretinitis which worsened with local TA and one patient developed cytomegalovirus (CMV) retinitis after intravitreal TA. The last patient had syphilis retinopathy which worsened with intravitreal MTX. There were atypical presentations, as demonstrated by a case of presumed birdshot chorioretinopathy flare which tested positive for toxoplasma chorioretinitis with polymerase chain reaction.

Conclusion: Uveitis due to infectious etiologies needs to be carefully excluded prior to the use of local steroid and/or methotrexate injections. Disease presentations may be atypical in the presence of marked immunosuppression following local therapy. Polymerase chain reaction can play an important role in the diagnosis in this setting.

Efficacy and safety of intracameral triamcinolone acetonide in uveitic cataract surgery

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Purpose: To evaluate the safety and efficacy of intracameral triamcinolone acetonide (TA) in reducing post-operative inflammation in uveitic cataract surgery.

Methods: Retrospective cohort study using medical records with a post-operative follow-up of at least one month, up to 12 months. Consecutive adult patients undergoing uveitic cataract surgery with significant iris manipulation (iris hooks or Malyugin Ring), were included. Cases before 2009 where intracameral TA was not available (control group) were compared with cases after 2009 where intracameral TA was administered (study group).

Results: Fifty-four eyes from 46 patients were in the study group, 19 eyes from 16 patients were in the control group. Significantly fewer eyes in the study group developed cystoid macular oedema (CMO) (22% vs 53%, RR 0.42 (95% confidence interval 0.22 to 0.83), $p = 0.020$). At one month, the study group had $\frac{1}{4}$ the risk of having CMO compared to controls (9% vs 35%, RR 0.26, (95% confidence interval 0.10 to 0.75), $p = 0.019$). Visual acuity was not significantly different at baseline. The study group achieved a better median visual acuity than the control group at one ($p = 0.013$) and three months

($p = 0.009$). Mean intraocular pressure was lower in the study group at one week ($p = 0.004$) and three months post-operatively ($p = 0.015$). The study group had more cases of intraocular pressure-rise ≥ 10 mmHg (50% vs 37%, $p = 0.425$) and ≥ 20 mmHg (36% vs 11%, $p = 0.210$). **Conclusion:** Our findings support using intracameral TA in uveitic cataract surgery to prevent post-operative inflammation. It appears to be effective for prevention of early CMO which may confer a visual acuity benefit.

Risks and complications of cataract surgery in uveitis

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Purpose: To determine the rate of complications in cataract surgery in uveitis

Methods: Retrospective data was gathered on subjects attending uveitis clinic at Auckland District Health Board between 2008 and 2020. Data was collected in Microsoft Excel and analysed in STATA.

Results: A total of 471 eyes of 371 subjects with uveitis underwent phacoemulsification surgery. Median duration of uveitis prior to cataract surgery was 3.0 years (interquartile range 1.4 – 6.6) and median period of quiescence prior to surgery was 1.0 years (interquartile range 0.5 – 2.0). Intra-operative posterior synechiae peel was required in 152 eyes (32.3%) and pupil management in 116 eyes (24.6%); most commonly iris hooks and vision blue. Intra-operative complications occurred in 32 eyes (6.8%). No factors for intra-operative complications were significant on multivariate analysis. Twelve month follow-up was available for 311 eyes (66.0%). By 12 months, visual acuity was 6/12 or better in 248 eyes (79.7%). The most common complication was uveitis flare, occurring in 266 eyes (56.5%); time of quiescence was associated with reduced risk of flare (HR 0.794 $p = 0.003$). Post-operative cystoid macular oedema (CMO) occurred in 56 eyes (11.9%) with 45 eyes developing CMO within six months. There are no risk factors significantly associated with CMO development.

Conclusion: Cataract surgery in uveitis is more complex, often requiring additional procedures. However, the overall complication rate in this cohort was still low. The primary challenge is in post-operative care, managing the high rate of prolonged inflammation, recurrent uveitis flares and CMO. Ensuring a period of pre-operative quiescence and ongoing monitoring post-operatively is paramount.

Idiopathic retinal vasculitis, aneurysms and neuroretinitis: Clinical improvement with infliximab

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Purpose: Idiopathic retinal vasculitis, aneurysms and neuroretinitis is a rare vision-threatening condition. If untreated vision loss occurs due to complications of progressive retinal ischemia including retinal neovascularisation, neovascular glaucoma and retinal exudation. Despite the proposed underlying inflammatory aetiology, this condition demonstrates poor response to corticosteroid treatment. We present two cases of idiopathic retinal vasculitis, aneurysms and neuroretinitis successfully treated with infliximab.

Methods: Case reports of a 14-year old male and a 16-year old male, and review of relevant literature.

Results: Two paediatric cases of idiopathic retinal vasculitis, aneurysms and neuroretinitis that demonstrate anatomic and functional improvement with infliximab treatment.

Conclusion: Infliximab treatment led to resolution of aneurysmal dilatations and retinal vasculitis, and reversal of some retinal capillary non-perfusion. Early treatment with infliximab should be considered for any subject presenting with idiopathic retinal vasculitis, aneurysms and neuroretinitis.

Endogenous endophthalmitis: A 21-year review of cases at a tertiary eye care centre

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Purpose: The primary objective was to identify causative organisms of endogenous endophthalmitis. Secondary aims were to determine systemic risk factors and visual prognostic factors.

Methods: A retrospective review of all subjects presenting to Auckland District Health Board (Auckland, New Zealand) between 1999 and 2020 with endogenous endophthalmitis.

Results: Seventy-eight eyes from 62 subjects were diagnosed with endogenous endophthalmitis over the study period. Median age was 61.6 years and 32 subjects (51.6%) were male. Diabetes was the most common risk factor seen in 24 (38.7%) subjects. 17 subjects (27.4%)



presented directly to ophthalmology and 17.4% had an initial misdiagnosis. Forty-nine subjects (79.0%) presented with reduced vision and only 27 (43.5%) presented with pain. Hypopyon was present in 13 eyes (16.7%). Gram-positive bacteria were the most common causative organism seen in 40 (51.3%) eyes, followed by yeast and fungi in 21 (26.9%) eyes, then gram-negative bacteria seen in 17 (21.8%) eyes. Median final best-corrected visual acuity was 6/18. Severe vision loss occurred in 33 (42.3%) eyes and 7 (9.0%) eyes required enucleation. Presenting visual acuity was a significant predictor of visual outcome.

Conclusion: Endogenous endophthalmitis occurred at 1.9 cases per million per year. Ophthalmologists require a high index of suspicion for underlying systemic infection in any subject presenting with ocular inflammation, and need to be aware that endogenous endophthalmitis may present without pain and frequently without hypopyon.

Intravitreal injection of COX-2 acetylating immuno-resolvents for the treatment of ocular inflammation: In vitro assessment in THP-1-derived macrophages and in vivo assessment in a rat model of endotoxin-induced uveitis

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Purpose: Current treatments for uveitis impede the body's endogenous inflammation-resolution pathways. COX-2 acetylating immuno-resolvents (CAIR) are agents capable of specifically acetylating COX-2 and redirecting its activity from pro-inflammatory to pro-resolving, amplifying the endogenous resolution of acute inflammation. Agents currently identified as CAIRs include locally delivered acetylsalicylic acid (ASA), and a more potent derivative, o-(acetoxypheyl)hept-2-ynyl sulfide (APHS). We hypothesised that intravitreal (IVT) injection of CAIRs would reduce histological markers of inflammation in an animal model of uveitis and reduce pro-inflammatory gene expression in THP-1 macrophages.

Methods: Lewis rats received subcutaneous injection of lipopolysaccharide (LPS) to induce bilateral experimental uveitis. After five hours, IVT injection of ASA or APHS was carried out OD, and vehicle injected OS. Control animals received vehicle subcutaneously and IVT vehicle OU, and all underwent histopathology 25-hours following LPS-induction. In vitro, THP-1 macrophages were co-treated for 6 hours with LPS and either ASA or APHS.

MTT and LDH assays evaluated cytotoxic effects; RT-qPCR assessed expression of pro-inflammatory transcripts IL-1 β , TNF α and COX-2.

Results: In LPS-treated animals, IVT CAIRs induced a marked reduction in inflammatory cell infiltrate compared to the vehicle-injected contralateral eye. In vitro, LPS-treated macrophages demonstrated significant upregulation in inflammatory cytokines IL-1 β , TNF α and COX-2, which was significantly reduced in the presence of CAIRs. CAIRs exhibited selective cytotoxicity towards LPS-stimulated macrophages.

Conclusion: CAIRs were well-tolerated and significantly reduced inflammatory markers in vitro and in vivo. CAIRs show promise as novel inflammation-resolving treatments, and evaluating their relative efficacy to current standard of care is warranted.

Uveitis and scleritis – The risk of mortality following the first presentation

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Purpose: To investigate the aetiology of all-cause mortality in uveitis and scleritis.

Method: A retrospective, cross-sectional chart review study was conducted on 2732 subjects presenting with their first episode of uveitis or scleritis to a single-centre hospital between 2006 and 2020. The main outcome was the mortality status of each subject.

Results: Median age of onset of uveitis or scleritis was 45 years (interquartile range [IQR] 32.2-60.9). 49.6% of subjects were female. Idiopathic disease comprised 30.8% of subjects, followed by HLA-B27 in 20.0% and sarcoidosis in 4.7%. 7.2% (N = 196) were deceased at a median follow-up time of 8.0 years (IQR 4.0-11.6). Idiopathic disease was the most common aetiology in subjects that were deceased within one year of presentation (N = 5) and in premature deaths <65 years (N = 11). Mortality peaked in the first seven years following diagnosis, then sharply declines. When adjusted for age, gender and ethnicity, the following aetiologies demonstrated a higher risk of mortality when compared to HLA-B27 (hazard ratio, p-value): intraocular tumours (64.9, p < 0.001), GPA/ANCA positive vasculitis (10.8, p < 0.001), toxoplasmosis (3.8, p = 0.012), sarcoidosis (3.8, p = 0.031), HZV (2.5, p = 0.035), idiopathic (2.2, p = 0.047) and other aetiologies (2.7, p = 0.012).

Conclusions: Idiopathic disease remains the most common aetiology of uveitis. In our study, idiopathic uveitis was the most common aetiology in those deceased within

the first year and in premature deaths. This study demonstrates the importance of careful systemic evaluation in patients presenting with the first episode of uveitis or scleritis. Repeating select investigations should be considered in those with idiopathic disease.

Ibrutinib-related uveitis: A case series and discussion of ocular toxicities secondary to oral chemotherapeutic agents

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Purpose: The use of oral chemotherapeutic agents, in particular small molecule kinase inhibitors, has increased over recent years. Ocular adverse reactions, while increasingly reported, remains poorly understood. To the best of our knowledge, we report the first four cases of ibrutinib-related uveitis and present a summary of the literature reporting ocular toxicities of oral chemotherapeutic agents.

Method: We report four cases of ibrutinib-related uveitis. Each case required a diagnosis of uveitis by a fellowship-trained ophthalmologist, negative investigations for other causes of uveitis and the use of ibrutinib. A comprehensive literature review was conducted for ocular side effects of oral chemotherapeutic agents.

Results: All cases were treated for chronic lymphocytic leukaemia with ibrutinib. Two males and two females were reported, ranging from 60–66 years of age and ranging from 1–3 years of ibrutinib treatment. Altogether, a literature review encompassed five classes of oral chemotherapeutic agents, with 42 individual medications reviewed. All parts of the eye have been reported to have potential adverse effects. In the anterior segment, corneal erosions, ulcers, and perforation, subconjunctival haemorrhage, conjunctivitis, abnormal lacrimation and uveitis have been reported. In the posterior segment, vitreous haemorrhage, chorioretinopathy, retinopathy, serous retinal detachment, retinal vascular occlusion, retrobulbar neuritis and optic neuritis have been reported.

Conclusion: While ibrutinib and other kinase inhibitors are generally well-tolerated, there are increasing reports of ocular toxicities, including uveitis. An understanding of an overview of ocular toxicities of oral chemotherapeutic agents is beneficial to monitor patients for potential ocular adverse effects and facilitate rapid ophthalmological assessment.

Ocular involvement in Behcet's disease: How often is the diagnosis delayed at first presentation, and does it make a difference?

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Purpose: Persistent, blinding uveitis is a frequent manifestation of Behcet's disease (BD), a multisystem vasculitis. However, the diagnosis may be delayed if other systemic features are not apparent at first ocular presentation. Here, we assessed how often this occurs and whether this resulted in poorer visual outcomes.

Method: Retrospective case series of patients from the Royal Victorian Eye and Ear Hospital from 1990 – 2018 who met the revised International Criteria for Behcet's Disease (ICBD).

Results: Forty-two patients (33 males; median age 30 years) were followed-up for a median of 6.4 years. Most patients (N = 28) developed ocular disease prior to non-ocular symptoms. Twenty-seven patients met ICBD criteria at first ocular presentation (Group A) and the commonest systemic manifestations were oral (N = 25) and genital ulcers (N = 8). During follow-up, oral ulcers (N = 14) was the most frequent feature leading to ICBD fulfilment in fourteen patients (Group B) over a median of 14 days (interquartile range 5 – 438). Mean logMAR visual acuity of the worse eye at initial presentation, and at one and five years thereafter was 0.651, 0.466 and 0.812 in Group A vs 0.685, 0.329 and 0.996 in Group B (p > 0.5 for all).

Conclusion: Oral ulcers was the commonest systemic manifestation leading to BD diagnosis at first ocular presentation and thereafter. Delayed BD diagnosis did not result in a poorer outcome, however our study was underpowered in this regard. Nonetheless, initial ocular involvement in BD caused significant vision impairment, although good recovery was noted by 5 years of follow-up.

Herpetic uveitis: The effect of prophylactic medications following cataract surgery

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Purpose: To investigate outcomes in eyes with herpetic uveitis following intra-ocular surgery.

Methods: Retrospective cohort study of patients with herpetic uveitis undergoing cataract surgery from the Royal Victorian Eye and Ear Hospital, Melbourne, from 2007 through to 2020[SR1].

Results: Sixteen patients (11 females) with aqueous PCR-confirmed recurrent/persistent herpetic uveitis were reviewed: six eyes with Herpes simplex and 10 eyes with Varicella Zoster. Median age at initial diagnosis was 68 years (range 52-88), and 71 years (range 54-73) at the time of surgery. Median duration of quiescence prior to surgery was 7.8 months (range 0-51). Increased topical steroid was used prophylactically pre-operatively in 67% Herpes simplex eyes ($N = 4$) and 50% ($N = 5$) of the Varicella Zoster eyes. Ten eyes

overall were treated with concurrent antiviral prior to surgery (one with aciclovir ointment; nine with oral antiviral). In nine of 16 eyes topical steroids were ceased completely within a median of 23 weeks following surgery, which led to a relapse in six of the nine. Four of six relapses had no oral antiviral coverage at the time.

Conclusion: Increasing topical steroid with ongoing antiviral treatment was the preferred prophylactic measure used in herpetic uveitis prior to cataract surgery. Oral antiviral treatment appears effective in reducing relapses. Complete cessation of topical steroid post-operatively was associated with high rates of relapse, particularly in the absence of concurrent antiviral prophylaxis and this should therefore be done extremely cautiously.

AUTHOR INDEX

- Abbondanza M 863, 864
 Abbott C 958
 Abbott CJ 953, 954, 959, 962, 966
 Abdul-Rahman A 859
 Abell R 945
 Abreu F 834
 Abu-Bakra M 907
 Agar A 815, 851, 853, 913, 915, 916, 918, 934, 936, 947, 967
 Agarwal A 819
 Agrawal P 907
 Ah-Moye S 907
 Ahmed S 931
 Akambase J 944
 Al-Ani HH 876, 974
 Al-Yasery E 902, 926, 968
 Ali H 960
 Ali N 845
 Allbon D 843
 Allen P 861, 934, 964, 965, 968
 Allen PJ 933, 954, 959, 962, 966
 Alpins N 946
 An D 962
 Anand K 844
 Andric M 805, 899
 Angelo L 900, 901
 Anjoy MD 903
 Ao J 950
 Apel A 864, 877, 887
 Apel J 877
 Armitage J 971
 Armstrong JJ 909, 975
 Arnalich F 862
 Arnold-Reed D 899
 Arora R 841
 Arslan J 809, 949
 Arthur CRG 817, 931
 Ashraf G 809
 Asik K 834
 Athanasiov P 878
 Athavale D 945
 Athavale DD 819
 Atik A 860
 Au B 860, 861, 902
 Au BWY 878
 Avci L 931
 Ayton LN 949, 959, 962, 966
 Baglin EK 954, 959, 962, 966
 Bahrami B 892
 Bai A 942
 Baker-Smith V 933, 934
 Bala C 878
 Balachandran C 948
 Balaratnasingam C 834, 953, 962
 Bandello F 832
 Barkley MR 941
 Barnes N 954, 959, 962, 966
 Barnett CP 812
 Barnett T 933, 934
 Barranco JJE 832
 Barrett G 879, 880
 Barteselli G 829
 Bartimote C 928, 929
 Basu K 834, 835
 Beaumont J 880
 Beban G 863
 Belin MW 888
 Bennett J 966
 Berry EC 812, 851, 853, 893, 910, 916, 919
 Beswick R 841
 Bharadwaj A 844
 Bhatt UK 837, 868, 894
 Bhayana AA 875, 957
 Bhikoo R 949
 Bhosale A 963
 Bigirimana D 838, 860, 908
 Bliss C 833
 Bondonno CP 896
 Bondonno NP 896
 Bouillaud E 832
 Bourke RD 952
 Bowditch E 970
 Boyd RN 840, 940
 Boyer D 833
 Braatvedt G 863
 Breen J 854, 893, 910
 Breeze F 804
 Briggs RJ 954
 Brooks J 943
 Brown D 832
 Brown J 828
 Browning S 933
 Browning SD 924, 930
 Buck D 903, 938
 Burgess J 897
 Burlutsky G 896, 900
 Byun Y-S 879
 Cabrera-Aguas M 869, 892, 894, 929
 Campbell T 902
 Carden SM 943
 Carneiro G 913
 Carrillo C 882, 897
 Cartwright D 842
 Caruso E 815, 831
 Casson R 851, 853, 892, 897, 913
 Casson RJ 853, 916, 950
 Cataract 868
 Catran AJ 947
 Chakrabarti R 809, 931
 Chakraborty K 856
 Chalakkal RJ 931, 937
 Chan E 894, 921, 932
 Chan W 871, 892, 950, 970
 Chan WO 840, 872, 910, 957
 Chang A 829, 952
 Chang AA 955, 956, 970
 Chang LY-L 946, 947, 948
 Channell J 936
 Charng J 845, 953
 Chatfield M 840
 Chatfield MD 940
 Chaudhry SG 952
 Chaudhry S 887, 944
 Chen E 898
 Chen F 951
 Chen FK 813, 831, 949, 953
 Chen Y-S 846
 Cheng J 869, 870, 875, 904, 910
 Cheng S 969
 Cherepanoff S 920
 Chew G 925
 Chhabra M 819
 Chiang MY 854



- Chiang MYM 852
Chidlow G 950
Chilibeck CM 860, 933
Chiu D 959, 965
Chiu ZK 902, 976
Chong C 843
Chong EW 894
Chow J 886
Choy W 935
Choy WOCK 935
Chu E 970
Chu S 938
Chung CWT 961
Chung D 966
Chung D 968
Chung IY 860, 903, 921, 938
Chung I-Y 902
Chung S-H 879
Chung-Wah-Cheong J 962
Clark A 916
Clark B 968
Clarke L 908
Cohen LM 820
Cohn AC 831
Cohn G 868
Conn J 809, 951
Constable IJ 813
Constable P 945
Cook J 936
Cornea 869
Cornish EE 960, 961
Cornish E 846
Coroneo M 935
Coroneo MT 815, 936, 947
Cracknell R 896
Craig A 919
Craig J 870
Craig JE 812, 850, 851, 853, 854, 893, 910, 913, 915, 916, 919
Crawford G 883
Crock C 809, 900, 902
Cronin B 852
Crowe S 869
Crowston J 911
Dadeya S 841
Dai S 840, 843, 940, 942
Daley JR 805, 894, 899
Daley J 936
Dalziel DM 895
Damato BE 922
Dameer A 932
Danesh-Meyer H 919
Danesh-Meyer HV 814, 855, 857, 902
Dang D 967
Dave T 822
Davis G 820
Dawes LC 918
Dawkins R 968
Dawkins RCH 959
De Roach JN 813
Deschatelets P 833
Detaram HD 896
Deva N 974
Dhanji DD 920
Dhariwal M 878
Dimitri M 925
D'Mellow G 854
Dobson R 936
Dong M 932
Dong MR 973
Doukas FF 947
Downie L 929
Drack AV 966
Drummond K 855
Drury B 914
Dubowsky A 893
Dubowsky J 910
Duffy S 841
Dunn H 909
Dunn HP 914, 924, 930, 936
Durkin S 871, 950
Dutt DDDCS 839
Dutta P 844
Ebeling PR 924
Edwards TL 949
Eghtedari Y 887
Egodage C 896
El-Nahrawy M 838
Elder JE 854
Emanuelli A 832
Enright NJ 900
Epp S 954
Even N 815
Evens T 918
Ewans L 961
Fagan X 809, 951
Fairley C 883
Fajardo A 876
Fajardo-Sanchez J 907
Fang W 958
Fauser S 830
Ferdi AC 891
Fernandes P 890, 905, 960
Fernando M 813
Figueira J 832
Findlay Q 954
Fiori S 940
Flanagan JPM 922
Fleck S 926
Fletcher E 954
Foster LJR 950
Franchina M 845
Francis IC 918, 934, 947, 967
Francois C 833
Fraser C 920, 930
Fraser CL 928, 929, 936, 960
Fraser-Bell S 834, 955, 956
Freundlich S 900, 901
Fry C 829
Fung A 952, 956
Fung J 904
Fung M 909
Furtado JM 845
Gal A 819
Galanopoulos A 851, 853, 913, 915, 916
Gardner L 875, 904
Garwag J 832
Gaskin JF 905
Geary RS 830
Gerendas B 834
Gharahkhani P 851
Giannouladis K 907
Gibbins A 912
Gilhotra J 871, 950
Gilkes L 899
Gill HK 814
Gillies M 831, 938
Gillor GI 903
Girolamo ND 887
Glance D 916
Glaucoma 869
Go CZ 864, 874, 906, 956
Go CZQ 924
Goel R 811, 819, 892
Goggin M 881
Goh J 846
Goh JKS 976
Goh KL 953, 958
Gokul A 804, 860, 884, 885, 888, 900, 901, 933
Goldberg I 854
Gole G 854
Gole GA 840, 940
Golzan M 896
Gonzalez-Cordero A 813

- Goodwin T 972
Gooley KR 931
Gopal B 890, 905, 960
Gopinath B 896, 900
Gorbatov M 932
Goyal S 907
Graham S 851, 853, 943
Graham SL 851, 853, 856, 913, 915, 917
Grealish A 916
Greco M 927
Green C 838, 860, 905, 908
Green M 886
Green MD 852
Greenan E 889
Grigg J 842, 905, 920, 968
Grigg JR 813, 960, 961
Grossi F 833
Gruen R 904
Gu B 954
Guest D 809, 951
Guest S 810, 812, 846, 901
Gunasagaran HL 957
Gunasekaran N 922
Gunasinghe HN 911
Guo B 860, 861, 897, 900, 925
Gupta A 864, 878
Gupta V 832, 851
Gupta VK 856, 917
Guymer R 815, 954, 958
Guymer RH 830, 831, 833, 835, 953, 958
Guzzetta A 840, 940
Gwoda A 970
Ha J 811
Haddad F 907
Hadden P 804
Hadden PW 897
Hadoux X 911, 958, 967
Halim WHWA 953
Hall AJ 964, 973, 976
Hallot T 914
Hamilton RA 922
Han D 805, 833
Han JV 860
Han L 898
Han X 853, 916
Hardy T 821, 822
Harper CA 831
Hart C 868
Hashmi F 926
Haskova Z 834
Hassall M 838, 917
Hassall MM 851, 853, 893, 910, 916
Hawley L 844
Hawley LJ 902
He G 924, 948
Healey P 852, 853
Healey PR 851, 853, 913
Health E 869
Healy PR 915
Heerden AV 860, 861, 878, 902
Heier J 833
Hennessy MP 815
Hepschke J 935
Hepschke JL 815, 936
Hewitt A 908
Hewitt AW 851, 853, 911, 913, 915, 916
Heydon P 805, 875, 899, 904
Hickey DG 949
High KA 966, 968
Hodgson JM 896
Hodgson L 815
Hodgson LAB 831, 953, 958
Holland J 878
Hollitt G 851, 853, 910
Hollitt GL 812, 853, 911, 916
Holz FG 835
Holz F 833
Hong CY 817
Hong S 937
Hong T 955, 956, 970
Hossain R 804
Hossain RR 810, 812, 823, 901
House P 839, 859
Howes F 863, 947
Hu A 828
Hu ML 949
Huang JJM 918, 934, 967
Huang S 820, 970
Hui F 911
Hull S 919
Humayun M 828
Hunter D 886
Hunter DS 893
Hunter M 845
Hussain A 822
Hussein SH 953
Hussey M 893
Hutnik CML 908, 909, 975
Huynh V 905
Isaacs M 842
Ison M 877
Iyer A 918
Jaffe GJ 834
Jamieson R 905
Jamieson RV 813, 960, 961
Jang KH 888
Jannaud M 958
Jao K 942
Jaross N 965
Jay Meyer J 876
Jeffery RCH 813
Jessup B 933, 934
Jiang IW 918, 934, 967
Jiang J 856
Jobling A 954
Johnson D 966
Jongue E 939
Juniat V 818, 820, 822, 925
Justis Ehlers P 952
K V 941
Kailani O 907
Kalantary A 926
Kalas DS 935
Kalas T 921
Kalita IR 920, 941, 942
Kam AW 924
Kam J 931
Kandel H 863, 864, 891
Karaconji T 842
Karapanos L 966
Karri R 855, 911
Karthik H 939
Katahanas G 928
Katahanas GL 886, 927
Kaufman D 829
Kaur S 872, 944
Kaushik S 805, 870, 896, 899
Keane MC 911
Keay L 930, 933, 936
Keel R 841
Keel S 971
Kentler WG 954, 959, 962, 966
Kerdraon Y 862
Khalil R 889, 906
Khan M 923
Khan MA 861, 918, 947
Khanal S 933, 934
Khanam S 819
Khokhar S 875
Khong EWC 951
Khong JJ 870, 924
Khoo CL 805, 899
Khoo P 862, 889, 890



- Khoo YJ 918
Kim HS 879
King A 907
Kiser P 975
Klebe S 893, 910, 916, 919
Knight LSW 812, 850, 851, 853, 854, 893, 910, 916
Koay A 911
Kokavec J 920
Kolic M 954, 959, 962, 966
Kolovos A 913
Kong CF 823, 864, 874, 922
Kong G 807
Korsakova M 960
Kowalski T 871
Kraft S 939
Kras A 938
Kulkarni A 907
Kumar H 958
Kumar P 844
Kumar R 944
Kumar S 819
Kumar V 957
Kuruvilla S 910
Kvansakul J 954, 959, 962, 966
Kwon MS 886
Lacey S 968
LaHood BR 881, 882
Lake S 910
Lamey TM 813
Lami H 875, 904
Landers J 851, 853, 910, 913, 915, 916
Lascaratos G 907
Lawless M 948
Lawless MA 882
Lawrence AL 843
Le T 952
Lee A 869, 870, 875, 886, 904, 910, 936
Lee G 852
Lee GA 852, 871, 907, 930
Lee J 859
Lee L 828, 969, 971
Lee LR 872
Lee M-HH 939
Lee NS 876
Lee SSY 806
Lemp-Hull J 882
Leong J 922
Leroy BP 966
Leung KFC 896
Leung V 908
Lewis JR 896
Lewis JS 913
Li J 944
Li RJ-C 860
Li S 888
Li Y 841, 843, 883, 885, 888, 940
Liew G 805, 832, 896, 899
Lightman S 845
Lim J 804, 975
Lim KS 907
Lim L 845, 846
Lim LL 809, 951, 964, 973, 976
Lim MY 873
Lim R 906
Lim W 970
Lin H 835
Lin M 918, 936
Lin M-L 976
Ling C 976
Ling DL 947
Ling MLH 891
Lingham G 806
Lisa Kearns S 854
Lisia Ferreira B 845
Liu H 909, 975
Liu W 916
Liu Z 949
Liz Insull E 880
Lo J 813
Logan B 869, 910, 932
Loh L 945
Loh RSK 945
Loi TH 813
Lovicu FJ 950
Lu LM 876, 885
Lunasco L 952
Luu C 958
Luu CD 831, 954, 959, 962
Luu S 854
Ly M 894
Ma S 845
MacGregor S 853, 911, 913, 916
Macken P 896
Mackey D 908
Mackey DA 806, 845, 854, 911
Macri C 818, 840, 872, 892, 957
Madge S 926
Maguire AM 966
Mah L 909
Mahady K 923
Mair M 938
Mak JKC 963
Makadia S 829
Makam R 863
Makeyeva G 958
Males J 891, 892, 946
Males JJ 871, 876
Males S 892
Malik R 945
Malhotra V 829
Mancuso C 905
Manners S 897
Manta AI 820, 870
Marshall H 851, 893, 910, 913
Marshall HN 812, 853, 916
Mathan J 932
Matthews B 868
Mayo M 804, 878, 911
McBride K 899
McCaleb ML 830
McCartney PJ 946
McCluskey P 846, 930, 932, 936, 961
McCluskey PJ 842
McDonald MA 964
McGhee C 863, 884, 900, 901
McGhee CNJ 804, 860, 888, 933
McGuinness MB 959
McGuinness M 965, 971
McGuinness MB 924, 949, 966
McKelvie J 804, 810, 812, 823, 878, 880, 883, 884, 888, 898, 901, 911, 927, 928
McKelvie P 821
McLintock C 879, 880, 883, 884, 927, 928
McNab A 820, 821, 926
McNab AA 925
McNeely D 822
Mehta H 938
Meikle PJ 916
Meng X 952
Mercieca K 914
Merriman M 812
Meulenens L 916
Meyer J 829, 855, 885
Mills RA 851, 853, 893, 910, 916
Mingo D 862
Mishra M 844
Misra S 804, 863, 901
Mitchell P 832, 833, 896, 900
Mohd R 953
Mok A 956
Molan A 845
Moloney G 894
Moloney T 969, 971



- Mones J 833
Moore P 957
Morgan B 916
Morgan WH 918
Morlet N 897, 916, 938
Morrall M 829
Mouttappa F 941
Mudri J 837, 951
Mullany S 812, 851, 853, 854, 893, 910, 913, 916, 919
Munsie MM 929
Murphy CC 889, 906
Murthy V 875
Murthy VS 904
Mustafar R 953
Mustafic N 960, 961
Ní Gabhann-Dromgoole J 889
Nagpal VA 844
Namkung S 860
Nanaware P 936
Nanayakkara U 923
Nankervis A 809, 951
Nash B 813
Nash RM 961
Nayagam DAX 954, 959, 962, 966
Neef GRR 914
Neuro-ophthalmology 870
New-Tolley J 919
Ng J 897, 916
Ng K 922, 968
Ng SGJ 901, 925
Ngah NF 832
Nguyen AAK 892
Nguyen EVH 907
Nguyen R 904
Nguyen T 851, 853, 910, 916
Nguyen TT 853, 915
Niederer R 845, 846, 902, 949, 973, 975
Niederer RL 814, 844, 860, 876, 972, 974
Nieuwenhuysen CV 927, 928
Niyazmand H 879, 880, 884
Northey L 912
Northey LC 869
Nouansavanh KO 897
Nugent R 875, 904
Nygaard S 897
Obamiro K 933, 934
Obtinalla C 965
Oculoplastic/Orbit 870
O'Day R 922, 973
O'Donnell B 924, 925
O'Donnell BA 819
O'Donoghue E 936
Ogbuehi K 937
Ogra S 926
Oh L 887
Oh S 823
O'Hare F 949
Okada M 965
O'Keeffe B 931
Ong A 973
Ong EL 904
Ong JKY 946
Ong K 873, 874, 876, 938
Ong MY 953
Ooi L 886, 915
O'Rourke M 821, 925, 926
Oskam JA 922, 968
Osuagwu UL 805, 899
Other 871
Pérez-Vives C 946, 948
Palmer LJ 913
Pandya V 959
Papa BM 914
Parija S 856, 944
Park E 936
Park J 927, 928, 969
Parnell M 907
Patel C 870, 882, 883, 897
Patel S 818, 822
Paul R 964
Paul Healey A 916
Perera N 947
Perez-Vives C 947
Perl N 907
Peters M 971
Petoe MA 954, 959, 962, 966
Petsoglou C 823, 920, 922, 931
Phakey S 964
Pham R 851, 913
Philip SS 840, 940
Pitman AG 918
Polkinghorne P 949, 974
Poulos CJ 895
Prasad P 875
Prea S 807
Prem-Senthil M 945
Qassim A 851, 853, 854, 893, 910, 913, 916
Quach W 946
Quah XM 862
Quinlivan A 919
Quinn M 908
Ragunath P 970
Rahman A 918
Raj PR 815, 958
Raja V 963
Rajagopalan S 905, 961
Ram J 944
Raman P 906
Rana K 818, 822
Rathi H 878
Raut A 819
Rauz S 862
Ravichandran S 880, 916
Razavi H 829, 936
Reape K 968
Reape KZ 966
Redmayne JK 952
Reese JL 952
Retina 871
Retsas S 961
Ribeiro R 833
Richards J 837, 839, 859
Ridge B 850, 851, 853, 911, 912, 916
Roberts TV 895
Robman L 958
Rodda S 896
Rodrigues I 907
Roelofs KA 922
Roger SL 976
Rogers M-L 961
Rogers S 976
Rogers SL 809, 951
Romeo JMA 933
Rootman DB 820
Rose LV 943
Rothschild P 902
Rothschild PS 971
Ruddle JB 812, 854
Ruiz CQ 835
Russell SR 966
Ryan T 860
Ryan TG 925
Saakova N 960
Sachdev P 856
Sadiq A 817
Sadler CHJA 895
Saeed P 822
Saha P 906
Sahhar L 838



- Sahoo B 913, 916
Sahu J 841
Saks D 913
Saks DG 851
Sakti DH 960, 961
Samalia P 846, 974
Samalia PD 844, 974
Samarawickrama C 861, 864, 874, 886, 893, 894, 923
Sanfilippo PG 806
Sarici K 952
Sarossy M 811
Sartor L 893, 912
Sasongko MB 809, 932, 951
Satchi K 820
Scheetz J 971
Scheidl S 834
Schneider E 830
Schulz A 851, 853, 856, 915
Schulz AM 943
Scopelliti A 905
Scott DAR 897
Scott J 877
Scott TM 871, 872, 907, 931
Scotter L 908
Selby A 918
Selva D 818, 820, 822, 925, 957, 970
Senthil MP 850
Seo S 879, 880, 915, 969
Sevgi DD 952
Shah S 842, 940, 942
Shapira Y 818, 822
Sharda S 841
Sharma A 969, 971
Sharma J 902
Sharma N 937
Sharma R 941, 961, 972
Sharpless MJ 923
Sheen-Ophir S 880
Shen T 851, 856, 917
Sheriff S 851, 856, 917
Shew W 857, 949
Shirke S 931
Shub A 809, 951
Shulruf B 935, 936
Shulz A 916
Sia D 871
Siemerink M 949
Siggins T 905
Siggs OM 812, 851, 853, 854, 893, 910, 911, 913, 916, 919
Silverman D 834
Simmons D 805, 899
Simon S 838, 917
Sims J 845, 846, 973, 975
Sims JL 844, 972, 974
Simunovic M 966
Singh G 957
Singh HV 920, 942, 963
Singh R 833
Singh V 898
Singh-Grewal D 842
Sivarajah P 815, 831
Slater J 863
Slattery J 919
Small K 968
Smith D 939
Smith JE 854
Smith JR 845
Soares B 838, 905
Souied E 832
Souksamone K 897
Sousa D 968
Souzeau E 812, 850, 853, 854, 893, 911, 912
Spencer S 935
Spencer SKR 936
Spoonner K 955, 956
Squirrell D 805, 833, 898
Srivastava SK 952
Staffieri S 908
Staffieri SE 850, 854
Stamatelatos G 946
Stanaway FF 895
Stapleton F 862
Staurengi G 833
Stead R 907
Steinle N 833
Strabismus 872
Stretton B 838, 917
Sukhija J 872, 944
Sukumaran S 919
Sullivan L 864
Sullivan TJ 820, 870, 923
Sun M 957
Sun MT 970
Surgery R 871
Symons A 855
Symons RCA 809, 951
Tadayoni R 834
Taher A 886, 939
Tan J 950
Tan KS 953
Tan Y 897, 917
Tan Y(I) 871
Tang J 876
Tangarorang J 899
Tanner A 907
Tao LW 943
Taranath DA 812, 854
Tavassoli S 926
Taylor A 904
Taylor HR 903
Teo I 859
Thangaraj SK 868
Thia B 924, 932
Thompson C 936
Thompson JA 813
Thomson D 930, 936
Thomson DW 915
Thong K 907
Tindill N 831
Ting E 907
Titchener SA 954, 959, 962, 966
To M-S 913
Toalster N 921
Tomkins-Netzer O 845, 846
Torda A 933
Tran D 976
Trang E 918
Triksa S 907
Tuli R 832
Tumuluri K 944
Turner A 811, 829
Vaghefi E 805, 833, 898
van Wijngaarden P 911, 922, 967, 968, 971
Varma S 931
Vaze A 932
Veivers D 924
Vellara H 885
Vellayutham V 805, 899
Verma N 945
Vincent AL 854, 949
Vincent SJ 907
Vines J 834
Vingrys A 807
Vinokurtseva A 908, 975
Viriato D 968
Viswanath S 841
Viswanathan D 891, 892, 946
Vittorio A 820
Vo ML 893
Vu KV 896
Vukicevic M 965
Vukmirovic A 918

- Wadhwa H 888, 972
Wai M 908
Waldie A 957
Walker JG 959
Wallace H 888
Wallace HB 810, 885
Walsh A 959
Walsh LG 937
Wan M 939
Wang AT 937, 972
Wang J-H 949
Wang L 832
Wang MTM 857
Wang N 949
Wang X 805, 894, 899
Watanabe A 822
Watson S 862, 887, 889, 890, 892, 894, 900, 928, 929
Watson SL 863, 864, 869, 891, 929, 950
Wechalekar MD 919
Welch S 949, 974
Wells J 870
Wells K 900, 903, 938
Wells M 912
Wen Q 874
Wen W 856
White A 864, 874, 912, 930
White AH 936
White AJ 869
White PJR 914
Whitten J 878
Whyte J 961
Whyte JP 930, 972
Wickremashinghe SS 831
Widyaputri F 809, 951
Wilks S 841
Willett F 854
Williams CE 954
Williamson J 969
Wilsher M 845
Wilson GA 897
Wilson-Pogmore A 937, 969
Wilson-Pogmore AA 915
Witherow JL 914
Wolf S 832
Wolpert LE 895
Wong C 957
Wong CX 970
Wong ELS 873, 889, 890, 918
Wong J 833
Wong JG 955, 956
Wong K 873
Wong N 926
Wong TY 835
Wong W 871, 872
Woo KI 822
Wood J 950
Wu K 900
Wu Z 815, 831, 953, 958
Wykoff C 833
Xie L 805, 833
Xiong J 909
Xu ZY 902
Xuan R 873, 874, 876, 938
Yan W 900, 921, 964, 965
Yang S 805, 833, 879
Yang Y(L) 819
Yao A 932
Yap A 805, 898
Yasery EA 860
Yates W 959
Yazar S 806
Yeoh J 954, 959
Yoneda A 822
Yong MH 953
Yoshioka N 933
You Y 856, 917
Young IM 877
Yu DY 918
Yu D-Y 962
Yu-Wai-Man C 907
Yu Z-F 966
Zagora SL 842
Zaheer A 961
Zahid R 952
Zahidin A 922
Zain AM 953
Zhang H 935
Zhang J 860
Zhang S 937
Zhang W 895
Zhou T 893, 910
Zhu EYQ 976
Ziaei M 884, 885, 888, 900, 901

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MINIMUM PRODUCT INFORMATION EYLEA® (aflibercept (rch)) INDICATIONS: EYLEA (aflibercept) is indicated in adults for the treatment of neovascular (wet) age-related macular degeneration (wet AMD); visual impairment due to macular oedema secondary to central retinal vein occlusion (CRVO); visual impairment due to macular oedema secondary to branch retinal vein occlusion (BRVO); diabetic macular oedema (DME); visual impairment due to myopic choroidal neovascularisation (myopic CNV). **CONTRAINDICATIONS:** Known hypersensitivity to aflibercept or excipients; ocular or periocular infection; active severe intraocular inflammation. **PRECAUTIONS:** Endophthalmitis; increase in intraocular pressure; immunogenicity; arterial thromboembolic events; bilateral treatment; risk factors for retinal pigment epithelial tears; treatment should be withheld in case of rhegmatogenous retinal detachment, stage 3 or 4 macular holes, retinal break, decrease in best-corrected visual acuity of ≥ 30 letters, subretinal haemorrhage or intraocular surgery; treatment not recommended in patients with irreversible ischemic visual function loss; population with limited data (diabetic macular oedema due to type 1 diabetes, diabetic patients with HbA1c $> 12\%$, proliferative diabetic retinopathy, active systemic infections, concurrent eye conditions, uncontrolled hypertension, myopic CNV; no experience in the treatment of non-Asian patients, previous treatment for myopic CNV and extrafoveal lesions); see full PI for effects on fertility, pregnancy, lactation, effects on ability to drive or use machines. **ADVERSE EFFECTS:** Very common: visual acuity reduced, conjunctival haemorrhage, eye pain. Common: retinal pigment epithelial tear, detachment of retinal pigment epithelium, retinal degeneration, vitreous haemorrhage, cataract, cataract cortical, cataract nuclear, cataract subcapsular, corneal erosion, corneal abrasion, intraocular pressure increased, vision blurred, vitreous floaters, vitreous detachment, injection site pain, foreign body sensation in eyes, lacrimation increased, eyelid oedema, injection site haemorrhage, punctate keratitis, conjunctival hyperaemia, ocular hyperaemia. Others: see full PI. **DOSAGE AND ADMINISTRATION:** 2 mg aflibercept (equivalent to injection volume of 50 μ L). EYLEA is for intravitreal injection only. The interval between doses injected into the same eye should not be shorter than one month. Advice on treatment initiation and maintenance of therapy specific to each patient population is described in the section below. Once optimal visual acuity is achieved and/or there are no signs of disease activity, treatment may then be continued with a treat-and-extend regimen with gradually increased treatment intervals to maintain stable visual and/or anatomic outcomes. If disease activity persists or recurs, the treatment interval may be shortened accordingly. Monitoring should be done at injection visits. The monitoring and treatment schedule should be determined by the treating ophthalmologist based on the individual patient's response. If visual and anatomic outcomes indicate that the patient is not benefiting from continued treatment, EYLEA should be discontinued. **For wet AMD:** Treatment is initiated with one injection per month for three consecutive months, followed by one injection every two months. Treatment interval may be maintained at 2 months or further extended using a treat-and-extend dosing regimen, by increasing injection intervals in 2- or 4-weekly increments. If visual and/or anatomic outcomes deteriorate, the treatment interval should be shortened to a minimum of 4 weeks. Generally, once optimal visual acuity is achieved and/or there are no signs of disease activity, the treatment interval may be adjusted based on visual and/or anatomic outcomes. The dosing interval can be extended up to every 4 months. **For CRVO:** Treatment is initiated with one injection per month for three consecutive months. After the first three monthly injections, the treatment interval may be adjusted based on visual and/or anatomic outcomes. **For BRVO:** Treatment is initiated with one injection per month for three consecutive months. After the first three monthly injections, the treatment interval may be adjusted based on visual and/or anatomic outcomes. **For DME:** Treatment is initiated with one injection per month for five consecutive months followed by one injection every two months. After the first 12 months, the treatment interval may be adjusted based on visual and/or anatomic outcomes. **For myopic CNV:** EYLEA treatment is initiated with one injection of 2 mg aflibercept (equivalent to 50 μ L). Additional doses should be administered only if visual and/or anatomic outcomes indicate that the disease persists. Recurrences are treated like a new manifestation of the disease. **DATE OF PREPARATION:** Based on PI dated 31 July 2020.

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