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The Royal Australian and New Zealand College of
Ophthalmologists

53rd Annual Scientific Congress

28 October – 1 November 2022

Brisbane Convention & Exhibition Centre, Brisbane

PROGRAM AND ABSTRACTS



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Clinical & Experimental Ophthalmology



The Royal Australian and New Zealand College of Ophthalmologists
53rd Annual Scientific Congress
28 October – 1 November 2022

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Clinical and Experimental Ophthalmology (CEO) is committed to building a publishing culture of diversity, equity, and inclusion. *CEO* strives to increase the participation of women, those from underrepresented cultural groups, early career professionals, and those from all regions of the world as Section Editors, Editorial Board members, authors, and peer reviewers. As the journal of The Royal Australian and New Zealand College of Ophthalmologists (RANZCO), *CEO* acknowledges the Aboriginal and Torres Strait Islander Peoples, the Traditional Owners of Country throughout Australia, and recognises their continuing connection to land, waters and community. We pay our respects to them and their cultures; and to their Elders past, present and emerging. In recognition that RANZCO is a bi-national College, we acknowledge the Rangitiratanga of Māori as Tangata Whenua and Treaty of Waitangi partners in Aotearoa New Zealand.



The Royal Australian and New Zealand College of Ophthalmologists 53rd Annual Scientific Congress

28 October–1 November 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
2022	Prof Ian McAllister

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 to present their work who are not necessarily a member of an academic department. 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
2022	Prof Martin AM



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
2022	Prof Helen Danesh-Meyer



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 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	Dr Catherine Green AO
2022	Prof Clare Gilbert

SCIENTIFIC PROGRAM**SATURDAY 29 OCTOBER**

06:30 - 07:45	Allergan Hosted Morning Symposium Venue: Plaza 1 & 2
06:30 - 07:45	Designs for Vision Hosted Morning Symposium Venue: M4
08:00 - 08:30	Australian Vision Research (AVR) AGM Venue: Great Hall 2
08:30 - 09:00	RANZCO CONGRESS OPENING LECTURE Prof Ben Hamer Venue: Great Hall 2 Topic: The Future of Work Chair: A/Prof Abhishek Sharma
09:00 - 09:30	ONCOLOGY UPDATE LECTURE Prof Sarah Coupland Venue: Great Hall 2 Topic: Update on Ocular Lymphomas: What's New in the WHO Chair: Dr John Mckenzie
09:30 - 10:00	THE FRED HOLLOWS LECTURE Prof Clare Gilbert Venue: Great Hall 2 Topic: Inequity in Eye Health Chair: Prof Adrian Fung
10:00 - 10:30	Morning Tea
10:30 - 11:00	RANZCO PLENARY Prof Nitin Verma AM Venue: Great Hall 2 Topic: Vision 2030 and Beyond Chair: Prof Nitin Verma AM
11:00 - 12:00	AUSTRALIAN VISION RESEARCH (AVR) PLENARY Venue: Great Hall 2 Topic: Five Successful AVR Grants from 2022 Chairs: Prof Stephanie Watson OAM and Dr Jennifer Fan Gaskin
12:00 - 13:30	Lunch



13:30 - 15:00

CONCURRENT SESSIONS**SYMPOSIUM – ANZGS Symposium 2022–Survival Tips from the Glaucoma Experts Part 2****Venue:** Great Hall 2**Chair:** Prof Graham Lee**Co-Chairs:** Dr Ridia Lim, A/Prof Anne Brooks and Prof Ivan Goldberg**COURSE – Ocular Herpes – Beyond Basics****Venue:** Great Hall 3**Chair:** A/Prof Anthony Hall**SYMPOSIUM – Young Fellows Symposium. A Beginner's Guide to Presbyopia Correction****Venue:** Great Hall 4**Chairs:** Dr Bernardo Soares and A/Prof Chameen Samarawickrama**FREE PAPERS – Neuro-Ophthalmology/Paediatric Ophthalmology/Ocular Oncology****Venue:** M4**Chairs:** A/Prof Clare Fraser and Dr Anu Mathew**PROFESSIONAL DEVELOPMENT – The Business of Eyes****Venue:** Great Hall 1**Chair:** Ms Donna Glenn

15:00 - 15:30

Afternoon Tea

15:30 - 17:00

CONCURRENT SESSIONS**SYMPOSIUM – Ocular Oncology – Sunshine State Update****Venue:** Great Hall 3**Chair:** Dr Lindsay McGrath**SYMPOSIUM – Thyroid Eye Disease Symposium****Venue:** Great Hall 2**Chair:** Dr Jwu Jin Khong and Dr Thomas Hardy**COURSE – Minor Corneal Procedures for the Comprehensive Ophthalmologist****Venue:** Great Hall 4**Chair:** Prof Stephanie Watson OAM**FREE PAPERS – Retina****Venue:** M4**Chairs:** Prof Adrian Fung and Dr Mei Hong Tan**PROFESSIONAL DEVELOPMENT – Tools of the Trade****Venue:** Great Hall 1**Chairs:** Dr Nisha Sachdev and Dr Mia Zhang

17:30 - 18:30

Film and Poster Viewing Session

Venue: Exhibition Hall

19:00

Alcon Hosted Evening Symposium

19:00

Roche Hosted Evening Symposium**SUNDAY 30 OCTOBER**

06:30 - 07:45

Zeiss Hosted Morning Symposium**Venue:** M1 & 2



06:30 - 07:45	Bayer Hosted Morning Symposium Venue: M4
08:00 - 08:45	ROYAL AUSTRALIAN AND NEW ZEALAND COLLEGE OF OPHTHALMOLOGISTS (RANZCO) AGM Venue: Great Hall 2
08:45 - 09:15	RETINA UPDATE LECTURE Prof James Bainbridge Venue: Great Hall 2 Topic: Gene Therapy—Opportunities and Challenges Chair: Dr Jennifer Arnold
09:15 - 09:45	UVEITIS UPDATE LECTURE Prof Debra Goldstein Venue: Great Hall 2 Topic: TBC Chair: Dr Robyn Troutbeck
09:45 - 10:15	THE DAME IDA MANN MEMORIAL LECTURE Prof Helen Danesh-Meyer Venue: Great Hall 2 Topic: An Eye on the Brain: Adding Insight to Injury Chair: Prof Charles McGhee
10:15 - 10:45	Morning Tea
10:15 - 10:45	Australian Society of Ophthalmologists (ASO) AGM Venue: M4
10:45 - 12:15	PLENARY-BEST PAPER PRESENTATIONS: Gerard Crock and John Parr Trophies Venue: Great Hall 2 Chairs: Dr Amy Cohn and Prof Clare Gilbert
12:15 - 13:45	Lunch
13:45 - 15:15	CONCURRENT SESSIONS
13:45 - 15:15	SYMPOSIUM – Retinal Imaging: The Best Cases from the RVEEH Angiogram Meeting for 2022 Venue: Great Hall 3 Chair: Dr Amy Cohn COURSE – Cataract Surgery - The Subspecialists' Perspective Venue: Great Hall 2 Chairs: Dr Thomas Campbell and Dr Elsie Chan COURSE – Paediatric Refresher Course for All Ophthalmologists Who See Kids Venue: Great Hall 4 Chairs: Dr Shanel Sharma and Dr Maree Flaherty FREE PAPERS – Rapid Fire Session: Oculoplastic/Orbit Venue: M4 Chairs: Dr Brett O'Donnell and Dr Lindsay McGrath PROFESSIONAL DEVELOPMENT – Registries - What's New, What's Coming and Why you Need to Get Involved Venue: Great Hall 1



Chairs: Dr Hemal Mehta, Prof Graham Lee and Dr Judy Ku

15:15 - 15:45

Afternoon Tea

15:45 - 17:15

CONCURRENT SESSIONS

COURSE – Management Strategies for Common Strabismic Conditions

Venue: Great Hall 1

Chairs: A/Prof Geoffrey Lam and Dr Deepa Taranath

COURSE – Endophthalmitis for General Ophthalmologists

Venue: Great Hall 2

Chair: A/Prof Kristopher Rallah-Baker and Dr Phoebe Moore

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

Venue: Great Hall 3

Chair: Dr Alison Chiu

FREE PAPERS – Epidemiology/Genetics/Public Health/Training and Education

Venue: M4

Chairs: A/Prof Andrea Vincent and A/Prof Samantha Fraser-Bell

19:00 - 23:00

Congress Dinner

Venue: Boulevard Room, Brisbane Convention and Exhibition Centre

MONDAY 31 OCTOBER

06:30 - 07:45

Apellis Hosted Morning Symposium

Venue: M4

08:00 - 08:30

AIOS Surgical Challenges Video Session & Update on Ophthalmology in Afghanistan

Venue: Great Hall 2

08:30 - 09:00

CATARACT UPDATE LECTURE

Prof Graham D. Barrett AM

Venue: Great Hall 2

Topic: Intraocular Lens Selection–Optical Principle of Choice

Chair: Dr Jacqueline Beltz

09:00 - 09:30

THE NORMAN McALISTER GREGG LECTURE

Prof Ian McAllister

Venue: Great Hall 2

Topic: Retinal Vein Occlusion: Where are We and Where are we Going?

Chair: Prof John Grigg

09:30 - 10:00

CORNEA UPDATE LECTURE

Prof Donald Tan

Venue: Great Hall 2

Topic: DMEK, the Artificial Iris and the Virtual Cornea Clinic

Chair: Dr Andrea Ang



10:00 - 10:30	Morning Tea
10:30 - 12:00	PLENARY Clinical Controversies Venue: Great Hall 2 Chair: Dr Ridia Lim
12:00 - 13:30	Lunch
13:30 - 15:00	CONCURRENT SESSIONS SYMPOSIUM – Optimising the Management of Common Corneal Conditions: What do Corneal Specialists Tell Their Patients Part II? Venue: Great Hall 3 Chair: Prof Stephanie Watson OAM SYMPOSIUM – What Happens After You’ve Diagnosed... Venue: Great Hall 2 Chair: Prof Celia Chen COURSE – Advances in Ophthalmic Surgical Education–Where are We at in 2022? Venue: Great Hall 4 Chair: Dr Rahul Chakrabarti FREE PAPERS – Glaucoma/Uveitis Venue: M4 Chairs: Dr Graham Hay Smith and Dr Jennifer Fan Gaskin PROFESSIONAL DEVELOPMENT – Two for One: Matching Ophthalmology to a Sustainable Future AND Patients – Beyond the Eyes Venue: Great Hall 1 Chairs: Dr John McCoombes and Dr Paul Beaumont
15:00 - 15:30	Afternoon Tea
15:30 - 17:00	CONCURRENT SESSIONS COURSE – Glaucoma Boot Camp: A Practical Refresher Course Venue: Great Hall 1 Chair: Dr Catherine Green AO Our Vision in Our Hands: Aboriginal and Torres Strait Islander Eye Health Venue: Great Hall 3 Chair: Dr Guy Gillor SYMPOSIUM – An Update on Sarcoidosis for the Ophthalmologist Venue: Great Hall 2 Chairs: A/Prof Lyndell Lim and A/Prof Samantha Fraser-Bell FREE PAPERS – Cataract/Cornea/Refractive Venue: M4 Chairs: Prof Gerard Sutton and Dr Judy Ku

**TUESDAY 1 NOVEMBER**

06:30 - 07:45	ANZGS Morning Symposium (Sponsored by Allergan) Dr Janey Wiggs Venue: M3 Topic: New Opportunities for Gene-Based Therapy in Glaucoma Chair: Dr Paul Healey
08:00 - 08:30	GLAUCOMA UPDATE LECTURE Dr Janey Wiggs Venue: M4 Topic: Using Genetics for Glaucoma Risk Assessment and Stratification Chair: Dr Paul Healey
08:30 - 10:00	PLENARY Translating Ideas into Innovation with Real Impact Venue: M4 Chair: Prof Gerard Sutton
10:00 - 10:30	Morning Tea
10:30 - 11:00	THE COUNCIL LECTURE Prof Frank Martin AM Venue: M4 Topic: Towards a National Preschooler Vision Screening Program Chair: Dr Caroline Catt
11:00 - 11:30	Congress Close

INVITED SPEAKERS



L01: RANZCO CONGRESS OPENING LECTURE, SATURDAY 29 OCTOBER 2022

Prof Ben Hamer



Synopsis:

The last couple of years have taught us the need to plan for disruption. It has shaken up how we live, work, and do business and in doing so, changed the game for leaders. Now, the number one skill for contemporary leaders is foresight - the ability to understand trends, forecast them into the future, and backcast to then understand what it means for the here and now. It's all about ensuring we're future-fit. In this keynote, Dr Ben Hamer will paint a data-backed picture of the future by walking through some innovations and advancements happening around the world today, demonstrating that the future isn't as far away as we might think. He'll go a little bit deeper on the Future of Work, showing how the way in which we work and our workforces might evolve, and what it all means for mid-career and senior professionals

Brief Curriculum Vitae:

Exclusively represented by Saxton

Professor Ben Hamer is one of Australia's few accredited futurists and is a global expert on the Future of Work. He heads up the Future of Work market for one of the world's leading advisories and has worked at the World Economic Forum, where he led critical projects on the future of work, skills, and education. Ben is a Board Member for the Australian HR Institute, where he was appointed as the youngest Non-Executive Director in the organisation's history and provides expert commentary across Australian media on a regular basis.

Current Work:

Ben has a Doctorate of Public Administration, which included time spent as a Visiting Scholar at Yale University, and is an Adjunct Professor with the Centre for Work and Wellbeing at Edith Cowan University. Coupled with his leading industry experience, Ben has advised ASX CEOs through to Government Ministers. He is a sought-after keynote speaker on the topic of life and work in the future, and what it all means for organisations, leaders, and workers.

Ben is the host of PwC Australia's Future of Work podcast and author of *iThe Kickass Career: How to succeed in the Future of Work, today.*

Contact Details:

www.benhamer.space

L02: ONCOLOGY UPDATE LECTURE, SATURDAY 29 OCTOBER 2022

Prof Sarah Coupland, PhD, MBBS, FRCPath, FARVO



Update on Ocular Lymphomas: What's New in the WHO

Synopsis:

Ocular lymphomas can be divided into ocular adnexal lymphomas (OAL) and intraocular lymphomas. OAL (i.e., those affecting the orbit, eyelids, conjunctiva, lacrimal gland and lacrimal sac) account for approximately 10% of all extranodal lymphomas. Most are primary tumours and are usually non-Hodgkin lymphoma of B-cell type: the most common OAL subtypes are the low-grade malignant extranodal marginal zone B-cell lymphoma (EMZL), followed by diffuse large B-cell lymphoma (DLBCL) and follicular lymphomas. Secondary involvement of the ocular adnexa by both systemic B- and T-non-Hodgkin lymphoma can occur.

Intraocular lymphomas are rare with the most common type being the vitreoretinal lymphoma, which is usually a high-grade DLBCL occurring in the vitreous and retina, and with frequent involvement of the central nervous system. Other intraocular lymphomas are those arising as primary or secondary tumours in the uveal tract, with the most common being a choroidal EMZL.

In this lecture, I will present a brief overview of the upcoming 5th edition of the World Health Organization (WHO) Classification of Haematolymphoid Tumours focussing on lymphoid neoplasms, and how it relates to the above ocular lymphomas. I will highlight and explain pertinent changes from the revised 4th edition, including the reorganisation of entities by a hierarchical system as adopted throughout the 5th edition of the WHO classification of tumours of all organ systems.

Brief Curriculum Vitae:

Prof Sarah Coupland is considered to be a trailblazer in the areas of ophthalmic pathology, haematopathology, molecular pathology and biobanking. Originating from Australia, she is now living in the UK where she is a senior Consultant Histopathologist at the Royal Liverpool University Hospital (RLBUHT) and is also the 'George Holt Chair of Pathology' at the University of Liverpool, England.

She leads the Supraregional Ophthalmic Pathology referral service at the RLBUHT. She is founder and head of the Liverpool Ocular Oncology Research Group (www.loorg.org), which examines ocular melanomas and lymphomas. She was Director of the North West Cancer Research Centre at the University of Liverpool for 5 years (2014–2019). Prof Coupland is current Vice President (Communications) of the UK's Royal College of Pathologists and General Secretary of The Pathological Society. Internationally, she is President of the International Society of Ophthalmic Pathology and Vice-Chair of the Ophthalmic Oncology Committee for the 8th TNM/AJCC Staging System. She contributed significantly to both the 7th and 8th Editions of the TNM/AJCC staging systems for Ophthalmic Tumours, and to the 4th Volume of the WHO Classification of Tumours of the Eye.

Previous posts have included: Association for Research in Vision and Ophthalmology Vice-President 2017–8 and ARVO Trustee in Anatomy-Pathology-Oncology; Eye-Pathology Lead for the European Society of Pathology; and Past-President of the European Ophthalmic-Oncology-Group. She has published ~330 scientific articles (H-index, 53, Scopus), has written ~75 chapters, and has a significant grant income, including Horizon2020 European and National Institutes of Health funding. She has won several awards, including the International Council of Ophthalmology's Eye Pathology Award – given at the World Ophthalmology Congress in Barcelona, 2018 (<https://icoph.org/about-the-ico/ico-awards-and-medals/>) and the 2019 RCPATH Excellence Award (<https://www.rcpath.org/discover-pathology/news/rcpath-excellence-awards-winners-announced.html>). She was included in the Pathologist Power Lists of 2019, 2020 and 2021. She was also listed amongst the Top 100 Influential Women in Ophthalmology in 2021 (<https://theophthalmologist.com/power-list/2021>). Prof Coupland is very active in teaching at both undergraduate and postgraduate level and is a great proponent of academic pathology. She was amongst the Athena Swan Leadership committee of the University of Liverpool and has promoted academic female progression by other means.

Finally, she has given numerous keynote lectures, organised symposia and courses, and regularly has Fellows

from across the globe wanting to receive training in molecular and ophthalmic pathology.

Contact Details:

Email: s.e.coupland@liverpool.ac.uk

L03: THE FRED HOLLOW'S LECTURE, SATURDAY 29 OCTOBER 2022

Prof Clare Gilbert, MB ChB, FRCOphth (Hons), MD, MSc

**Inequity in Eye Health****Synopsis:**

I have chosen this topic as it reflects Fred Hollow's values, mission and passion, yet inequity remains highly relevant to global eye health today. After defining inequity and eye health, regional data from the Global Burden of Diseases will be presented, as well as data from national surveys and other studies in Africa and Asia, highlighting inequity in accesses to eye care services. Reasons for this will be outlined, as well as current opportunities.

Brief Curriculum Vitae:

Prof Clare Gilbert trained in surgical retina and worked as a clinical ophthalmologist in the UK for 10 years. She has worked at the International Centre for Eye Health at the London School of Hygiene and Tropical Medicine, UK since 1990. Her main research interest is blindness in children in low and middle income countries, including refractive errors, retinopathy of prematurity (ROP) and cataract and primary eye care. Her other research interests are glaucoma in sub-Saharan Africa and primary eye care. She has undertaken studies in collaboration with colleagues in Latin America, Africa and Asia.

She is a technical advisor to several non-government organisations including the Vision Impact Institute, Velux Stiftung, the USAID Child Blindness Program and until recently, the Queen Elizabeth Diamond Jubilee Trust (the Trust). Between 2013 and 2019, she provided technical advice to two large scale programs in India for ROP and diabetic retinopathy which were supported by the Trust.

She has facilitated over 30 workshops on ROP in Latin American countries, Vietnam, Central Europe, Ukraine, Russia, Pakistan and Bangladesh. She was a member of a group who contributed to Pan American Health Association's Guidelines on ROP for South and Central America.



Prof Gilbert is an author of 360 peer-reviewed publications (more than 50 on ROP), and has co-authored 27 book chapters. She has received several international awards, including the Jules Francois Golden Award (International Council of Ophthalmology), the International Prevention of Blindness Award (American Academy of Ophthalmology) and the Barrie Jones Award (Royal College of Ophthalmology).

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**L04: RETINA UPDATE LECTURE,
SUNDAY 30 OCTOBER 2022**

Prof James Bainbridge, MA PhD FRCOphth

**Gene Therapy—Opportunities and Challenges****Synopsis:**

The eye has key advantages as a target organ for gene therapy and has provided an exemplar for applications in other organ systems. Targeting of genes to the outer retina may be achieved by transvitreal or transchoroidal approaches to the subretinal space, or by intravitreal injection of vectors modified to traverse the inner retina. Supplementation of genes to surviving retinal cells can dramatically improve the outcome for specific genetic deficiencies. The successful amelioration of RPE65-deficiency in clinical trials and the licencing of voretigene neparvovec have been landmarks in the development of this novel technology to realise the potential for treatment of other genetic retinal diseases; however, several specific challenges must be addressed. The supplementation of large genes will depend on the development of new vector systems that provide greater capacity. Optimal safety and efficacy will demand improved control of both genetic dosing and harmful inflammatory responses. While gene supplementation can help compensate for deficiencies, recent advances in gene editing offer the potential for lasting cure by permanent correction of gene defects. Trials to evaluate the impact of these novel approaches must be designed with reliable and relevant outcome measures that demonstrate improved quality of life.

Brief Curriculum Vitae:

Prof James Bainbridge is a Consultant Retinal Surgeon at Moorfields Eye Hospital London and holds the Chair of

Retinal Studies at University College London. He studied medicine at the University of Cambridge and trained in clinical ophthalmology at Moorfields. His postgraduate academic training, PhD and postdoctoral research at University College London were supported by Wellcome Trust Fellowships and a UK National Institute for Health Research Professorship. As a surgeon-scientist, his aim is to protect and restore sight by developing new treatments for diseases of the retina. His program of translational research extends from the laboratory investigation of mechanisms of disease to clinical trials of new medical and surgical interventions. Awards for his achievements include the US Foundation Fighting Blindness Board of Directors' Award and the 2018 Champalimaud Vision Award. In 2020, he was elected Fellow of the UK Academy of Medical Sciences.

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**L05: UVEITIS UPDATE LECTURE,
SUNDAY 30 OCTOBER 2022**

Prof Debra Goldstein, MD

**Brief Curriculum Vitae:**

Dr Debra Anne Goldstein received her medical degree from McGill University in Montreal, Canada where she subsequently completed an ophthalmology residency. She then pursued a fellowship in uveitis and ocular immunology at McGill, followed by a second fellowship in uveitis at the University of Illinois at Chicago. She has published over 250 peer-reviewed papers and book chapters, and has lectured widely all over the world. She has conducted extensive investigator initiated and multicentre research projects. She has been the recipient of numerous awards and honours including the Senior Achievement Award and the Life Achievement Honor award from the American Academy of Ophthalmology (AAO), the AAO Secretariat Award for special contributions to the Academy, Unsung Hero recognition from the AAO, as well as an AOA clinical teaching award. She was twice awarded the Golden Apple Award for Best Teacher in Ophthalmology when she was a professor at the University of Illinois at Chicago. In April of 2017, she was awarded the prestigious Magerstadt Professorship in Ophthalmology. In 2021, she became an ARVO Silver Fellow. Dr Goldstein is currently the Magerstadt Professor of Ophthalmology as well as the Director of the Uveitis Service in the Department of

Ophthalmology at Northwestern University's Feinberg School of Medicine.

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L06: THE DAME IDA MANN MEMORIAL LECTURE, SUNDAY 30 OCTOBER 2022

Prof Helen Danesh-Meyer, MBChB, MD, PhD, FRANZCO



An Eye on the Brain: Adding Insight to Injury

Synopsis:

The convergence of technological advances opens opportunities for novel ocular biomarkers into brain function and disease. The retina and optic nerve share embryological, anatomical, immunologic responses and molecular findings to the brain. Furthermore, the complex white matter tract which coordinate eye movements provide insights into the brain in both health and disease. New technologies such as amplified magnetic resonance imaging, eye tracking and optical visualisation provide exciting possibilities for paradigm shifts in our approach to neurological disease.

Brief Curriculum Vitae:

Prof Helen Danesh-Meyer is the first female Professor of Ophthalmology in New Zealand and holds the Sir William and Lady Stevenson Chair in Ophthalmology and Head of Academic Neuro-ophthalmology and Glaucoma. She was the youngest appointed professor at the University of Auckland Faculty of Medical and Health Sciences and one of the few women who is professor in a surgical speciality. She is clinician-scientist that divides her time equally between patient care/surgery and research. She has published approximately 200 papers in glaucoma and neuro-ophthalmology, authored several textbooks and chapters and raised over \$15 M in grant funding. Several of her research findings have impacted clinical practice and her research has been featured in the *New Scientist*. She mentored over 20 clinical and research Fellows. She is active in teaching and education, and regularly lectures nationally and internationally. Her clinical expertise includes imaging modalities in neuro-ophthalmology, giant cell arteritis, ischaemic optic neuropathies, the role of astrocytes in optic neuropathies and glaucomatous optic neuropathy. Several

aspects of her clinical research have influenced and altered clinical management strategies in the international arena, in particular her work on imaging of the retinal nerve fibre layer in chiasmal compression. As a neuro-ophthalmologist, she pioneered quantitative evaluation of the optic nerve and its morphological changes using optic nerve imaging modalities such as optical coherence tomography, scanning laser ophthalmoscopy and scanning laser polarimetry. Over the last decades, Prof Danesh-Meyer has established a basic science research unit which investigates mechanisms of injury and repair to the optic nerve and retina. In particular, her research focusses on the temporal and spatial changes of connexin43(Cx43), a gap junction protein following injury. This body of work has identified new therapeutic strategies of modulating Cx43 upregulation which results in neuronal rescue.

She has achieved numerous 'firsts' for a NZ ophthalmologist: first NZ member of the international Glaucoma Research Society (membership determined by research contribution to the field), the first NZ ophthalmologist to be Visiting Professor at Harvard Fall Festival, first Australian or NZ to be appointed to the American Academy of Ophthalmology Basic Clinical Science Course and first NZ ophthalmologist to serve on the Editorial Board of *American Journal of Ophthalmology and Ophthalmology*.

Prof Danesh-Meyer is also an active contributor to the wider community. She is the only NZ ophthalmologist to have been awarded the Paul Harris Award by Rotary for her service to the community. She is a Founding Trustee and Chair of Glaucoma New Zealand, a charitable trust to prevent blindness from glaucoma. She is also presently the Chair of Women in Ophthalmology for RANZCO.

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L07: CATARACT UPDATE LECTURE, MONDAY 31 OCTOBER 2022

Prof Graham D. Barrett AM, MBChB, FRANZCO



Intraocular Lens Selection—Optical Principle of Choice

Synopsis:

Surgeons have many choices today when selecting an intraocular lens (IOL). One of the most important factors to consider is the optical



principle they think best addresses their patient's need for unaided near vision following cataract surgery. For many years, multifocal IOLs with more than one focal plane have been the most common type of IOL implanted for patients requesting spectacle independence. Diffractive IOLs are able to provide excellent unaided vision, but the quality of vision may be compromised and associated dysphotopsia is not uncommon. Intraocular lenses which extend the depth of focus have become available and are based on several different optical principles, which can avoid many of the issues encountered with multifocals.

These lenses can be used in conjunction with modest levels of monovision for additional spectacle independence. An understanding of the optical principles of the different lenses is important, as well as familiarity with clinical data, patient outcomes and even an element of philosophy in choosing an appropriate lens. The lecture will provide an update on the different type of so-called "Extended Depth of Focus" or "Monofocal Plus" lenses which are likely to challenge multifocals as a preferred intraocular lens for cataract surgery.

Brief Curriculum Vitae:

Prof 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 at the University of Western Australia. His special areas of interest include cataract and implant surgery, as well as corneal and keratorefractive surgery.

He has been especially active in the field of small incision cataract surgery and phacoemulsification, 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 American Society of Cataract and Refractive Surgery and European Society of Cataract and Refractive Surgeons Annual Film Festivals. 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 IOL 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.

Prof Barrett has been on the Editorial Board of the *Journal of Cataract and Refractive Surgery*, *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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L08: THE NORMAN McALISTER GREGG LECTURE, MONDAY 31 OCTOBER 2022

Prof Ian McAllister, MBBS, DM (UWA), FRANZCO, FRACS



Retinal Vein Occlusion: Where are We and Where are We Going?

Synopsis:

Retinal vein occlusion was originally described by Liebreich in 1855 using his newly invented stand ophthalmoscope. It remains troubling that in the subsequent 168 years, despite some advances in controlling sequelae, we are no closer to developing a lasting cure for this condition which remains a common cause of unilateral visual loss. Treatments have evolved from laser ablation to specific intravitreal cytokine antagonists. While there have been considerable improvements in outcomes, these are achieved at both significant expense and burdens of therapy.

These treatments address only some of the sequelae of the obstruction to venous outflow that exists in this condition, and have no effect on either the underlying pathology or induced significant elevations in venous pressure. If we are going to maximise visual outcomes and reduce treatment burdens, an effective method of relieving this obstruction needs to be also developed. We also need to understand more completely the sequence of cytokine upregulation that occurs to more appropriately target the induced dysregulation.

This presentation will examine the progress that has been made in both these areas. The relief of outflow obstruction has focussed on both direct methods which have significant limitations, and indirect ones with the development of the laser induced chorio-retinal bypass. Intra-retinal cytokine upregulation studies give us information on what is happening within the retina as a

consequence of the retinal vein occlusion, rather than relying on levels that leach into the aqueous and vitreous. This does have implications for timing of antagonists and preserving retinal neural elements.

Brief Curriculum Vitae:

Prof Ian McAllister is Professor of Ophthalmology at the University of Western Australia (UWA), a consultant ophthalmologist and a member of the Board of Directors at the Lions Eye Institute, and an emeritus consultant at Royal Perth Hospital. He specialises in the treatment and researching of vitreoretinal disorders and treatments.

He completed medical and ophthalmology post graduate training in Western Australia, before obtaining additional sub-specialty training in vitreoretinal disorders in the USA. He gained a doctorate in medicine from UWA after his return.

He is actively involved in research for cures for vitreoretinal disorders—especially retinal vascular disorders and macular degeneration—and developed the world's only causal-based treatment for retinal venous occlusion. He has held multiple National Health and Medical Research Council and numerous minor grants in this field.

He has been involved for many years in state-wide diabetic retinopathy screening and treatment, and was vice-chair of the Ophthalmic Research Institute of Australia and chair of the Research Board for many years.

He has published extensively with over 160 peer-reviewed papers and is in constant demand as an invited speaker for national and international conferences.

Prof McAllister is the recipient of several major international awards.

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L09: CORNEA UPDATE LECTURE, MONDAY 31 OCTOBER 2022

Prof Donald Tan, MBBS, FRCSG, FRCSE, FRCOphth, FAMS



DMEK, the Artificial Iris and the Virtual Cornea Clinic

Synopsis:

Descemet's membrane endothelial keratoplasty (DMEK) has come of age as the potentially ideal approach to corneal endothelial replacement, but is fraught with technical challenges in complex cases with anterior segment co-morbidities such as

aniridia, peripheral anterior synechiae, glaucoma drainage tubes, an absent or unstable lens iris diaphragm, and aphakia. A staged approach involving reconstruction of the anterior chamber with iris removal and placement of an artificial iris, followed by DMEK is presented. A series of cases is presented, in which recreation of a normalised anterior chamber with the use of the artificial iris, allows for simpler and more predictable DMEK surgery, especially when the DMEK pull-through approach is utilised. Such patients require prolonged and close subspecialty and multi-subspecialty follow-up, and in this COVID-19 era of lock-downs and travel restrictions, the Virtual Cornea Clinic was established between two Asian countries to monitor and look after such complex corneal cases.

Brief Curriculum Vitae:

Prof Donald Tan is a senior partner at the Eye & Cornea Surgeons division of Eye & Retina Surgeons, and Clinical Professor at the Ophthalmology and Visual Sciences Academic Clinical Program at Duke-National University of Singapore. A founding doctor and previous Medical Director of the Singapore National Eye Centre, he is a global leader in the field of cornea and external disease and refractive surgery, with major contributions to the development of new techniques and devices in corneal transplantation and corneal refractive surgery. He has published over 430 peer-reviewed articles in the corneal, refractive and myopia fields, and is the recipient of over 30 international awards. He was a past president of the US-based Cornea Society and was inducted as a member of the Academia Ophthalmologica Internationalis in 2018. Prof Tan founded the Asia Cornea Society and the Association of Eye Banks of Asia, and is currently immediate past president and secretary general of the Asia Cornea Society.

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L10: GLAUCOMA UPDATE LECTURE, TUESDAY 1 NOVEMBER 2022

Dr Janey Wiggs, AM MBBS FRANZCO FRACS



Using Genetics for Glaucoma Risk Assessment and Stratification

Synopsis:

Early disease detection and treatment are necessary to preserve vision in glaucoma patients, yet



current methods lack the ability to pre-symptomatically identify people at risk, and many people affected by glaucoma are undiagnosed. Genes that contribute to glaucoma development can be used for genetic testing and risk stratification. A number of genes causing early-onset forms of glaucoma have been discovered, and many genetic risk variants influencing disease susceptibility have been identified using genome-wide association studies. Genetic testing using early-onset glaucoma genes can identify pre-symptomatic mutation carriers, as well as inform risk assessment and genetic counseling. Polygenic risk scores derived from genome-wide association studies are useful for risk stratification in adult populations, and high genetic burden, as defined by the polygenic risk score, can impact disease features as well as interaction with other risk factors. This lecture will review currently known glaucoma genes and genetic risk variants, as well as the clinical utility of genetic testing in glaucoma patients.

Brief Curriculum Vitae:

Dr Janey Wiggs is the Paul Austin Chandler Professor of Ophthalmology at Harvard Medical School and is the Vice Chair for Clinical Research in Ophthalmology, Associate Director of the Ocular Genomics Institute and the Director of the Genetics Diagnostic Laboratory at Mass. Eye and Ear. She received her BA and PhD degrees in biochemistry from the University of California at Berkeley and her MD degree from Harvard. She completed an ophthalmology residency at Massachusetts. Eye and Ear and fellowship training in glaucoma and in medical genetics, and is board certified in both Ophthalmology and in Medical Genetics. Her research program is focussed on the discovery and characterisation of genetic factors that contribute to the blinding eye disease glaucoma and is funded by the National Eye Institute. Dr Wiggs currently serves on a number of editorial and scientific advisory boards, is a past member of the National Advisory Council of the National Eye Institute and is an elected member of the National Academy of Medicine.

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L11: THE COUNCIL LECTURE, TUESDAY 1 NOVEMBER 2022

Prof Frank Martin, AM MBBS FRANZCO FRACS



Towards a National Preschooler Vision Screening Program

Synopsis:

The current status of pre-schooler vision screening in Australia will be reviewed. The development, implementation and independent evaluation of the Statewide Eyesight Preschooler Screening program (StEPS) will be described. The way forward to implement a national program will be addressed.

Vision screening of preschool children is appropriate because reduced vision can be reliably identified at that age, and the child is within the critical period of visual development. This allows for intervention at an optimal time in order to reverse visual loss from amblyopia and correct refractive problems by the time of school entry.

Current vision screening programs vary between Australian states and territories. StEPS was implemented in 2008 in New South Wales (NSW) with an outreach model providing the service at preschools, childcare centres and community health centres bringing vision screening to the child. Screeners included nurses, orthoptists and lay-personnel. An independent evaluation of the StEPS program (2018) has endorsed the program as being cost-effective and universal, being offered to 96% of 4-year-old pre-schoolers. There were high screening rates in rural and regional centres of NSW (84%) and increasingly accessed by the Indigenous population.

Vision 2020 established an early intervention committee (2021) to develop a national framework for vision screening in 3.5- to 5.0-year-olds based on StEPS protocol. Vision 2020 is advocating for this framework to become national.

RANZCO has included early detection of vision problems in childhood as one of the two pillars of its Vision 2030 plan and will play a major leadership role in implementing a National Preschooler Vision Screening Program.

Brief Curriculum Vitae:

Prof Frank Martin is a visiting ophthalmologist at the Sydney Children's Hospitals Network at Westmead and



at Sydney Eye Hospital. He is a Clinical Professor at the University of Sydney in the Departments of Paediatrics and Child Health and in Ophthalmology. He is President of the Board of the Children's Medical Research Institute and Chair of the Asia Pacific Society of Paediatric Ophthalmology and Strabismus, the Asia Pacific Myopia Society and the Orthoptic Advisory Committee. He served as President of RANZCO from 1997–1998 and of the Asia-Pacific Academy of Ophthalmology from 2009–2013. He has also been President of the International Strabismological Association, the International Paediatric Ophthalmology and Strabismus Council and a member of the Board of the American Academy of Ophthalmology.

He has received a number of Distinguished Awards including the RANZCO College Medal, the Jose Rizal Medal, the Michelle Beets Memorial Award, the International Council of Ophthalmology Mark Tso Golden Apple Award for teaching, a Secretariat Award from the American Academy of Ophthalmology, an Honour Award from the American Association of Paediatric Ophthalmology

and Strabismus, and the Linksz Medal from the International Strabismological Association.

Prof Martin has a special interest in strabismus and amblyopia and in paediatric eye disorders. He has been a strong advocate for preschool vision screening and was in the pivotal group that initiated the successful StEPS preschool vision screening program in NSW.

He has served the College in many ways throughout his career including being Editor of the *Australian and New Zealand Journal of Ophthalmology*, Chair of the Part II Court of Examiners, Treasurer and many years on the RANZCO NSW Branch Committee. Throughout his career, he has played an active role in education and teaching of medical students, orthoptists and the next generation of ophthalmologists.

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SATURDAY 29 OCTOBER SPEAKERS**06:30 - 07:45 H01—Allergan Hosted Morning Symposium****Venue:** Plaza 1 & 2**06:30 - 07:45 H02—Designs for Vision Hosted Morning Symposium****Venue:** M4**08:00 - 08:30 AUSTRALIAN VISION RESEARCH (AVR) AGM****Venue:** Great Hall 2**08:30 - 09:00 L01—CONGRESS OPENING LECTURE****Title:** The Future of Work

Speaker Prof Ben Hamer

Chair: A/Prof Abhishek Sharma**Venue:** Great Hall 2

Synopsis: The last couple of years have taught us the need to plan for disruption. It has shaken up how we live, work, and do business and in doing so, changed the game for leaders. Now, the number one skill for contemporary leaders is foresight — the ability to understand trends, forecast them into the future, and backcast to then understand what it means for the here and now. It's all about ensuring we're future-fit. In this keynote, Dr Ben Hamer will paint a data-backed picture of the future by walking through some innovations and advancements happening around the world today, demonstrating that the future isn't as far away as we might think. He'll go a little bit deeper on the Future of Work, showing how the way in which we work and our workforces might evolve, and what it all means for mid-career and senior professionals.

09:00 - 09:30 L02—ONCOLOGY UPDATE LECTURE**Title:** Update on Ocular Lymphomas: What's New in the WHO

Prof Sarah Coupland

Synopsis: Ocular lymphomas can be divided into ocular adnexal lymphomas (OAL) and intraocular lymphomas. OAL (i.e., those affecting the orbit, eyelids, conjunctiva, lacrimal gland and lacrimal sac) account for approximately 10% of all extranodal lymphomas. Most are primary tumours and are usually non-Hodgkin lymphoma of B-cell type: the most common OAL subtypes are the low-grade malignant extranodal marginal zone B-cell lymphoma (EMZL), followed by diffuse large B-cell lymphoma (DLBCL) and follicular lymphomas. Secondary involvement of the ocular adnexa by both systemic B- and T-non-Hodgkin lymphoma can occur. Intraocular lymphomas are rare with the most common type being the vitreoretinal lymphoma, which is usually a high-grade DLBCL occurring in the vitreous and retina, and with frequent involvement of the central nervous system. Other intraocular lymphomas are those arising as primary or secondary tumours in the uveal tract, with the most common being a choroidal EMZL. In this lecture, I will present a brief overview of the upcoming 5th edition of the World Health Organization (WHO) Classification of Haematolymphoid Tumours focussing on lymphoid neoplasms, and how it relates to the above ocular lymphomas. I will highlight and explain pertinent changes from the revised 4th edition, including the reorganisation of entities by a hierarchical system as adopted throughout the 5th edition of the WHO classification of tumours of all organ systems.

Chair: Dr John McKenzie**Venue:** Great Hall 2**09:30 - 10:00 L03: THE FRED HOLLOWS LECTURE****Title:** Inequity in Eye Health

Prof Clare Gilbert



Synopsis: I have chosen this topic as it reflects Fred Hollow's values, mission and passion, yet inequity remains highly relevant to global eye health today. After defining inequity and eye health, regional data from the Global Burden of Diseases will be presented, as well as data from national surveys and other studies in Africa and Asia, highlighting inequity in accesses to eye care services. Reasons for this will be outlined as well as current opportunities.

Chair: Prof Adrian Fung

Venue: Great Hall 2

10:00 - 10:30

Morning Tea

10:30 - 11:00

P01—RANZCO PLENARY

Title: Vision 2030 and Beyond

Prof Nitin Verma AM

Chair: Prof Nitin Verma AM

Venue: Great Hall 2

11:00 - 12:00

P02—AUSTRALIAN VISION RESEARCH (AVR) PLENARY

Chair: Prof Stephanie Watson OAM

Venue: Great Hall 2

Synopsis: The Australian Vision Research (AVR) Plenary Session will showcase five of the successful AVR grants from 2022, offering a delightful array of pioneering ophthalmic research projects from around Australia.

Speakers and Topics:

Dr Vivek Gupta—Tau targeting to protect Retinal Ganglion Cells and the Optic Nerve in glaucoma

A/Prof Fan Fan Zhou—Developing novel therapy for human uveal melanoma

A/Prof Peter van Wijngaarden—Hyperspectral retinal imaging perfusion maps for retinal vascular diseases

Dr Kathryn Burdon—Genetic indicators of treatment response to anti-VEGF intraocular injections for diabetic macular oedema

Prof Stephanie Watson OAM—The Bacterial Ocular Surveillance System (BOSS)

12:00 - 13:30

Lunch

13:30 - 15:00

CONCURRENT SESSIONS

13:30 - 15:00

S01-SYMPOSIUM-ANZGS Symposium 2022—Survival Tips from the Glaucoma Experts Part 2

eye@cityeye.com.au

Chair: Prof Graham Lee

Co-Chairs: Dr Ridia Lim, A/Prof Anne Brooks, Prof Ivan Goldberg

Venue: Great Hall 2

Synopsis: Glaucoma management is fraught with pitfalls. There are so many devices on the market – which one is appropriate for a particular patient and when is it not? 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. What about those high risk eyes when the optic nerve is end-stage?

Speakers and Topics:

Why, when and why not of glaucoma devices?

1. A/Prof Frank Howes—iStent

2. A/Prof Paul Healey—Hydrus

3. Prof Helen Danesh-Meyer—Preser Flo

4. Prof Graham Lee—Tube

Dr Ridia Lim—How do I make trabeculectomy work?

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

Q&A with panel and speakers—Is there a role for iTrack?



13:30 - 15:00

S02—COURSE Ocular Herpes—Beyond Basics

mei-ling@lei.org.au

Chair: A/Prof Anthony Hall**Venue:** Great Hall 3

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 OAM—Herpes keratitis in 2020: Getting the treatment right!

Dr Priya Samalia—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

13:30 - 15:00

S03—SYMPOSIUM Young Fellows Symposium. A Beginner's Guide to Presbyopia Correction

bernardosoares@gmail.com

Chairs: Dr Bernardo Soares and A/Prof Chameen Samarawickrama**Venue:** Great Hall 4

Synopsis: Ophthalmologists are widely trained in an environment where monofocal intraocular lenses (IOL) are the standard of care. However, knowledge and expertise in multifocal/extended depth of focus (EDOF) IOLs are increasingly expected by our patients. But where do we go to bridge this gap? This session, run by the Younger Fellows Group, aims to cover the basics of understanding multifocal and EDOF IOLs, patient selection and which eyes are suitable for implantation. It is an interactive session featuring presenters who can share their knowledge and experience, in a relaxed environment designed to engage the audience and allow an open forum where any question can be asked.

Speakers and Topics:

- A/Prof Chameen Samarawickrama
- Dr Bernardo Soares
- Dr Louise Robinson
- Dr Zoe Gao
- Dr Tanya Trinh
- Dr Andrea Ang
- Dr Nicholas Toalster
- A/Prof Elaine Chong
- Dr Ben La Hood
- Dr John Hogden

Debate

1. Dr Andrea Ang, Dr Tanya Trinh and Dr Nicholas Toalster
2. If I had my way, I would only ever inset a monofocal
3. If I had my way, I would only ever insert an EDOF
4. If I had my way, I would only ever insert a multifocal

Online polling will be conducted before and after the debate to see if the presenters had swayed our audience's opinion.

2. A/Prof 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. A/Prof 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. Online polling will be performed to see which brands are favoured before and after the presentation.
5. 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.).

13:30 - 15:00

S04—FREE PAPERS—Neuro-ophthalmology/Paediatric Ophthalmology/Ocular Oncology**Chairs:** A/Prof Clare Fraser and Dr Anu Mathew**Venue:** M4

Lower body mass index is associated with poorer glaucomatous outcomes in three cohorts

Ella Berry¹, Henry Marshall¹, Sean Mullany¹, Santiago Diaz Torres², Joshua Schmidt¹, Daniel Thomson¹, Thi Nguyen¹, Lachlan Wheelhouse Knight¹, Georgina Hollitt¹, Ayub Qassim¹, Bronwyn Ridge¹, Angela Schulz³, Stewart Lake¹, Richard Mills¹, Ashish Agar⁴, Anna Galanopoulos⁵, John Landers¹, Paul Healey⁶, Stuart Graham³, Alex Hewitt⁷, Robert Casson⁵, Stuart MacGregor², Owen Siggs^{1,8}, Jamie Craig¹
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Purpose: To evaluate the relationship between body mass index (BMI) and glaucoma progression.

Methods: Multi-cohort observational study combining a retrospective longitudinal analysis of suspect and early manifest primary open-angle glaucoma cases from the Progression Risk of Glaucoma: Relevant SNPs with Significant Association (PROGRESSA) study, and two replication cohorts from the Canadian Longitudinal Study of Ageing (CLSA) and the UK Biobank.

In the PROGRESSA study, multivariate analysis correlated BMI with retrospective longitudinal visual field progression in 471 participants. BMI was then prospectively associated with longitudinal change in vertical cup-to-disc ratio (VCDR) in the CLSA study, and with cross-sectional VCDR and glaucoma diagnosis in the UK Biobank.

Results: In the PROGRESSA study, a lower BMI conferred a faster rate of visual field progression (β : 0.04 dB/year/SD [0.005, 0.069] $p = 0.013$). A lower BMI was then associated with greater VCDR change in the CLSA (β : -0.007 95% confidence interval [-0.01, -0.001] $p = 0.029$). Finally, in the UK Biobank a 1 standard deviation lower BMI was associated with a worse cross-sectional VCDR (β : -0.048/SD [-0.056, 0.96] $p < 0.001$), and with a 9% greater likelihood of glaucoma diagnosis, as per specialist grading of retinal fundus imaging (odds ratio 0.91 [0.85, 0.97]; $p = 0.008$).

Conclusion: Lower BMI was correlated with poorer longitudinal and cross-sectional glaucomatous outcomes.

This supports previous work illustrating a correlation between BMI and glaucoma.

Analysis of multifocal visual evoked potentials using artificial intelligence algorithms

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Purpose: Clinical trials for remyelination in multiple sclerosis (MS) require an imaging biomarker. The multifocal visual evoked potential (mfVEP) is an accurate technique for measuring axonal conduction; however, it produces large datasets requiring lengthy analysis by human experts to detect measurable responses versus noisy traces. This study aimed to develop a machine-learning approach for the identification of true responses versus noisy traces and the detection of latency peaks in measurable signals.

Methods: We obtained 2240 mfVEP traces from 10 MS patients using the VS-1 mfVEP machine, and they were classified by a skilled expert twice with an interval of 1 week. Of these, 2025 (90%) were classified consistently and used for the study. ResNet-50 and VGG16 models were trained and tested to produce three outputs: no signal, up-sloped signal or down-sloped signal. Each model ran 1000 iterations with a stochastic gradient descent optimiser with a learning rate of 0.0001.

Results: ResNet-50 and VGG16 had false-positive rates of 1.7% and 0.6% respectively when the testing dataset was analysed ($n = 612$). The false-negative rates were 8.2% and 6.5% respectively against the same dataset. The latency measurements in the validation and testing cohorts in the study were similar.

Conclusions: Our models efficiently analyse mfVEPs with <2% false positives compared with human false positives of <8%. mfVEP, a safe neurophysiological technique, analysed using artificial intelligence, can serve as an efficient biomarker in MS clinical trials and signal latency measurement.

Does surgical correction of refractive error alleviate headache in patients with keratoconus?—A retrospective analysis

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Purpose: Refractive error has long been thought to be a cause for headache; however many previous studies examined patients with headaches of different pathogeneses together, introducing confounding factors. We investigate if surgical correction of refractive error with Topography Guided Photorefractive Keratectomy (TGPRK) and Collagen Cross Linking (CXL) alleviates headache in patients with keratoconus in an appropriately classified patient population, guided by the International Classification of Headache Disorders (ICHD-3).

Method: 40 patients who had keratoconus and required TGPRK and CXL met the inclusion criteria. Patients who met diagnostic criteria for headache, as defined by the ICHD-3, were asked about the quality and nature of their headaches and impact on quality of life by means of the Head Impact Score (HIT-6) questionnaire, both pre-operatively and post-operatively.

Results: 24 of the 40 patients reported headache pre-operatively. Post-operatively, only 9 patients had diagnosable headaches ($p < 0.05$). The mean number of headache days per week decreased from 4.38 ± 2.37 days/week to 0.46 ± 0.72 days/week ($p < 0.05$). The mean duration of headache decreased from 108 ± 100.7 to 34.4 ± 63.5 min ($p < 0.05$). The consumption of analgesia decreased from 2.42 ± 2.34 days/week to 0.56 ± 1.16 days/week ($p < 0.05$). 61% of patients who consumed analgesia pre-operatively stopped consuming analgesia altogether post-operatively. HIT-6 scores decreased significantly post-operatively.

Conclusion: Surgical correction of refractive error in patients with keratoconus can alleviate or completely resolve headache in a large proportion of cases, significantly improving quality of life. Surgical treatment of keratoconus should be considered in patients as part of their headache management.

Radiological findings in paediatric orbital cellulitis

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Purpose: Paediatric orbital cellulitis is a rare, sight-threatening condition. Radiological findings provide insight and clinical direction into pre- and post-septal cellulitis differentiation, and guide prompt, appropriate treatment.

Methods: Retrospective review over 10 years at a single tertiary paediatric referral centre in New South Wales. Paediatric patients admitted with pre-septal and post-septal cellulitis between January 2007 and December 2016 were analysed. Patients who underwent radiological

imaging (computed tomography [CT] and magnetic resonance imaging [MRI]) were included.

Results: Over 10 years, 237 patients were admitted with pre-septal or post-septal cellulitis (13.1%; $n = 31$). Of these, 50 patients (21.1%; median age 6) underwent CT scan. Prevalence of CT subgroups: Chandler grade [I = 46% ($n = 23$)], [II = 26% ($n = 13$)], [III = 22% ($n = 11$)], [IV = 4% ($n = 2$)], [V = 0%]. Sub-group analysis revealed CTs yielded 60.7% for post-septal involvement and 31.3% for sub-periosteal or orbital abscess. Eight patients (3.4%) underwent MRI with subgroups: Chandler [I = 12.5%, ($n = 1$)], [II = 50% ($n = 4$)], [III = 12.5%, ($n = 1$)], [IV = 25%, ($n = 2$)], [V = 0]. Common radiological findings were sinusitis (maxillary and ethmoid presented in 100% of post-septal cases) and subperiosteal abscess (22%). Lamina papyracea dehiscence (16%; $n = 8$) and orbital displacement (14%; $n = 7$) were less common. MRI was used for operative planning; 75% ($n = 6$ of 8) progressed to surgical intervention.

Conclusion: The incidence of post-septal orbital cellulitis was 13.1% with CT the primary imaging modality. Radiological findings included maxillary and ethmoid sinusitis, subperiosteal abscess, lamina papyracea dehiscence, and orbital displacement providing diagnostic differentiation between pre- and post-septal cases.

A 10-year snapshot of preferred treatment patterns for retinopathy of prematurity

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Purpose: To assess the preferred treatment patterns for retinopathy of prematurity (ROP) amongst ophthalmologists worldwide.

Method: Between March and May 2022, a retrospective survey was distributed to ophthalmologists performing ROP screening and treatment internationally. Treatment patterns of ROP over a 10-year time frame between 2012 and 2022, was assessed.

Results: Forty-four ophthalmologists from 12 different countries responded to the survey. Per annum, there were an average number of 427 babies screened by each respondent. In total, between 2012 and 2022, 2688 babies (35%) were treated with laser therapy, and 3708 babies (48%) were treated with anti-vascular endothelial growth factor (VEGF). Anti-VEGF is the preferred treatment method for aggressive posterior (AP)-ROP (59.52%), Type 1 ROP in Zone 1 (66.67%) and Type 1 ROP in posterior



Zone 2 (52.38%). The majority used laser for first-line treatment of Type 1 ROP in anterior Zone 2 (73.81%) and Type 1 ROP in Zone 3 (80.95%). Laser remains the preferred treatment modality utilised in babies requiring repeat treatment of AP-ROP (51.35%), Type 1 ROP in Zone 1 (44.44%), Type 1 ROP in posterior Zone 2 (54.05%), Type 1 ROP in anterior Zone 2 (70.59%) and Type 1 ROP in Zone 3 (76.47%).

Conclusion: For cases of posterior disease (AP-ROP, Type 1 ROP in Zone 1 and posterior Zone 2), anti-VEGF appears to be the first-line treatment of choice. Most ophthalmologists use laser as first-line treatment for Type 1 ROP in anterior Zone 2 and Zone 3. For repeat treatments, laser is the preferred intervention.

Prevalence of ocular motility abnormalities and outcome in children with Chiari malformations

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Purpose: To report the prevalence and outcomes of ocular motility abnormalities in children with Chiari malformations.

Methods: A retrospective chart review of children who underwent posterior fossa decompression for Chiari malformation in Queensland Children's Hospital between January 2006 and August 2021 was undertaken. Demographic information, type of ocular motility abnormality including strabismus angle pre and post posterior fossa decompression, type of Chiari malformation, need for strabismus surgery and final ocular motility outcome were collected.

Results: One hundred and four children with Chiari malformation were identified, and of those 30 children with ophthalmic examinations were included in the final analysis. Of these 30 patients, 19 had some form of ophthalmic abnormalities. The most common abnormality was esotropia ($n = 10$), followed by nystagmus ($n = 4$), subjective diplopia ($n = 4$), vertical misalignment ($n = 3$), optic disc swelling ($n = 3$), exotropia ($n = 1$) and optic disc pallor ($n = 1$). Of the patients with esotropia, one had complete resolution of their strabismus following posterior fossa decompression, while another had significant improvement. Two further patients with esotropia had significant improvement in their strabismus after posterior fossa decompression followed by strabismus surgery. One patient had resolution of their

esotropia following ventriculoperitoneal shunt insertion shortly after posterior fossa decompression. One patient had no change in esotropia following posterior fossa decompression.

Conclusion: Ocular motility abnormalities, especially esotropia, are common in children with Chiari malformation. Posterior fossa decompression itself can improve ocular alignment. Strabismus surgery should be performed after posterior fossa decompression if warranted.

Improving paediatric uveitis visual outcomes and quality of life

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Purpose: To investigate visual outcomes and perceived quality of life of paediatric patients with uveitis treated in a multidisciplinary clinic involving ophthalmologists and rheumatologists at a tertiary children's hospital.

Methods: Review of all paediatric uveitis patients presenting to the Children's Hospital Westmead between 2005 and 2022. Completion of validated instruments for children to assess functional visual ability (FVA) and quality of life (QoL).

Results: There were 111 patients (207 eyes) diagnosed with paediatric uveitis. There were 61 female and 48 male patients. The most common aetiological diagnoses was JIA-U ($n = 65$, 59%) followed by Idiopathic uveitis ($n = 33$, 29.6%). The mean duration of inflammation prior to commencement of a biological agent was 22.0 months (range: 1–48 months). Over 50% eyes diagnosed with uveitis developed raised intraocular pressure at some point, 43/207 eyes (21%) had glaucoma surgery. A significant number developed cataract and underwent cataract surgery. Mean visual acuity significantly improved after 6 weeks of biological therapy and was maintained over 12 months. Scores for FVA and QoL were reduced in children with paediatric uveitis. Patients and family members reported improved quality of life being able to be seen by all treating doctors at the same multidisciplinary clinic.

Conclusions: Control of intraocular inflammation is essential in paediatric uveitis. Rapid taper of any steroids is crucial as ocular hypertension/glaucoma and cataract is dose and duration dependent. Biologic therapy reduced intraocular inflammation with maintained visual acuity. Paediatric uveitis has a marked effect on



FVA and QoL. Multidisciplinary clinics are gold standard treatment.

Multi-centre evaluation of artificial intelligence algorithm retinopathy of prematurity: AI in the diagnosis of retinopathy of prematurity

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Purpose: Multi-centre validation of artificial intelligence algorithm, ROP.AI's, accuracy in the detection of plus disease in retinopathy of prematurity (ROP) to determine its real-world applicability in ROP screening within Australia.

Method: A retrospective evaluation comparing ROP.AI against images collected from multiple ROP experts across four major tertiary centres in Australia. ROP diagnosis was categorised into presence of plus disease, pre-plus disease or normal by 1 of 5 expert ophthalmologists. A total of 6312 RetCam retinal images with corresponding clinical diagnoses were collected from across Australia. All images were de-identified, unprocessed and uploaded to ROP.AI through the encrypted software platform MedicMind to determine the algorithm's ability in detecting plus disease. Sensitivity, specificity, negative predictive value and area under the receiver operating characteristic curve (AUROC) were calculated to determine ROP.AI's diagnostic ability in comparison to clinician diagnoses.

Results: The ROP.AI algorithm, at a pre-defined operating point of 0.5 and compared to clinical diagnoses, achieved a sensitivity of 92%, specificity of 59%, and negative predictive value of 99% in the detection of plus disease. AUROC for the detection of plus disease was 0.865.

Conclusion: ROP.AI performed well against multiple ROP experts in detecting plus disease in a geographically diverse, multi-centre, novel test set. Its high sensitivity, negative predictive value and AUROC demonstrates real-

world potential in improving ROP screening. Further algorithm training and platform development may improve its diagnostic accuracy and suitability for clinical adoption.

Validation of weight-gain based prediction models for retinopathy of prematurity in an Australian population

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Purpose: Validation, in an Australian cohort, of four different weight-gain based algorithms for the prediction of Type 1 retinopathy of prematurity (ROP); Weight, insulin like growth factor neonatal retinopathy of prematurity algorithm (WINROP), the Children's Hospital of Philadelphia retinopathy of prematurity (CHOPROP), the Colorado retinopathy of prematurity algorithm (CO-ROP), and the postnatal growth, retinopathy of prematurity (G-ROP) algorithm.

Methods: This was a 4-year retrospective cohort analysis of infants screened for ROP in a tertiary hospital in Australia. Main outcomes measure were sensitivities, specificities, positive and negative predictive values.

Results: A total of 594 infants were reviewed; 531 infants were eligible. Twenty-four infants developed Type 1 ROP. The sensitivities and specificities for Type 1 ROP respectively (95% confidence intervals) were for WINROP 83.3% (61.1–93.3%), 52.3% (47.8–56.7%); CHOPROP 100% (86.2–100%), 46.0% (41.7–50.3%); CO-ROP 100% (86.2–100%), 32.0% (28.0–36.1%); and G-ROP 100% (86.2–100%), 28.2% (24.5–32.3%).

Conclusions: This is the first study, to our knowledge, to directly compare different algorithms to predict severe ROP. CHOPROP, CO-ROP and G-ROP were 100% sensitive for Type 1 ROP; however, not all infants with persisting Type 2 ROP that eventually required late treatment were detected. Although specificities were low (ranging between 28% and 52%) a more targeted screening protocol approach, by incorporating a weight gain algorithm, to improve efficiency and reduce the number of screens appears to be a viable and safe option.

Change of anti-vascular endothelial growth factor treatment practices for retinopathy of prematurity

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Purpose: To examine anti-vascular endothelial growth factor (VEGF) use as first-line therapy for retinopathy of prematurity (ROP) between two time periods: 2012 to 2019, and 2020 to 2022.

Method: A retrospective survey of 14 questions was distributed to paediatric ophthalmology interest groups internationally. Main outcome measures included the proportion (measured as 20% intervals between 0% and 100%) of anti-VEGF use as first-line therapy for ROP, and the incidence of repeat anti-VEGF treatment between the two time periods.

Results: Between 2012 and 2019, 66.5% of ophthalmologists reported infrequent use of anti-VEGF as first-line therapy (<20% of total treated babies). 5.7% and 14.2% of ophthalmologists reported anti-VEGF use in 20–40% and 40–60% of total treated babies, respectively. None reported using anti-VEGF in the 60–80% interval; and only 11.4% of ophthalmologists used anti-VEGF in the >80% interval. Between 2020 and 2022, the number of ophthalmologists using anti-VEGF as first-line therapy increased in the 20–40% and >80% intervals (from 5.7% to 15.3%; 11.4% to 17.9%, respectively). In the 60–80% interval, 12.8% of ophthalmologists reported anti-VEGF use post 2020 as compared with none between 2012 and 2019. The majority did not require repeat anti-VEGF treatment in both time periods (51.5% and 55.8%, respectively). The preferred anti-VEGF agent was Bevacizumab administered at the 0.625 mg dose.

Conclusion: The survey outcome suggests there has been an overall increase in anti-VEGF use as first-line therapy worldwide since 2020. The preferred anti-VEGF agent is Bevacizumab administered at 0.625 mg. Further studies should be undertaken to standardise anti-VEGF treatment for ROP.

Plaque brachytherapy for ocular melanoma in New Zealand: Results of the Auckland experience

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Purpose: To evaluate the clinical outcomes of plaque brachytherapy on treatment of ocular melanoma in Auckland, New Zealand.

Method: Retrospective, single-centre cohort study of ocular melanoma treated with plaque radiotherapy from 1 January 2005 to 31 December 2020. Medical records were reviewed for demographics, tumour features and clinical outcomes.

Results: A total of 199 cases were identified. The mean age at diagnosis was 63.2 ± 14.2 years. One hundred and six (53%) cases were female and 188 (94%) cases were of European ethnicity. Almost half (47%) of the cases were asymptomatic at presentation. The most common symptoms were photopsia and blurred vision. Presenting tumour features included mean Snellen visual acuity $\geq 6/12$ (logMAR 0.26 ± 0.48), mean intraocular pressure 15.0 ± 3.7 mmHg, mean largest tumour basal diameter 11.5 ± 3.5 mm (median 11.5 mm, interquartile range [IQR] 9.0–13.84 mm) and mean apical thickness 3.5 ± 2.2 mm (median 3.1 mm, IQR 2.0–4.25 mm). The median time to treatment was 13 days (IQR 6–27 days). The mean follow up was 9.5 ± 4.4 years and all-cause mortality was found in 57 cases (29%). The median survival time was 6.1 years and the 1, 5 and 10-year overall survival probability was 96%, 78% and 36%. Documented metastases occurred in 16 cases (8%) and the primary location of spread was primarily to the liver.

Conclusion: Small to medium-sized ocular melanoma receiving plaque radiotherapy in New Zealand had a comparable outcome to the Collaborative Ocular Melanoma Study randomised trial of iodine-125 brachytherapy (82%).

Optic nerve sheath fenestration outcomes—20-year retrospective analysis

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Objective: To determine the efficacy and safety of optic nerve sheath fenestration (ONSF) for idiopathic intracranial hypertension (IIH), and other indications from a



major tertiary hospital and specialty eye referral hospital in Melbourne, Australia from July 2000 to December 2020

Method: All patients undergoing ONSF were retrospectively reviewed with patient demographics, surgery indications, visual acuity, visual fields, fundus photos of optic discs, retinal nerve fibre layers, average thickness of optic discs on optical coherence tomography, treatments, and complications recorded. Non-parametric tests were used to compare the treatment groups pre- and post-operatively.

Results: A total of 116 eyes from 70 patients underwent ONSF, which involved 92 eyes with IIH, 9 eyes with cerebral venous sinus thrombosis, and 26 eyes with other aetiologies (Other). Post ONSF there was a best corrected visual acuity improvement or stabilisation of 84% in all groups, with 50% achieving a best corrected visual acuity

of 6/6 or better at final follow up. Retinal nerve fibre layers, visual fields and fundus grades all trended towards improvement, with most improvement by day 360. Common complications included transient diplopia ($n = 29$, 25%) and worsening of visual function requiring further cerebrospinal fluid diversion procedures ($n = 20$, 17%). Complications most significant in 'Other' group with 1/3 of eyes requiring LP/VP CSF diversion procedures performed post ONSF.

Conclusion: Our data supports the use of ONSF in the setting of raised intracranial pressure, papilloedema, and visual failure due to IIH or cerebral venous sinus thrombosis, and when other CSF diversion procedures or medical therapies have failed.

13:30 - 15:00

S05—PROFESSIONAL DEVELOPMENT

Title: The Business of Eyes

Chair: Ms Donna Glenn

Venue: Great Hall 1

Speakers:

Ms Donna Glenn

Dr Ben Clark

Ms Dominique Egan

Ms Michelle De Guia

Dr Alex Hunyor

Dr Carolyn Ross

15:00 - 15:30

Afternoon Tea

15:30 - 17:00

CONCURRENT SESSIONS

15:30 - 17:00

S06—SYMPOSIUM-Ocular Oncology—Sunshine State Update

lindsay.mcg@gmail.com

Chair: Dr Lindsay McGrath

Venue: Great Hall 3

Synopsis: The aim is to provide ocular oncology updates for the general ophthalmologist. We will explore strategies for breaking bad news and report interesting advances in diagnosis and therapy of ocular tumours.

Speakers and Topics:

Dr Lindsay McGrath—Ocular oncology patient journey

Dr Romana Bowd—Strategies in breaking bad news to patients

Dr Kelly Brooks—Advances in uveal melanoma tumour genetics currently under investigation and publication

Dr Jaclyn White—A unique gene mutation noted in several retinoblastoma patients in Queensland

Presentations by interstate members of the Ocular Oncology special interest group—Interesting oncology cases for the general ophthalmologist

15:30 - 17:00

S07—SYMPOSIUM-Thyroid Eye Disease

jwujinkhong@gmail.com

Chairs: Dr Jwu Jin Khong and Dr Thomas Hardy

Venue: Great Hall 2



Synopsis: In the last 5 years, major clinical trials have emerged for thyroid eye disease (TED) including the completion of phase 3 trials for teprotumumab, now US Food and Drug Administration approved, as a first in-class treatment for TED. Other medical therapies including biologics have been trialled, requiring a reappraisal of the place of medical therapy options for active TED. New data has also emerged for TED specifically in the evaluation of dysthyroid optic neuropathy (DON), including optical coherence tomography interpretation and visual field classification. This symposium aims to discuss recent medical advances in TED diagnosis of DON and evidence-based practice through case-based discussion.

Speakers and Topics:

Prof Tim Sullivan—Teprotumumab efficacy, safety and extended outcomes: pooled data from 2 randomised controlled trials and Optic-X Study

Dr Jwu Jin Khong—Advances in medical treatment and new treatment trials in thyroid eye disease

Dr Timothy Godfrey—Medical consideration, cost and access to immunotherapies for TED patients

Dr Thomas Hardy—Update on diagnostic testing for dysthyroid optic neuropathy (DON) and DON management

Dr Simon Taylor, Dr Raf Ghabrial, Dr Tim Godfrey, Dr Thomas Hardy, Dr Jwu Jin Khong, Prof Tim Sullivan - Panel discussion of cases

Complex TED case presentation and discussion with input from the expert panel.

15:30 - 17:00

S08—COURSE-Minor Corneal Procedures for the Comprehensive Ophthalmologist

stephanie.watson@sydney.edu.au

Chair: Prof Stephanie Watson OAM

Venue: Great Hall 4

Synopsis: The aim of this course is to provide comprehensive ophthalmologists with the skills needed to know when and how to perform minor corneal procedures. Minor corneal procedures are not uncommonly needed in routine clinical practice. This symposium will provide an update for the comprehensive ophthalmologist on the indications, procedure and post-op management of minor corneal procedures. Speakers will share 'hot practice tips', focus on evidence-based approaches and highlight procedures that can be performed in the clinic and/or operating theatre.

Speakers and Topics:

Dr Tanya Trinh—Corneal foreign bodies and rust rings. An update on the options for managing this commonly seen corneal problem.

Dr Chameen Samarawickrama—Superficial keratectomy. The indications and methods for preforming superficial keratectomy.

Dr Nick Toalster—EDTA chelation. The indications for, methods of and post-op care of band keratopathy managed with EDTA chelation

Prof Stephanie Watson—Corneal gluing. When corneal gluing should be performed and how to carry out the procedure at the slit lamp and alternatively with the patient lying flat.

Dr Jacqueline Beltz—Cornea and cataract surgery. An overview of important 'what not to miss' steps in managing cataract surgery in patients with corneal disease.

Dr Svetlana Cherpanoff—Corneal pathology: When to send a specimen and how. Advice on the handling of and interpretation of corneal specimens from minor procedures

Q&A

15:30 - 17:00

S09—FREE PAPERS—Retina

Chairs: Prof Adrian Fung and Dr Mei Hong Tan

Venue: M4



Rapid treatment of endophthalmitis with intravitreal antibiotics is associated with better visual outcomes

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Background: To discover whether the timing of intravitreal antibiotics from the time of presentation to injection, affects the visual outcomes of patients with endophthalmitis from all causes.

Methods: A retrospective study of consecutive patients managed at Auckland District Health Board between 1 January 2004 and 1 July 2021. The main outcome measure was final visual acuity at follow-up and the proportion of subjects with severe vision loss ($\leq 6/60$).

Results: A total of 374 eyes were included in the study, with a median age of 69.7 years at presentation. 192 subjects (51.6%) were female. The median presenting visual acuity was hand movements, and hypopyon was present in 194 subjects (51.9%). Cataract surgery was the most frequent aetiology in 115 subjects (30.7%), followed by intravitreal anti-vascular endothelial growth factor injections in 89 subjects (23.8%) and endogenous endophthalmitis in 54 subjects (14.4%). Median time to injection of intravitreal antibiotics was 3.5 h (interquartile range 2–6). On multivariate analysis, early treatment with intravitreal antibiotics was associated with better visual outcome, particularly for those treated within two hours, while poor presenting visual acuity and culture-positive endophthalmitis were associated with worse outcomes.

Conclusion: Rapid intravitreal antibiotic administration is associated with better final visual acuity outcomes, particularly for those receiving treatment within 2 h of presentation. Patients with severe vision loss on presentation, benefit the most with improved final visual acuity following expedited treatment.

Hyperpigmentary abnormalities in age-related macular degeneration: Impact on visual sensitivity

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Purpose: To understand the impact of hyperpigmentary abnormalities (HPA) on visual sensitivity when assessed using microperimetry.

Method: A total of 280 eyes from 140 participants with bilateral large drusen due to age-related macular degeneration underwent microperimetry testing (central 3.6 mm diameter region) and multimodal imaging (including colour fundus photographs and optical coherence tomography). The mean visual sensitivity on microperimetry over 5 sectors, each having the same area, was derived. HPAs were manually annotated on colour fundus photographs, and their presence and extent within each of the 5 sectors was determined. Drusen volume in each of these sectors was also derived from optical coherence tomography imaging. Linear mixed-effects models were used to examine the association between the presence or extent of HPAs on sector-based visual sensitivity, adjusting for drusen volume and age.

Results: The presence of HPA in each sector was not significantly associated with differences in visual sensitivity ($p = 0.883$). However, an increasing extent of HPAs in each sector was significantly associated with reduced sector-based visual sensitivity ($p < 0.001$).

Conclusion: In a cohort of individuals with bilateral large drusen, the increasing extent of HPAs—and not simply its presence—was independently associated with reduced sector-based visual sensitivity. As such, the extent of HPAs may be an important biomarker in age-related macular degeneration and should be investigated further for association with risk of progression.

Safety of intravitreal pegcetacoplan in geographic atrophy: 24-month results from the phase 3 DERBY and OAKS trials

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Purpose: 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 with sham in patients with geographic atrophy (GA) secondary to age-related macular degeneration. Month 24 safety results will be reported here.

Methods: Included patients were ≥ 60 years old, had 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 was present at baseline. The primary endpoint was change in GA lesion measured by fundus autofluorescence from baseline to month 12. Secondary endpoints, which include visual function, will be measured at month 24. Safety measures include incidences of ocular and systemic adverse events.

Results: DERBY and OAKS enrolled 621 and 637 patients, respectively. At month 12, most ocular adverse events were considered mild or moderate. Over 12 months, the rate of infectious endophthalmitis was 0.047% per injection, and the rate of intraocular inflammation was 0.22% per injection. Exudative age-related macular degeneration rates in the pooled studies were 6.0%, 4.1% and 2.4% for pegcetacoplan monthly, every-other-month, and sham, respectively. The safety profile of pegcetacoplan at 18 months was consistent with the safety profile reported at 12 months. The 24-month safety data will be presented.

Conclusions: Pegcetacoplan was generally safe and well tolerated at month 12.

Gene therapy for Bietti crystalline dystrophy provides functional CYP4V2 in vivo and ex vivo models

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Purpose: Bietti crystalline dystrophy (BCD) is an inherited retinal disease caused by mutations in the CYP4V2 gene. This study aims to validate a series of essential precursor in vitro experiments prior to developing a clinical gene therapy for BCD.

Methods: Human wild-type or codon-optimised CYP4V2 was cloned into a plasmid with a CAG promoter and packaged into AAV2 (AAV2.wtCYP4V2 or AAV2.coCYP4V2) for viral transduction experiments. HEK293 or ARPE19 cells or BCD patient specific induced pluripotent stem cell-derived RPE cells were transduced, and CYP4V2 expression was assessed by immunocytochemistry and western blot. Functionality of CYP4V2 in cells exogenously expressing CYP4V2 was confirmed by a cytochrome P450 enzyme assay. Expression of CYP4V2 was assessed in ex vivo human retina explant transduced by AAV2.

Results: Immunocytochemistry and western blot results showed that HEK293, ARPE19 and patient induced pluripotent stem cell derived RPE cells transduced with AAV2.coCYP4V2 resulted in increased protein expression levels of CYP4V2 compared to those transduced with AAV2.wtCYP4V2. We observed significantly increased CYP4V2 enzyme activity in cells transduced with AAV2.coCYP4V2 compared to those transduced with AAV2.wtCYP4V2. We demonstrated CYP4V2 expression in human RPE/choroid explants transduced with AAV2.coCYP4V2 compared to those transduced with AAV2.wtCYP4V2.

Conclusions: These preclinical data support the further development of a gene supplementation therapy for a currently untreatable blinding condition—BCD. Codon-optimised CYP4V2 transgene demonstrates its superiority over wild type in terms of protein expression and enzyme activity. Ex vivo culture of human retinal explant is an effective approach to test AAV-mediated transgene delivery.

Thirty-six-month outcomes after starting vascular endothelial growth factor inhibitors for treatment-naïve central retinal vein occlusion: Data from the Fight Retinal Blindness! registry

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Purpose: We performed a retrospective analysis of a large prospectively specified observational database of patients with central retinal vein occlusion (CRVO) treated with vascular endothelial growth factor (VEGF) inhibition from routine practice.



Method: We identified 527 treatment-naïve patients with CRVO that commenced VEGF inhibitors between 1 December 2010 and 2018. The primary outcome was mean change in visual acuity (VA) from baseline to 36 months. We compared VEGF agents with generalised mixed effects models.

Results: In all eyes, the mean VA change (95% confidence interval) was +10 (7, 12) letters, 44% gained and 14% lost ≥ 15 letters, 37% had final VA ≥ 70 and 30% ≤ 35 letters. Mean CST change was $-306 \mu\text{m}$. The adjusted mean VA change was similar with each VEGF inhibitor (+12 letters) despite significant difference in adjusted mean CST change with aflibercept ($-310 \mu\text{m}$), ranibizumab ($-258 \mu\text{m}$) or bevacizumab ($-216 \mu\text{m}$; $p < 0.001$). VEGF switchers (19%) gained +11 letters like non-switchers (69%) but with more injections (20 vs. 10; $p < 0.001$). Completers (257/527, 49%) had a median of 18 injections over 26 visits with ongoing treatment documented at 3 years in 195/527 eyes (37%) but a similar percentage had ceased therapy before 3 years. Only 62 (12%) eyes had no subsequent macular oedema without treatment.

Conclusion: Patients with CRVO that commenced VEGF inhibitors in routine care had VA improvements of around 10 letters at 3 years. The choice of VEGF inhibitor influenced CST but not VA outcomes. We estimate that around half of eyes were still receiving injections after 36 months.

Evaluation of 8 mg intravitreal aflibercept for neovascular age-related macular degeneration: Results from the Phase 2 CANDELA study

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Purpose: The phase 2, randomised, single-masked, open-label, 44-week CANDELA trial (NCT04126317) assessed the safety and efficacy of intravitreal aflibercept (IVT-AFL) 8 mg versus IVT-AFL 2 mg in patients with neovascular age-related macular degeneration (nAMD).

Methods: Treatment-naïve patients with active subfoveal choroidal neovascularisation secondary to nAMD (best corrected visual acuity [BCVA] 78–24 letters) were randomised 1:1 to 3 monthly doses of IVT-AFL 8 mg or IVT-AFL 2 mg followed by doses at Weeks (W) 20 and 32. Primary endpoints were safety and the proportion of eyes without retinal fluid in the centre subfield at W16.

Results: Overall, 106 patients (mean baseline BCVA 58.0 letters) were randomised. The incidence of ocular adverse events through W44 was 37.7% (20/53) for both IVT-AFL groups. No new safety signals were identified (no occlusive vasculitis or adjudicated arterial thromboembolic events, nor serious events of intraocular inflammation, were reported through W44). In the IVT-AFL 8 mg and 2 mg groups, 50.9% and 34.0% of eyes at W16 (treatment difference, 17.0% [95% confidence interval -1.6% , 35.5%]; $p = 0.0770$) and 39.6% and 28.3% of eyes at W44 (treatment difference, 11.3% [95% confidence interval -6.6% , 29.2%]; $p = 0.2185$) had no retinal fluid in the centre subfield. Reductions from baseline in median central subfield thickness at W44 were -162 versus $-88 \mu\text{m}$ with IVT-AFL 8 mg versus 2 mg, with increases in mean BCVA of $+7.9$ versus $+5.1$ letters ($p = 0.1957$).

Conclusions: Safety of IVT-AFL 8 mg was similar to that of IVT-AFL 2 mg. In this study, we observed anatomic and functional improvements with IVT-AFL 8 mg suggesting potential additional therapeutic benefit in comparison to IVT-AFL 2 mg in nAMD.

VOYAGER: An innovative, global, observational study to gain real-world insights into the port delivery system with ranibizumab and faricimab in patients with neovascular age-related macular degeneration and diabetic macular edema

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Purpose: To gather long-term clinical insights among patients receiving Susvimo (Port Delivery System with ranibizumab) or Vabysmo (faricimab) for neovascular age-related macular degeneration (nAMD) and diabetic macular edema (DME) in routine clinical practice globally.

Method: Patients (≥ 5000) receiving Susvimo or Vabysmo for approved indication(s) in routine local clinical practice (~ 500 sites; 31 countries) will be observed for ≤ 5 years. Variables being collected include visual acuity (VA), treatment patterns and management, imaging assessments and treatment decisions and safety events. Optical coherence tomography and other images will be captured to evaluate retinal fluid and anatomic biomarkers impacting VA.

Results: The primary outcome is change in VA from baseline at month 12 per eye, by indication and per product. Key secondary objectives include real-world treatment regimens, treatment patterns and tolerance to fluid and correlations with change in VA over time. Safety outcomes will include the incidence, severity, duration and outcome of ocular and non-ocular adverse events. Other objectives will be to evaluate the effectiveness of Susvimo or Vabysmo on central subfield thickness reduction and to evaluate nAMD- and DME-specific disease features (e.g., disease activity, presence/location of atrophy and fibrosis in nAMD, diabetic retinopathy severity level in DME).

Conclusion: By collecting real-world long-term clinical data and images, clinician treatment patterns and key anatomic features impacting VA in patients treated with Susvimo or Vabysmo for their approved indication(s), VOYAGER will generate insights into treatment patterns and factors driving patient treatment decisions, real-world effectiveness and safety outcomes on a global and regional level.

Aflibercept monotherapy versus aflibercept with retinal laser to peripheral retinal ischemia for diabetic macular oedema

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Purpose: We tested the hypothesis that targeted retinal laser photocoagulation (TPRP) to areas of peripheral retinal ischaemia reduces the overall number of intravitreal aflibercept injections required to treat diabetic macular oedema over a 24-month period.

Method: Prospective, double-masked, multicentre, randomised controlled trial. All eyes received 2 mg/0.05 ml intravitreal aflibercept following a treat-and-extend protocol. Those eyes randomised to combination therapy also received TPRP laser to the ischaemic peripheral retina guided by ultra-wide field fundus fluorescein angiography. The primary outcome measure was the number of intravitreal aflibercept injections in each of the two treatment arms at 24 months. Secondary outcome measures at 24 months compared with baseline: mean change in central macular thickness (CMT), mean change in visual acuity, treatment interval at completion of trial and the proportion of eyes without macular oedema.

Results: We enrolled 48 eyes; 27 eyes were randomised to combination therapy (aflibercept and TPRP) and 21 to aflibercept monotherapy. Thirty-two eyes (67%) completed the 2-year study. The number of intravitreal treatments given (10.5 (SD 5.8) and 11.8 (SD 5.6), $p = 0.44$) were similar for both groups. The visual outcome (mean improvement of 4.0 (−1.8, 9.8) and 7.8 (2.6, 12.9) letters, $p = 0.32$), mean decrease in CMT (−154 (−222, −87) and −152 (−218, −86) μm , $p = 0.96$), proportion of eyes with CMT $< 300 \mu\text{m}$ (48% and 67%; $p = 0.50$) and safety outcomes were similar in both treatment groups.

Conclusions: Laser to areas of ischaemic peripheral retina does not reduce the burden of intravitreal aflibercept injections for treating diabetic macular oedema.

PERCEIVE study report: Real-world safety and effectiveness of voretigene neparvovec

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Purpose: PERCEIVE is a post-authorisation safety study assessing long-term safety and effectiveness of Voretigene Neparvovec (VN) in a real-world setting.

Methods: PERCEIVE is an ongoing, prospective, longitudinal, multicenter (ex-US), registry-based observational study. All VN-treated patients considered eligible. Patients are treated according to local prescribing information and followed-up per routine clinical practice for 5 years. Primary objective is to collect adverse events (AE), including AEs of special interest (AESIs). Secondary objectives include assessment of visual function.

Results: August 2021, 106 patients enrolled, 103 received VN (mean age [SD]: 19.5 [10.85] years; females: 52 [50.5%]). Mean (SD) follow-up was 0.8 (0.64) years (max: 2.3 years). Thirty-five patients (34.0%) reported ≥ 1 ocular AEs including ocular AESIs ($n = 17$ [16.5%]). Most common ocular AE, chorioretinal atrophic changes (at injection site and/or elsewhere, $n = 13$). Ocular AESIs included foveal degeneration ($n = 4$), vitritis ($n = 4$), eye inflammation ($n = 3$), retinal tear ($n = 2$) and increased intraocular pressure ($n = 5$). Two patients had ocular serious AEs (SAEs: eye inflammation, $n = 1$; increased intraocular pressure, $n = 1$). Non-ocular AEs occurred in 8 patients; headache ($n = 4$) the most frequent. Visual function improved in terms of full-field light sensitivity threshold, and best corrected visual acuity (LogMAR) at year 2 with a mean (SD) change from baseline of -13.67 (22.62) decibels and -0.03 (0.55), respectively.

Conclusions: The safety and effectiveness of VN observed in the PERCEIVE study, with up to 2 years of data, is consistent with findings from VN clinical trials. Chorioretinal atrophy has been identified as a new adverse drug reaction, which so far has not been associated with loss of visual function.

Experiences of subretinal gene therapy administration in patients with geographic atrophy

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Purpose: The retina is an ideal target for gene therapy due to its inherent vulnerability to sight threatening single gene mutations, coupled with the relative ease of surgical access to the eye. Researchers are now broadening the application of this technology to genetically complex retinal diseases such as age-related macular degeneration (AMD). This talk will provide an update on the gene therapy surgery performed in the Gyroscope Therapeutics Ltd-sponsored AMD clinical trial of an investigational retinal gene therapy for geographic atrophy being conducted at the Centre for Eye Research Australia (CERA).

Method: A phase II, open-label, outcomes-assessor masked, multicentre, randomised, controlled study to evaluate the safety and efficacy of two doses of GT005 administered as a subretinal injection in subjects with geographic atrophy.

Results: An update on the trial's progress at the Royal Victorian Eye and Ear Hospital and CERA will be provided, including a summary of the eligibility criteria, details of the surgical procedure using an optical coherence tomography-guided operating microscope, and discussion of the outcome measures used to assess safety and efficacy.

Conclusion: This ongoing clinical trial is the first gene therapy for dry AMD to be performed in Australia and the first gene therapy of any kind to be delivered at CERA and the Royal Victorian Eye and Ear Hospital. The surgical team's experience will be transferable to other emerging retinal gene therapies.

Optical coherence tomography outcomes of the DiMECAT trial

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Purpose: To evaluate diabetic macular oedema (DME) optical coherence tomography (OCT) features (IRC, EZ, DRIL, HRF, subfoveal fluid and foveal contour) pre- and post-cataract surgery with adjunctive intravitreal bevacizumab (IVBVB) or triamcinolone (IVTA), and assess their association with best corrected visual acuity (BCVA).



Method: Post-hoc analysis of the DiMECAT trial, a prospective randomised clinical trial where patients with cataract and DME received either IVBVB or IVTA during and after cataract surgery. Macular OCT scans were obtained at baseline, one month, three months and six months post-operatively. B-scans centred on the fovea were graded per the TCED-HVF protocol by 2 masked graders. Wilcoxon rank-sum and Fisher's exact tests assessed associations between OCT features and BCVA or treatment groups, respectively.

Results: Forty-nine eyes (from 46 patients; 15 female; mean age 69 years) were included; 23 received IVBVB. Prevalence of DME OCT features for all eyes at the pre-operative and 6 months visits respectively, were: EZ (60%, 57%), DRIL (43%, 55%), HRF (4%, 6%), IRC (70%, 66%), subfoveal fluid (6%, 2%), and foveal contour (63%, 71%). There was no significant difference in any OCT feature between treatment groups ($p > 0.05$). DRIL ($p \leq 0.03$) and EZ ($p < 0.01$) were associated with poorer BCVA at all post-operative reviews. Poorer BCVA was also associated with IRC at 1 ($p = 0.02$) and 6 months ($p = 0.024$), and foveal contour at month 1 ($p = 0.03$). No association was identified with the other OCT parameters ($p > 0.05$).

Conclusion: DRIL and EZ integrity are significantly associated with poorer visual outcomes. Once present, they remain relatively unchanged post-operatively despite ongoing IVBVB and IVTA.

Cryotherapy versus laser does not influence anatomical success following vitrectomy for primary rhegmatogenous retinal detachment repair: Registry analysis of 2413 patients

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Purpose: To determine if a difference exists between cryotherapy and endolaser photocoagulation retinopexy in the rates of anatomical success following primary rhegmatogenous retinal detachment (RRD) repair with pars plana vitrectomy (PPV).

Methods: Eyes with primary RRD in a bi-national retinal surgery registry who underwent repair with PPV and had a minimum of 3-months follow-up were recorded prospectively by participating surgeons, and outcome was entered at 3 months. A generalised mixed model approach was used to compare the effect of retinopexy type on outcome. Variables known to be associated with retinal surgical success were considered as covariates for the final model. The primary endpoint was the proportion of patients with stable retinal re-attachment without the need for further retinal detachment surgery, assessed 3-months post-operatively. The secondary outcome measured was visual acuity at 3-months compared with baseline measurements.

Results: Of a total 2413 patients included, the overall single-procedure success rate was 85%. There was no statistically significant difference in surgical success between the adjusted proportion of successful reattachment for the Cryo group (87%) when compared to the Laser group (82%) ($p = 0.84$, odds ratio 1.04, 95% confidence interval 0.74, 1.46). There was no difference between groups for the mean change in visual outcomes at 3-months (adjusted mean change of -0.48 logMAR for Cryo vs. -0.50 logMAR for Laser group, $p = 0.82$).

Conclusions: Choice of cryotherapy versus endolaser retinopexy was not observed to influence the anatomical success of PPV for RRD, nor visual acuity outcomes at 3-months post-operatively.

15:30 - 17:00

S10—PROFESSIONAL DEVELOPMENT

Title: Tools of the Trade

Chairs: Dr Nisha Sachdev and Dr Mia Zhang

Venue: Great Hall 1

17:30 - 18:30

Film and Poster Viewing Session

Venue: Exhibition Hall

19:00

H03—Alcon Hosted Evening Symposium

19:00

H04—Roche Hosted Evening Symposium

06:30 - 07:45

H05—Zeiss Hosted Morning Symposium**Venue:** M1 & 2

06:30 - 07:45

H06—Bayer Hosted Morning Symposium**Venue:** M4

08:00 - 08:45

ROYAL AUSTRALIAN AND NEW ZEALAND COLLEGE OF OPHTHALMOLOGISTS (RANZCO) AGM**Venue:** Great Hall 2

08:45 - 09:15

L04—RETINA UPDATE LECTURE**Title:** Gene Therapy—Opportunities and Challenges

Prof James Bainbridge

Synopsis: The eye has key advantages as a target organ for gene therapy and has provided an exemplar for applications in other organ systems. Targeting of genes to the outer retina may be achieved by transvitreal or transchoroidal approaches to the subretinal space, or by intravitreal injection of vectors modified to traverse the inner retina. Supplementation of genes to surviving retinal cells can dramatically improve the outcome for specific genetic deficiencies. The successful amelioration of RPE65-deficiency in clinical trials and the licencing of voretigene neparvovec have been landmarks in the development of this novel technology. To realise the potential for treatment of other genetic retinal diseases however, several specific challenges must be addressed. The supplementation of large genes will depend on the development of new vector systems that provide greater capacity. Optimal safety and efficacy will demand improved control of both genetic dosing and harmful inflammatory responses. While gene supplementation can help compensate for deficiencies, recent advances in gene editing offer the potential for lasting cure by permanent correction of gene defects. Trials to evaluate the impact of these novel approaches must be designed with reliable and relevant outcome measures that demonstrate improved quality of life.

Chair: Dr Jennifer Arnold**Venue:** Great Hall 2

09:15 - 09:45

L05—UVEITIS UPDATE LECTURE**Title:** TBC

Prof Debra Goldstein

Synopsis: TBC**Chair:** Dr Robyn Troutbeck**Venue:** Great Hall 2

09:45 - 10:15

L06—THE DAME IDA MANN MEMORIAL LECTURE**Title:** An Eye on the Brain: Adding Insight to Injury

Prof Helen Danesh-Meyer

Synopsis: The convergence of technological advances opens opportunities for novel ocular biomarkers into brain function and disease. The retina and optic nerve share embryological, anatomical, immunologic responses and molecular findings to the brain. Furthermore, the complex white matter tract which coordinate eye movements provide insights into the brain in both health and disease. New technologies such as amplified magnetic resonance imaging, eye tracking and optical visualisation provide exciting possibilities for paradigm shifts in our approach to neurological disease.

Chair: Prof Charles McGhee**Venue:** Great Hall 2

10:15 - 10:45	Morning Tea
10:15 - 10:45	AUSTRALIAN SOCIETY OF OPHTHALMOLOGISTS (ASO) AGM Venue: M4
10:45 - 12:15	P03—PLENARY BEST PAPER PRESENTATIONS: Gerard Crock and John Parr Trophies Chairs: Prof Clare Gilbert and Dr Amy Cohn Venue: Great Hall 2

Waste produced by cataract surgery: A clearer view on the impact of operating theatres on the world's climate crisis

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Purpose: Climate change and carbon footprint are global issues. Australia's healthcare sector contributes 7% towards national greenhouse gas emissions, with operating theatres a major contributor. We measured the quantity of surgical waste generated from cataract surgery (the second most common elective surgical procedure) and how it was disposed at two tertiary public hospitals.

Methods: A prospective, observational study was conducted on 21 cataract procedures within the Gold Coast Hospital and Health Service, Australia. Waste was collected and segregated into six different streams: soft plastic; hard plastic; paper; cardboard; textiles; and electricals and metals. The carbon dioxide equivalent (CO₂e) emissions were recorded for total waste and each waste stream per operation. Annual estimates of waste and greenhouse gasses Australia wide were calculated using hospital and Australian Institute of Health and Welfare data.

Results: One cataract surgery produced 3.29 kg of waste, stratified as 20.4% hard plastics, 17.3% soft plastics, 20.4% paper and cardboard, 33.7% textiles and 6.7% metals and electrical equipment. Annual waste from 1655 procedures was 5450 kg with a cumulative carbon footprint of 7.513 tonnes CO₂e. We extrapolated that in a typical year across Australia, cataract surgery produces 1903 tonnes of CO₂e from 429 600 cataract surgeries. Globally in 2016, 75 670 tonnes of waste and 101 890 tonnes of CO₂e were produced as a direct result of cataract procedures.

Conclusion: To reduce the carbon footprint from surgery, a sustainability plan is needed that looks at reusing equipment, rethinking packaging and educating staff on waste segregation and disposal.

Early detection of keratoconus by artificial intelligence

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Purpose: To develop an artificial intelligence (AI) platform that can detect keratoconus (KC) and differentiate it from non-KC cases through evaluation of corneal topographic images.

Methods: A databank of corneal topographic images was collated from patients who were seen between the years 2000 and 2020 with healthy corneas, keratoconic corneas and other corneal abnormalities. An AI architecture has been devised with 21 million parameters and 200 "layers" deep, to analysed topographical maps generated by a scheimpflug corneal tomographer (Pentacam).

Results: A total of 4000 axial maps from 3400 individuals were divided into: No Keratoconus, Keratoconus Suspect, Referable Keratoconus and Other Abnormalities. The dataset was then divided into 60/20/20 for training, validation and testing respectively. There was no patient overlap among the groups. The outcome was then assessed against the known diagnosis, as determined by 2 cornea specialists. The algorithm currently achieves 85% accuracy in differentiating between 'No Keratoconus' and 'Referable Keratoconus' groups, and 80% accuracy for identifying 'Keratoconus Suspect' from 'Referable Keratoconus' cases.

Conclusion: AI is a very useful in detecting KC at an early stage. Further work is in progress to make the technology more accessible for all optometrists and enable easier setup in the community and within schools to screen for KC.



A randomised controlled trial of cataract surgery versus combined cataract surgery with insertion of iStent inject

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Purpose: To compare the intraocular pressure (IOP) and quality of life outcomes in glaucoma suspect and mild-to-moderate open angle glaucoma patients undergoing cataract surgery alone or combined with iStent inject implantation.

Method: In this randomised clinical trial, eyes were randomised to cataract surgery with iStent inject (treatment group, $n = 54$) or no stent implantation (control group, $n = 50$) at the Royal Victorian Eye and Ear Hospital. There was no preoperative medication washout period, with all topical agents ceased from day 1 postoperatively and reintroduced in a stepwise manner after surgery depending on the IOP during reviews. Study participants were followed up for 2 years.

Results: There were no statistically significant difference in baseline disease severity between the two groups (mean deviation: -4.8 control vs. -4.5 treatment group). Preoperatively, medicated IOPs were 17.3 ± 3.2 mmHg and 17.7 ± 3.0 mmHg in the treatment and control groups, respectively. There were no statistically significant differences in IOP, visual field indices and optical coherence tomography parameters between groups throughout the 2-year study period. The main statistically significant difference was in the medications used at 18 months (0.9 treatment group vs. 1.2 control group) and 2 years (0.8 treatment group vs. 1.4 control group). Quality of life data is still being analysed.

Conclusion: Cataract surgery combined with iStent inject implantation resulted in less IOP-lowering medication use at 18 months and 2 years when compared to cataract surgery alone.

A randomised controlled trial: Laissez-faire versus direct surgical closure of full-thickness lower lid defects

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Purpose: To compare the anatomical integrity, complication rate and patient satisfaction between laissez-faire (healing by secondary intention [LF]) and direct surgical closure (DC) of full-thickness lower lid margin defects following lesion excision.

Methods: A multi-centre randomised controlled trial involving Waikato and Marlborough District Health Boards. A total of 120 patients will be randomly assigned to LF or DC. Patient demographics, defect size, lower lid integrity, complications, quality of life and patient satisfaction scores will be analysed. This study has been approved by Heath and Disability Ethics Committee.

Results: To date, 30 patients, mean age 74 years, have been randomised to LF or DC. Wound dehiscence occurred in 3 DC patients. The 2 groups had similar rate of punctate epithelial erosions and trichiasis. At Three months follow-up, 3 LF patients had slight vertical notching of their lower lids with the average of 0.8 mm. Three LF patients had lid retraction with an average of 1.3 mm compared to 2 mm in 1 DC patient. None of these patients reported functional or cosmetic concerns of their lid. No cases required revision surgery. The LF and DC groups reported similarly high scores in the overall outcome (9.5, 9.4 respectively) and cosmesis (8.8, 9.5). A higher portion of LF patients reported improvement in their quality of life postoperatively (82% compared to 67% in DC group).

Conclusions: This is the first randomised controlled trial comparing LF to DC in lower lid reconstruction. To date, both groups have had excellent and comparable functional results, cosmetic outcomes and patient satisfaction.

Efficacy of intravitreal pegcetacoplan in geographic atrophy: 24-month results from the phase 3 DERBY and OAKS trials

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Purpose: DERBY and OAKS are two 24-month, phase 3, randomised, double-masked, sham-controlled clinical trials comparing the efficacy, including change from baseline in geographic atrophy (GA) lesion growth via fundus autofluorescence and visual function, and safety of monthly or every-other-month (EOM) intravitreal pegcetacoplan with sham in patients with GA secondary to age-related macular degeneration.

Methods: Included patients were ≥ 60 years old, had 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 was change in GA lesion size measured by fundus autofluorescence from baseline to month 12.

Results: DERBY and OAKS enrolled 621 and 637 patients, respectively. At month 12 in OAKS, pegcetacoplan statistically significantly reduced GA lesion growth versus sham in the monthly and EOM arms by 21% ($p = 0.0004$) and 16% ($p = 0.0055$), respectively. DERBY did not reach statistical significance; pegcetacoplan decreased GA lesion growth versus sham by 12% ($p = 0.0609$) and 11% ($p = 0.0853$) in the monthly and EOM arms, respectively. The month 18 data were consistent (OAKS: 22% and 16% reduction; DERBY: 13% and 12% reduction, in monthly and EOM arms, respectively). The 24-month efficacy data will be presented.

Conclusions: Pegcetacoplan is the first therapy shown to control GA lesion growth in a large phase 3 trial.

Common genetic variants are predictive of visual field progression in glaucoma: A prospective longitudinal study using a glaucoma polygenic risk score

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Purpose: Glaucoma polygenic risk scores (PRS) have been shown to be predictive of the risk of developing glaucoma. We investigated whether PRS can additionally stratify risk of glaucoma functional progression.

Methods: Primary open-angle glaucoma (POAG) suspects and early-manifest glaucoma cases enrolled in the national longitudinal study of glaucoma progression (PROGRESSA cohort) were included in this study. Participants underwent a 6-monthly clinical assessment including Humphrey Visual Field testing. Progression was defined as a new cluster of ≥ 3 points depressed in the pattern deviation probability plot at two consecutive Humphrey Visual Field. A minimum of 5 reliable fields were required. High-risk individuals were those harbouring most of the known glaucoma-associated genetic variants (top 5% PRS relative to a normative population). A multivariable mixed-effect cox model adjusting for age, gender and inter-eye correlation was used for statistical analysis.

Results: Longitudinal data from 1909 eyes of 981 individuals (43.6% male, aged 70.3 ± 10.3 years), with a mean duration of follow-up of 9.3 ± 4.3 years, were included. Progression was detected in 936 eyes (49%) within 4.7 ± 3.9 years. High genetic risk individuals ($N = 135$, 13.8%) were 1.42 times more likely to progress (hazard ratio 95% confidence interval 1.12–1.80, $p = 0.004$) compared to the rest. We validated this finding using progression criteria used in AGIS ($p = 0.016$) and CIGTS ($p = 0.040$) reports.

Conclusion: Genetic risk scores impart clinical utility in the management of early POAG cases and suspects by identifying those with a higher risk of visual field progression.

12:15 - 13:45

Lunch

13:45 - 15:15

CONCURRENT SESSIONS

13:30 - 15:00

S11—SYMPOSIUM-Retinal Imaging: the Best Cases from the RVEEH Angiogram Meeting for 2022

amycohn1@gmail.com

Chair: Dr Amy Cohn

Venue: Great Hall 3

Synopsis: The Royal Victorian Eye and Ear Hospital Angiogram meeting is a weekly meeting run by the retina consultants for registrar training. This symposium will show a selection of cases highlighting diverse retinal pathologies and management dilemmas. The expert panel will be interrogated regarding pathophysiology, natural history and evidence-based therapy. Our aims of the symposium:

1. To discuss a wide range of retinal pathologies;



2. To apply best practice and peer review literature to retinal disease management;
3. To showcase the best use of multimodal imaging in retinal disease management; and
4. To encourage discussion between panel members and audience.

The format will be case-based discussion with a summary of the key aspects of diagnosis, management and multimodal imaging for various retinal diseases. The cases will be presented in a dynamic and interactive way with encouragement of audience participation.

Speakers and Topics:

Panel: Dr Salmaan Qureshi, Prof Robyn Guymer, Dr Ming-Lee Lin and Dr Xavier Fagan

Cases and retinal imaging will be presented and discussed by the expert panel on diagnoses including:

- Diabetic macula oedema
- Proliferative diabetic retinopathy
- Macula telangiectasia
- Retinal vein occlusion
- Patch off blindness and PAMM
- Uveitis
- Inherited retinal dystrophies
- White dot syndromes
- Any many more

13:30 - 15:00

S12—COURSE-Cataract Surgery—The Subspecialists' Perspective

thomasgordoncampbell@gmail.com

Chairs: Dr Thomas Campbell and Dr Elsie Chan

Venue: Great Hall 2

Synopsis: The aim is to present a practical, interactive and case-based course for all cataract surgeons and trainees on the management of other pathologies in the perioperative management of cataract patients.

Speakers and Topics:

Panel: Prof Adrian Fung, Dr Rachael Niederer, Dr Alp Atik, Dr Mohammed Ziaei and Dr Shivanand Sheth

In this course, subspecialists will discuss cataract surgery from the point of view of their own subspecialty.

1. The vitreo-retinal perspective. Prof Adrian Fung will discuss epi retinal membranes, vitreo-macular traction and intraoperative management of vitreous loss.
2. The uveitis and retina perspective. Dr Rachael Niederer will discuss managing uveitic patients and macular oedema in the perioperative period.
3. The glaucoma perspective. Dr Alp Atik will discuss the management of the surgical and medical glaucoma patient at the time of cataract surgery.
4. The cornea perspective. Dr Mohammed Ziaei will discuss managing astigmatism.
5. The strabismus perspective. Dr Shivanand Sheth will discuss ocular-motility considerations in the management of monovision and presbyopia correcting lenses.
6. Discussion/Q&A

13:30 - 15:00

S13—COURSE-Paediatric Refresher Course for All Ophthalmologists Who See Kids

shanel@eyeandlaser.com.au

Chairs: Dr Shanel Sharma and Dr Maree Flaherty

Venue: Great Hall 4

Synopsis: A refresher course with the aim of increasing the general ophthalmologists confidence in seeing paediatric patients and managing routine paediatric cases. Also aims to clarify when paediatric cases may need referral to a tertiary paediatric ophthalmic department. By increasing the general ophthalmologist's confidence in assessing paediatric patients, we aim to ensure that all children who require ophthalmic care can receive timely care from the current network of private paediatric and general ophthalmologists and the public hospital ophthalmic services.

Speakers and Topics:

Dr Loreto Rose—Myopia assessment and management for all ophthalmologists seeing kids

Dr Jonathan Ruddle—Amblyopia—when a child fails vision screening and evidence-based treatment from the Pediatric Eye Disease Investigator Group trials

Dr Parth Shah—Nasolacrimal duct obstruction in children—what is the differential, when to operate—tube or not to tube

Dr Anu Mathew—Refracting children and when to remove glasses with minor scripts, bifocal / multifocal lenses

Dr Maree Flaherty—How to assess children with “tracking disorders”, learning difficulties at school. How to differentiate ocular from non-ocular causes

Prof David Mackey AO—Ultraviolet eye damage from childhood

13:30 - 15:00

S14—FREE PAPERS—Oculoplastic/Orbit

Chairs: Dr Brett O'Donnell and Dr Lindsay McGrath

Venue: M4

13:30 - 15:00

S15—PROFESSIONAL DEVELOPMENT-Registries – what's new, what's coming and why you need to get involved

eye@cityeye.com.au

Chairs: Dr Lawrence Lee, Dr Hemal Mehta and Prof Graham Lee and Dr Judy Ku

Venue: Great Hall 1

Synopsis: This fast-paced session will explore the world of large-scale registries. Registries are an essential part of ophthalmology; analysis of large data sets enables advancements in clinical practice, informs research and has direct and tangible benefits to public health. In this session, CPD Chair, Dr Lawrence Lee will detail what CPD users need to know about the brave new world of Australian Medical Council-approved CPD Homes. All Fellows need to be aware of what's coming and how the College will work to guide them through these changes. CPD Committee member and Director, Prof Nigel Morlet will make the case for the importance of eye disease registries and explain how the registry-novices can get involved and make use of established registries.

Speakers and Topics:

Dr Lawrence Lee—Update on CPD requirements

Prof Nigel Morlet—Importance of Eye Disease Registries

Miriam Keane—Australian Corneal Graft Registry

Prof Stephanie Watson OAM—Fight Corneal Blindness!

Prof Jamie Craig—Australian and New Zealand Registry of Advanced Glaucoma

Prof Mitchell Lawlor—Fight Glaucoma Blindness!

Dr Rohan Essex—ANZSRS Retina Surgery Registry

A/Prof Matthew Simunovic—Fight Inherited Retinal Blindness!

Dr Ashley Kras—Who scopes the potential of registries to inform personalised medicine?

Autoimmune markers in screening for orbital inflammatory disease

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Purpose: Immunogenic causes of inflammation may be difficult to differentiate in the work-up of orbital inflammatory disease. The study aims to investigate the utility of autoimmune markers in the screening for orbital inflammation. Markers studied included angiotensin-converting enzyme, antinuclear antibody,

anti-neutrophilic cytoplasmic autoantibodies, extractable nuclear antigen, anti-cyclic citrullinated peptide and anti-double stranded DNA antibody.

Methods: A retrospective single-centre study of consecutive patients with non-infective orbital inflammation screened for autoimmune markers at presentation. Serology was interpreted alongside clinical course and other investigations (e.g., radiographic features and histopathology). Tabulated data and Pearson's chi-square allowed analysis of trends between serology, diagnosis and the decision to biopsy.

Results: Seventy-nine patients between 1999 and 2021 were included (50 females, mean age 50.4 ± 17.4 years). Twenty-eight (34.6%) patients had specific orbital



inflammation and 53 (65.4%) patients had non-specific orbital inflammation (NSOI). Of the 12 patients with positive serology and a specific diagnosis, only 5 (41.7%) patients had concordant serological results. There was no association between serology results and the patient undergoing biopsy ($p = 0.651$). Serology was unable to exclude nor differentiate NSOI from other specific conditions and antinuclear antibody had limited discriminatory value between specific conditions and NSOI.

Conclusion: Serological testing alone may not provide a clear direction for further investigation of orbital inflammation, and a biopsy may occur independently of the serological results. The value of autoimmune markers may lie in subsequent follow-up as patients may develop suggestive symptoms after an indeterminate positive result or initially seronegative disease.

Magnetic resonance dacryocystography shows delayed tear transit in functional epiphora

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Introduction: Magnetic resonance dacryocystography (MRDCG) offers improved spatial and temporal resolution compared to dacryoscintigraphy (DSG) in functional epiphora.

Methods: Prospective patients of a tertiary oculoplastic clinic with unilateral or bilateral epiphora were included if no external cause of epiphora was found, they showed patency on syringing ($\leq 20\%$ reflux), and no obstruction or stenosis on dacryocystography. Included eyes underwent DSG, and MRDCG with qualitative assessment and quantitative measures of tear transit time, compared to historic reference values.

Results: We included 24 symptomatic eyes of 18 patients. The median age was 62 (range 17–82) years. DSG was abnormal in 96% of eyes. MRDCG showed complete block in 16 (67%) eyes. The median (range) MRDCG contrast transit times for all eyes with functional epiphora were 25 (8–135) seconds to the sac, 59 (8–594) seconds to the nasolacrimal duct, and 118 (93–1053) seconds to the inferior meatus. The median (range) transit times along the fundus-nose distance were 42 (17–621) seconds to fill the first 25%, 97 (34–684) seconds to fill 50% 109 (67–963) seconds to fill 75% and 135 (93–1053) seconds to fill 100%. Transit times to the sac ($p = 0.003$), nasolacrimal duct ($p = 0.016$), and times to fill the first 25%, 50% and 75% of the fundus-nose distance were significantly longer compared to the historic reference times (all $p < 0.05$).

Conclusion: Functional epiphora shows delayed tear transit to the sac and proximal-to-distal nasolacrimal duct.

Functional epiphora with mucosal apposition: A new dacryoendoscopic feature

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Purpose: To describe mucosal apposition of the lacrimal system as a new dacryoendoscopic feature in functional nasolacrimal duct obstruction.

Method: Retrospective case series of dacryoendoscopies performed for functional epiphora. All patients underwent lacrimal syringing, dacryocystography and dacryoscintigraphy.

Results: Seven lacrimal systems from 5 patients with functional nasolacrimal duct obstruction were identified for inclusion. The mean age was 71.8 years (range 58–81 years) with a slight male preponderance (M:F = 3:2). All patients had dacryoendoscopic evidence of mucosal apposition with a slit-like configuration at the sac-duct junction, proximal or mid-nasolacrimal duct. The lumen became fully expanded upon irrigation with saline. All patients underwent silicone intubation, of which two lacrimal systems (28.6%) had concurrent balloon dacryoplasty. Symptomatic improvement was reported in only one lacrimal system (14.3%).

Conclusion: This series presents new dacryoendoscopic evidence of mucosal apposition as a cause of functional epiphora. This specific cohort may have less successful outcomes with primary silicone intubation.

Normative lacrimal gland dimensions by magnetic resonance imaging in an Australian cohort

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Purpose: To report the normative dimensions of the lacrimal gland on fat suppressed contrast-enhanced magnetic resonance imaging (MRI) in an Australian cohort.

Method: Retrospective review of patients who underwent 3 T orbital MRI. Two hundred and eleven orbits



were used to conduct lacrimal gland measurements. Orbits were excluded if there was ipsilateral orbital or lacrimal gland disease, prior surgery or poor image quality. The length and width of the lacrimal gland was measured in axial and coronal sections using the largest image.

Results: The mean lacrimal gland axial length was 14.6 mm in the right orbit and 14.3 mm in the left orbit. Mean axial width was 4.9 mm in both orbits. Coronal lengths averaged 16.2 mm in the right orbit and 16.4 mm in the left orbit. The coronal width averaged 4.8 mm in both orbits. A significant negative correlation was found between age and the right axial length ($r = -0.26$, $p < 0.01$) and left axial length ($r = -0.26$, $p < 0.01$) of the lacrimal gland. No statistically significant difference was found between genders or laterality.

Conclusion: This study presents the normal lacrimal gland dimensions on fat suppressed contrast-enhanced MRI in an Australian cohort. An inverse relationship exists between age and the axial length of the lacrimal gland. This data may be used to help diagnose enlargement of the lacrimal gland.

Orbital plasmacytoma and multiple myeloma—An Australian study

Jessica Xiong^{1,2}, Jessica Tong^{1,3}, Jonathan Hyer⁴, Brett O'Donnell^{5,6}, Dinesh Selva³, Thomas Hardy⁴, Alan McNab⁴, Simon Taylor^{1,2,7}, Edwin Figueira⁸, Krishna Tumuluri^{1,2,7,9}

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Purpose: To provide Australian data on the clinical, radiological features and outcomes in patients with orbital plasmacytomas.

Methods: Multicentre retrospective review of orbital plasmacytoma and orbital involvement in multiple

myeloma (MM) from 2005 to 2022 across multiple sites in Australia.

Results: Sixteen participants, median age 63 years (range 53–87) and 9 (56%) females were identified. Fifteen (94%) had a known diagnosis of MM prior to their orbital presentation. Eleven (69%) were receiving active treatment for systemic myeloma on presentation, while 4 (25%) were in remission. Majority were unilateral orbital involvement ($n = 14$, 88%) and 2 (12%) were bilateral cases. Common presenting symptoms and signs were decreased visual acuity ($n = 12$, 37%), proptosis ($n = 11$, 34%), limited motility ($n = 12$, 75%) and optic neuropathy ($n = 4$, 25%). Radiologically 9 (56%) involved superotemporal orbit, 5 (31%) inferotemporal orbit and 12 (75%) involved ≥ 1 extraocular muscles. Twelve (75%) were biopsied and confirmed orbital plasmacytoma on histopathology. Treatment modalities included intravenous and oral steroids ($n = 6$, 38%), chemotherapy ($n = 5$, 31%), radiotherapy ($n = 10$, 63%), stem cell transplant ($n = 2$, 12%) and surgical debulking and decompression ($n = 2$, 12%). Mortality was high, with 10 (63%) having MM-related mortality.

Conclusion: This is the largest cohort of Australian data on orbital plasmacytomas. Most patients have a diagnosis of systemic MM at presentation. It is crucial to recognise and treat these patients early due to a poor prognosis when associated with MM.

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 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 5 lacrimal gland, 6 orbital and 1 infraorbital nerve biopsies. A preceding histological diagnosis of IgG4-RD occurred in 8 patients, of which 3 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 1 patient. IgG-4 secreting lymphoma occurred in 4 patients. Serum IgG4 was raised in 5 patients. Extra-ocular organ involvement occurred in 1 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.

Presenting a new surgical procedure for lower eyelid reconstruction: Minimal and marginal approach for releasing the lid with closure handling technique (MARCH technique)

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Purpose: To present a new surgical procedure for lower eyelid reconstruction.

Methods: Prospective interventional study with a clinical series of 6 patients who underwent reconstruction of the full-thickness lower eyelid defect after basal cell carcinoma excision from March 2022 to June 2022.

Results: In cases where the defect involves up to around 60% of the lower eyelid, the Minimal MARCH technique would be a more conservative approach, with very promising results that would encourage us to use it as the first surgical step.

Conclusions: Periocular skin cancers are especially challenging due to recurrences, local invasion, and surgical iatrogenic morbidity. To save periosteum and tarsus in

anticipation of possible future relapses, we present the Minimal MARCH technique. It is a safe alternative, minimally aggressive, with good tolerance and recovery and excellent functional and cosmetic outcomes.

Dysthyroid optic neuropathy: Case series at a tertiary ophthalmic referral centre

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Purpose: To describe the demographics and clinicoradiologic features of dysthyroid optic neuropathy (DON) patients at a tertiary ophthalmic centre, treatment modalities and final visual outcomes.

Methods: A retrospective audit of DON patients who have received intravenous methylprednisolone (IVMP) therapy at the Royal Victorian Eye and Ear Hospital from July 2015 to October 2021.

Results: Twenty-two patients were included; 59% were female and the average age at presentation was 58.7 (35–82) years. Ninety-one percent had Grave's disease; autoimmune thyroid disease was present for ≤ 8 months before thyroid eye disease diagnosis (72%). Eighty-two percent had a smoking history. The most common presentations were diplopia (63.6%) and proptosis (50%). Seventy-seven percent had predominantly extra-ocular muscle enlargement, and 50% had apical crowding. Fifty-five percent had bilateral DON, and the average visual acuity (VA) of the worse eye at the DON diagnosis was 6/19. Forty-five percent had relative afferent pupillary defect.

Fifty-nine percent progressed to require second-line treatment with orbital decompression. Thirty-two percent were refractory to the combination of IVMP and surgical decompression, hence required radiotherapy, immunotherapy or both. The average cumulative dose of IVMP during DON treatment and until the second-line therapy were 6.8 ± 1.9 g and 4.5 ± 2.3 g, respectively. DON was reversed in 50% of cases, and 100% had inactive thyroid eye disease at the final follow-up (mean 1.7 years). The average final VA of the worse eye was 6/9.5.

Conclusion: Our DON patients were predominantly middle-aged smokers with a slight female preponderance with extra-ocular muscle enlargement. More than half failed IVMP and required orbital decompression. The mean change in VA was two Snellen lines of improvement.



Outcomes of intubation and endoscopic dacryocystorhinostomy in functional nasolacrimal duct obstruction

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Background: To ascertain the success of lacrimal intubation and dacryocystorhinostomy (DCR) in alleviating epiphora due to functional nasolacrimal duct obstruction (FNLDO).

Methods: Consecutive adult patients with epiphora attending a tertiary lacrimal clinic from May 2010 to February 2021 were reviewed to identify cases with FNLDO. FNLDO was defined as epiphora with the exclusion of alternate causes of watering on clinical examination, patent lacrimal syringing, normal dacryocystography, and post-sac delay on DSG. Epiphora resolution and improvement rates in FNLDO were compared between lacrimal intubation and endo-DCR.

Results: Twenty-three endo-DCRs (20 patients, 65% females, mean age 68.9 ± 12.2) and 41 intubations (29 patients, 61.2% females, mean age 65.0 ± 14.1) performed in FNLDO were included. Resolution of epiphora was achieved in 15 (65.2%) of the DCR procedures (median follow-up 9 months) compared to 14 (34.1%) of intubations (median follow-up 10 months; $p = 0.017$). Significant epiphora improvement (i.e. either improvement or resolution) was noted in 21 (91.3%) DCRs and 24 (58.5%) intubations ($p = 0.006$). Seven patients (17.1%) undergoing intubation as the primary procedure had endo-DCR performed following the intubation. Among respondents to a phone questionnaire, 53.8% who had endo-DCR (median 69 months) and 50% that had intubation (median 28 months) reported significant improvement in epiphora.

Conclusions: Improvement in epiphora due to FNLDO was approximately 59% in intubations, while the success of endo-DCR was higher (91%). The long-term results of these interventions warrant further investigation.

Functional epiphora—An under-reported entity

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Purpose: To determine the etiology of epiphora in a tertiary lacrimal clinic and highlight the high proportion of 'functional' cases.

Design: Single-centre retrospective review.

Methods: Records of adult patients presenting to a tertiary lacrimal clinic from January 2011 to February 2021 with epiphora were reviewed. Patients underwent testing with syringing/probing and lacrimal imaging to reach a diagnosis of functional epiphora. Functional epiphora was diagnosed based on the exclusion of alternate causes of epiphora on clinical examination, patent lacrimal syringing, normal dacryocystography and delay on dacryoscintigraphy.

Results: A total of 576 symptomatic eyes of 372 adult patients (mean 66.2 ± 15.5 years, 63.4% females) with epiphora were evaluated for causes. Post-sac obstruction (stenosis/complete obstruction) and functional epiphora (non-anatomical delay) were the most common causes of presentations to the lacrimal clinic (26% each). Functional epiphora with post-sac delay was substantially more common than functional epiphora with pre-sac delay (89% vs. 11%). In 16% of the cases, no cause for the epiphora was found while more than one cause (multi-factorial) was present 11% of the time.

Conclusions: Functional epiphora was found to be as common as a nasolacrimal anatomical obstruction when lacrimal imaging is utilised.

Microbiology of bacterial orbital cellulitis: Tertiary institutional experiences in South

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Purpose: This study describes the microbiology of bacterial orbital cellulitis (OC) over an 11-year period and its clinical associations at three tertiary institutions in Adelaide, South Australia.

Methods: Multi-centre retrospective study of paediatric and adult patients with bacterial OC with microbiology conducted between January 2012 and August 2022 (Inclusive). Pre-septal cellulitis was excluded. Differences in means were determined by the Independent Samples t-test, and categorical data was analysed via Pearson's Chi square. A P-value < 0.05 was statistically significant.



Results: This study included 99 patients (male: 69, mean age: 22.0 ± 23.8 years old), of which 70.7% were aged ≤ 18 years. Sinus and orbital abscess cultures had the greatest positive yield (73.7%). The frequency of organisms isolated was as follows: *Streptococcus* species (34/99, 34.3%), *Staphylococcus aureus* (28/99, 28.3%), *Haemophilus* species (5/99, 5.1%), mixed anaerobes (3/99, 3.0%), *Enterobacter cloacae* (2/99, 2.0%), *Moraxella catarrhalis* (1/99, 1.0%), *Pseudomonas aeruginosa* (1/99, 1.0%), *Corynebacterium* species (1/99, 1.0%), *Klebsiella pneumoniae* (1/99, 1.0%), *Proteus mirabilis* (1/99, 1.0%), *Citrobacter koseri* (1/99, 1.0%), and *Enterococcus* species (1/99, 1.0%). No

organism was cultured in 32.3% of cases. Methicillin-resistant *Staphylococcus aureus* (MRSA) accounted for 28.6% of all *Staphylococcus aureus* isolates, of which 50% occurred in 2021 to 2022.

Conclusion: Yearly microbiological trends have remained largely constant in South Australia. The causative organism was not identified in 32.3% of cases, further emphasising appropriate empirical antibiotics, and obtaining microbiology from various sources. MRSA OC remains of increased clinical and public health concern and may be associated with a more aggressive disease course.

15:15 - 15:45

Afternoon Tea

15:45 - 17:15

CONCURRENT SESSIONS

15:45 - 17:15

S16—COURSE-Management Strategies for Common Strabismic Conditions

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Chairs: A/Prof Geoffrey Lam and Dr Deepa Taranath**Venue:** Great Hall 1

Synopsis: To provide general ophthalmologists suggestions on how to manage some commonly seen strabismic conditions, through lively debate.

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

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.

15:30 - 17:00

S17—COURSE-Endophthalmitis for General Ophthalmologists

rosie.dawkins@gmail.com

Chairs: A/Prof Kristopher Rallah-Baker and Dr Phoebe Moore**Venue:** Great Hall 2

Synopsis: Endophthalmitis remains a feared complication of ophthalmic surgery and intravitreal injections. This course aims to bring the state of the science in prevention, emergency management and further treatment to general ophthalmologists.

Speakers and Topics:

A/Prof Penelope Allen—Current Australian data and state of the science

Dr Rohan Merani—Evidence for prevention in intra-vitreous injections and cataract surgery

Dr Elsie Chan—Emergency management of endophthalmitis, including tips for corneal patients

A/Prof Matthew Simunovic—Diagnosis and organism identification

Dr George Kong—Prevention, patient education, early identification and management in glaucoma patients

Dr Rosie Dawkins—Evidence for vitreo-retinal surgery in endophthalmitis

15:30 - 17:00

S18—SYMPOSIUM-Expanding the Surgical Practice of the General Ophthalmologist—Surgical Correction of Refractive Error

dralisonchiu@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 (ICLs), 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.

Q and A session with panel discussion

Speakers and Topics:

A/Prof 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

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

Prof Donald Tan — Update on treatments for myopia progression: the current evidence

Dr Alison Chiu — Extreme measures: Treatment of the patient with high refractive error (implantable collamer lenses, laser options, refractive lens exchange)

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

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

Q and A session with panel discussion

15:30 - 17:00

S19—FREE PAPERS—Epidemiology/Genetics/Public Health/Training and Education

Chairs: Prof Andrea Vincent and A/Prof Samantha Fraser-Bell

Venue: M4

A smartphone lens attachment improves the quality of referrals to eye casualty

Oliver Riley

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Purpose: Eye casualty clinics have seen significant increases in patient numbers, COVID-19 has exacerbated this issue and demonstrated the potential of telemedicine as a solution. Our study evaluated the potential benefit of a smartphone-based lens attachment to improve the referral pathway for anterior-segment pathology in eye casualty.

Method: Fifty-four patients with anterior segment complaints were recruited. Questionnaires were completed by each patient to simulate the history from the point of referral. White light and cobalt photos were

captured using a smartphone lens. The clinician reviewing the patient then documented the actual diagnosis and the appropriate timeframe in which the patient could have been seen within. The subsequent images and questionnaires were reviewed by a single consultant ophthalmologist who was independent to the data collection process. The assessor then made a diagnosis and management plan based upon the questionnaire ('History'), and the questionnaire with the photo ('History with Image'), and assess their clinical confidence.

Results: Diagnostic accuracy was significantly higher in 'History with Image' (98.2%) when compared to 'History' (48.2%). 'History with Image' prevented significantly more appointments when compared to 'History' alone and similar levels to retrospective clinic review. Time-frame of appointments between 'History with Image' and 'Clinic' appointments was similar. Clinical



Confidence was significantly higher with 'History with Image' when compared with 'History Only'.

Conclusion: We demonstrate that a low-cost smartphone lens attachment alongside a standardised questionnaire can improve the referral pathway by reducing unnecessary appointments and improving both clinical confidence and diagnostic accuracy.

Adherence and barriers to the recommended diabetic retinopathy screening guidelines in pregnant women with pregestational diabetes in metropolitan Melbourne

Felicia Widyaputri^{1,2,3}, Sophie Rogers¹, Alison Nankervis^{4,5}, Jennifer Conn^{4,5}, Muhammad Sasongko³, Alexis Shub^{6,7}, Xavier Fagan^{8,9}, Daryl Guest¹⁰, Robert Symons^{1,2,10,11}, Lyndell Lim^{1,2,8}
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Purpose: As pregnancy affects diabetic retinopathy (DR), National Health and Medical Research Council guidelines recommend at least one eye check in early pregnancy and ideally 3-monthly thereafter through to the postpartum. We report adherence rates and barriers to the recommended DR screening in a prospective cohort study.

Method: This was a cross-sectional survey study that collected data on the enablers of and barriers to attending the guideline-recommended DR screening from a prospective cohort of pregnant women with type 1 or type 2 diabetes. The survey used was a modification of the Compliance with Annual Diabetic Eye Exams Survey. Patients were recruited from the Royal Women's

Hospital and Mercy Hospital for Women in Melbourne, Australia from January 2018 to September 2019. Comprehensive eye examinations were provided without cost.

Results: From 147 recruited patients, 125 (85.0%) completed our survey. The median age of participants was 34 years (range 19–47 years), 64 (51%) had type 1 diabetes. A retinal assessment was undertaken at least once during pregnancy in 56 (44.8%) women and 33 (26.4%) had the ideal number of examinations. Competing priorities ($p = 0.006$) was the main reason given for non-attendance. Eye exams were ranked as the fourth priority (interquartile range 4–5) among other health appointments during pregnancy.

Conclusion: Despite the risk of losing vision from worsening DR during pregnancy, less than half of the participants adhered to recommended screening guidelines, suggesting that eye health is not a priority in these patients. More proactive efforts to integrate care are needed to prevent visual loss in this growing population.

The 4eyesVision Kit: Trials of an innovative method of vision screening and correcting refractive error in remote and disadvantaged communities

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Purpose: To test the concept of community-led vision screening and refractive error correction using the 4eyesVision Kit.

Method: Trials were conducted in Papua New Guinea in partnership with the Kokoda Track Foundation. First prototypes were tested in Kokoda Village to determine if laypeople could learn to perform vision screening and basic subjective refraction with minimal instruction using the 4eyesVision Testing Wheel. Building on experience of this trial, the design of various components of the testing kit was revised, and a second larger trial was conducted in Hanuabada Village.

Results: Both trials confirmed that refractive error was a major cause of vision impairment in these remote communities, and that vision testing and glasses were not accessible. The first trial successfully proved that lay people could learn to perform vision screening accurately and dispense customised glasses, thus significantly improving visual acuity. The second trial involved 6 community members performing vision screening and subjective refraction on 400 people over 3 days, resulting in 220 pairs of glasses being dispensed on the spot. A



follow-up survey revealed that 98% of people rated the glasses 5/5 for improvement in quality of vision and quality of life.

Conclusion: Uncorrected refractive error affects one billion people worldwide, and the current paradigm for treating it is not adequate to address the huge need. Trials of the 4eyesVision Kit have proven the concept that vision screening, subjective refraction and dispensing of customised glasses can be conducted by lay people in underserved communities, thus reducing the burden of uncorrected refractive error.

Three types of teleophthalmology delivery in Western Australia during the COVID-19 lock-down: Comparison of three modalities

Amy Kalantary¹, Rachael Heath Jeffery¹, Katie Wang², Nicholas Dunstan², Alex Craig³, Vaibhav Shah⁴, Yachana Shah⁴, Margie O'Neill⁴, Stephen Copeland⁴, Angus Turner⁴

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Purpose: To combat travel restrictions for specialist outreach to regional areas during the 2020 COVID-19 lock-down, Lions Outback Vision introduced three different modalities of teleophthalmology consultations; home-based telephone, hospital-based video and optometry-based video. This study evaluated the utility of these in providing specialist care to rural patients during the pandemic.

Method: Data from patients referred during the COVID-19 lock-down period (23 March 2020 to 5 June 2020) were analysed. If sufficient clinical information and imaging were available, then ophthalmologists conducted home-based telephone consultations. If further ocular imaging or examination was required, then optometry-based video or hospital-based video were used. Data were analysed using analysis of variance and two-sided t tests for continuous data and chi square statistics for categorical data ($p < 0.05$).

Results: Majority of the 431 consultations were conducted via home telephone (38%) or optometry-based video (37%). Indigenous patients ($p = 0.014$) and patients in very remote communities ($p < 0.01$) were more likely to receive an at-home consultation. These patients were more likely to be booked for surgery than optometry ($p < 0.01$) and cataracts were the predominant diagnosis in optometry consults compared to hospital ($p < 0.01$).

Conclusion: This study highlights the role of home telephone for providing accessible specialist care for patients living in very remote regions and for Indigenous patients. As such, telephone-based ophthalmology should continue to be funded and used beyond the duration of the pandemic for rural patients where appropriate. Limitations include small sample size, and further research could be conducted to evaluate the outcome for these patients at follow-up face-to-face appointments.

Association of retinal age gap with arterial stiffness and incident cardiovascular disease

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Background: With the advances of deep learning technology, we have recently developed an algorithm to predict retinal age based on fundus images, which could be a novel biomarker for ageing and mortality. Therefore, we aim to investigate associations of retinal age gap with arterial stiffness index (ASI) and incident cardiovascular disease (CVD).

Methods: A deep learning model was trained based on 19,200 fundus images of 11,052 participants without any medical history at baseline to predict the retinal age. Retinal age gap (retinal age predicted minus chronological age) was generated for the remaining 35,917 participants. Regression models were used to assess the association between retinal age gap and ASI. Cox proportional hazards regression models and restricted cubic splines were used to explore the association between retinal age gap and incident CVD.

Results: We found each one-year increase in retinal age gap was associated with increased ASI ($\beta = 0.002$, 95% confidence interval [CI]: 0.001–0.003, $p < 0.001$). After a median follow-up of 5.83 years (interquartile range: 5.73–5.97), 675 (2.00%) developed CVD. In the fully adjusted model, each one-year increase in retinal age gap was associated with a 3% increase in the risk of incident CVD (hazard ratio 1.03, 95% confidence interval 1.01–1.06, $p = 0.014$). In the restricted cubic splines analysis, the risk of incident CVD increased significantly when retinal age gap reached 1.21 (hazard ratio 1.05; 95% confidence interval 1.00–1.10; p -overall < 0.001 ; p -nonlinear = 0.068).

Conclusion: We found that retinal age gap was significantly associated with ASI and incident CVD events, supporting the potential of this novel biomarker in identifying individuals at high risk of future CVD events.



The Victorian evolution of inherited retinal diseases natural history registry (VENTURE study): Characteristics of the 150 initially registered participants

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Purpose: Emerging treatments are being developed for inherited retinal diseases (IRD), requiring a clear understanding of natural progression and a database of potential participants for clinical trials. Herein we present data from the first 150 participants enrolled in the Victorian Evolution of IRDs Natural History Registry (VENTURE).

Methods: VENTURE collects retrospective and prospective data from people with IRDs. Participants are asked to attend a prospective baseline examination to confirm their IRD diagnosis. Genetic testing is performed with a next-generation sequencing panel by an independent laboratory if prior results are not available. Phenotype and genotype data are used to enrol participants into disease-specific longitudinal sub-studies and to notify them of future clinical trials.

Results: From 7 July 2020 to 30 December 2021, VENTURE enrolled 150 registrants (138 families); 75 were referred by clinicians and 75 self-referred into the registry. Most registrants (63%) have a rod-cone dystrophy phenotype. Over 39% of registrants had a molecular diagnosis at the time of their study enrolment; and a further 55% of participants have initiated genetic testing through VENTURE. Of the 93 participants who have received a probable molecular diagnosis, the most common affected genes are RPGR (13% of all registrants), USH2A (10%), CYP4V2 (7%), ABCA4 (5%) and CHM (5%). Most registrants had early to moderate vision impairment at study registration, with 55% having visual acuities of better than 6/60 (20/200). Study recruitment is ongoing.

Conclusion: VENTURE will complement existing patient registries and help drive IRD research in Australia, facilitating access to research opportunities for individuals with IRDs.

Ribonucleic acid editing with CRISPR-Cas13 for the treatment of usher syndrome

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Purpose: Mutations in the gene USH2A are the most common cause of Usher syndrome type II and autosomal recessive retinitis pigmentosa. One therapeutic strategy is to repair mutations with gene editing. Ribonucleic acid (RNA) editing uses molecular tools to change single nucleotides in RNA. We firstly develop a novel USH2A mouse model, and then use CRISPR-Cas13 RNA editing tools correct a common mutation in USH2A

Methods: A mouse model with a premature termination codon in USH2A was created with CRISPR-Cas9. Mice were evaluated over 18-months with immunostaining, auditory brainstem response, optical coherence tomography and electro-retinography. CRISPR-Cas13 RNA editing tools were then screened for efficiency of repair of target mutations using a luciferase assay in vitro.

Results: USH2A-transgenic mice did not express Usherin in the retina and cochlea, and demonstrated a congenital auditory deficit at higher frequencies (8–24 kHz). Retinal degeneration was not observed by electro-retinography and optical coherence tomography. RNA editing tools demonstrated repair rates of up to 47.5% ± 0.3 of target mouse and human USH2A mutations in an in vitro luciferase assay, with 80% correction shown with DNA sequencing. Off-target editing rates varied by design of the Cas13 editing tool.

Conclusions: We demonstrate a novel RNA editing approach for Usher syndrome and develop a USH2A mouse model for the in vivo evaluation of future RNA editors.

Does a negative gene panel result indicate a non-hereditary disease in patients with dominant retinitis pigmentosa?

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³Australian Inherited Retinal Disease Registry, Perth, Australia

Purpose: Improvements in DNA sequencing technology have led to rising expectations amongst clinicians on the success rate of gene panels. We examined the outcome of



genetic testing in autosomal dominant retinitis pigmentosa (adRP) pedigrees.

Method: Patients were recruited from the Western Australian Retinal Degeneration study and the Australian Inherited Retinal Disease Registry. The proband of each adRP pedigree initially underwent genetic testing using microarray, MVL targeted panels (59-988 genes) or TruSight one panel (4800 genes). Candidate variants were then Sanger sequenced in 1 or more other family members for segregation analysis. Inconclusive results were interrogated for rare variants and additional copy number variants if not already performed.

Results: Forty-one adRP families with 230 affected individuals across 2–5 generations were included. Mean (SD) age at symptom onset was 25 (14) years. Initial genetic results were reported at a mean (SD) age of 48 (19, 9–85 years), between 1 and 72 years after symptom onset. 27/41 (64%) tests returned a positive result. Causal genes included RHO ($n = 9$), PRPF31 ($n = 4$), RP1 ($n = 4$), HK1 ($n = 3$), PRPH2 ($n = 3$), SAG ($n = 1$), SNRNP200 ($n = 2$) and RP9 ($n = 1$). Notably 14/41 (34%) tests returned an inconclusive results. Further analysis of all sequence variants and aCGH or qPCR for missed deletions as well as repeat panel testing resulted in another 9 pedigrees being resolved (PRPF31, BEST1, IMPDH1, IMPG1, RPE65, SAG). However, 5/41(12%) adRP pedigrees remained unsolved.

Conclusion: Success rate of genetic testing in adRP pedigrees improved from 64% to 88% with re-examination of reported and non-reported variants as well as testing for large gene changes, not detectable by panels.

Ribonucleic acid sequencing of human lens epithelial cells in post vitrectomy cataract vs. steroid induced cataract

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Purpose: Vitrectomy and corticosteroid-use are known to accelerate cataract development; however, the causative mechanisms are largely unknown. We conducted ribonucleic acid (RNA)-sequencing of human lens epithelial cells in steroid-induced and post-vitrectomy cataract to verify and compare gene expression profiles.

Methods: Human anterior lens capsule specimens from post-vitrectomy ($n = 8$), steroid-induced subcapsular ($n = 12$) and age-related ($n = 2$) cataracts were collected from patients following written informed consent from the Alfred Hospital Research and Ethics Committee. Capsulorhexis specimens were collected at the time of cataract

surgery for analysis. RNA was isolated using RNeasy Micro Kit and RNA libraries were synthesized using Illumina Stranded Total RNA Prep Ligation with Ribo-Zero Plus followed by sequencing on a NovaSeq S4, 300 cycles at AGRF.

Results: Approximately 55,000 genes were detected from RNA-seq. We focused on ~15,000 genes with moderate or high average expression of >10 transcripts per million reads sequenced. Principal component analysis clustered steroid induced subcapsular cataract and post-vitrectomy cataract separately, suggesting overall differences in gene expression between the 2 groups, while age-related cataract samples clustered close to post-vitrectomy samples. We identified 9 upregulated and 21 downregulated DEGs in steroid-induced cataract when compared to post-vitrectomy cataract.

Conclusions: Our findings suggest that post-vitrectomy cataract and steroid-induced subcapsular cataract have different RNA transcription profiles. Bioinformatics analyses suggest that lens epithelial cells from post-vitrectomy cataract have a similar transcriptome to lens epithelial cells from age-related cataract, but the transcriptome from steroid-induced posterior subcapsular cataract lens epithelial cells was quantitatively and qualitatively different.

Ophthalmology operation note encoding with open-source machine learning and natural language processing

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Background: Encoding of operation notes is essential for accurate activity-based funding and workforce planning. The aim of this project was to develop machine learning, namely natural language processing, models that may be able to assist with this task.

Methods: This study involved 1000 ophthalmological operation notes for procedures performed in 2 metropolitan hospitals. Manual encoding was conducted for all procedures. XGBoost, decision tree, Bidirectional Encoder Representations from Transformers and logistic regression models were developed for classification experiments. The best performing model was used on the hold-out test dataset using for both multi-label or binary classification. A cost-based analysis was subsequently conducted.

Results: Across the entire dataset, the human-entered coding was correct in 53.9% of cases. The 5 most common procedures were “lens extraction and insertion of intraocular lens” (374 cases), “vitrectomy via pars plana sclerotomy” (298 cases), “retina, photocoagulation of”



(149 cases), “glaucoma, filtering operation for” (56 cases) and “intravitreal injection” (49 cases). The Bidirectional Encoder Representations from Transformers model had the highest classification accuracy (88.0%) in the multi-label classification on these the 5 procedures. When applied to all codes, with 5 or more cases, XGBoost achieved a classification accuracy of 75.5%. Financial analyses demonstrated potential for significant discrepancies in reimbursement.

Conclusions: Natural language processing has been successful in the classification of ophthalmology operation note encoding. Further research is required in this area, as greater automation may facilitate more accurate reimbursement and enable surgeons to spend more time with patients.

One.Right.Eye: A real-time virtual 3D model eye for personalised patient education

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Purpose: There is currently a large gap in patient education tools available in public hospitals and telehealth/remote settings to aid in the understanding of eye conditions. We aim to improve doctor-patient communication with our new real-time virtual 3D model eye: One.Right.Eye. This online tool allows personalised patient education either in person or remotely through telehealth consults.

Methods: We built an anatomically accurate digital model of the eye which is readily accessible to doctors and patients. By bringing together a team of doctors, software engineers and artists, we set out to improve the patient education experience for a few important and common eye diseases.

Results: We present One.Right.Eye. This interactive 3D model will be demonstrated in real time during the presentation to the audience, with audience interaction. We will illustrate how a personalised patient education experience is made possible either in person or remotely—with the clinician driving the eye which is simultaneously viewed by the patient remotely.

Conclusion: The COVID-19 pandemic has accelerated the need and progress of teleophthalmology as an adjunct model of care. One.Right.Eye is an anatomically accurate digital 3D model of the eye which aims to address this gap and contribute towards greater patient education and telehealth capabilities within ophthalmology.

19:00 - 23:00

Congress Dinner

Venue: Boulevard Room, Brisbane Convention and Exhibition Centre

MONDAY 31 OCTOBER SPEAKERS

06:30 - 07:45

H08—Apellis Hosted Morning Symposium**Venue:** M4

08:00 - 08:30

AIOS SURGICAL CHALLENGES VIDEO SESSION & UPDATE ON OPHTHALMOLOGY IN AFGHANISTAN**Chair:** Dr Mark Renehan**Venue:** Great Hall 2**Speakers**

Dr Lalit Verma

Dr Harbansh Lal

Dr Namrata Sharma corneas, fungal keratitis - treatment protocol

Dr Qais Nasimee — Report of Rapid Assessment of Avoidable Blindness in Afghanistan

08:30 - 09:00

L07—CATARACT UPDATE LECTURE**Title:** Intraocular Lens Selection—Optical Principle of Choice

Prof Graham Barrett AM

Synopsis: Surgeons have many choices today when selecting an intraocular lens (IOL). One of the most important factors to consider is the optical principle they think best addresses their patient's need for unaided near vision following cataract surgery. For many years, multifocal IOLs with more than one focal plane have been the most common type of IOL implanted for patients requesting spectacle independence. Diffractive IOLs are able to provide excellent unaided vision, but the quality of vision may be compromised and associated dysphotopsia is not uncommon. Intraocular lenses which extend the depth of focus have become available and are based on several different optical principles which can avoid many of the issues encountered with multifocals. These lenses can be used in conjunction with modest levels of monovision for additional spectacle independence. An understanding of the optical principles of the different lenses is important as well as familiarity with clinical data, patient outcomes and even an element of philosophy in choosing an appropriate lens. The lecture will provide an update on the different type of so-called "Extended Depth of Focus" or "Monofocal Plus" lenses which are likely to challenge multifocals as a preferred intraocular lens for cataract surgery.

Chair: Dr Jacqueline Beltz**Venue:** Great Hall 2

09:00 - 09:30

L08—THE NORMAN McALISTER GREGG LECTURE**Title:** Retinal Vein Occlusion: Where are We and Where are We Going?

Prof Ian McAllister

Synopsis: Retinal vein occlusion was originally described by Liebreich in 1855 using his newly invented stand ophthalmoscope. It remains troubling that in the subsequent 168 years, despite some advances in controlling sequelae, we are no closer to developing a lasting cure for this condition which remains a common cause of unilateral visual loss. Treatments have evolved from laser ablation to specific intravitreal cytokine antagonists. While there have been considerable improvements in outcomes, these are achieved at both significant expense and burdens of therapy. These treatments address only some of the sequelae of the obstruction to venous outflow that exists in this condition and have no effect on either the underlying pathology or induced significant elevations in venous pressure. If we are going to maximise visual outcomes and reduce treatment burdens, an effective method of relieving this obstruction needs to be also developed. We also need to understand more completely the sequence of cytokine upregulation that occurs to more appropriately target the induced dysregulation. This presentation will examine the progress that has been made in both these areas. The relief of outflow obstruction has focused on both direct methods which have significant limitations and indirect ones with the development of the laser induced chorio-retinal bypass.



Intra-retinal cytokine upregulation studies give us information on what is happening within the retina as a consequence of the retinal vein occlusion rather than relying on levels that leach into the aqueous and vitreous. This does have implications for timing of antagonists and preserving retinal neural elements.

Chair: Prof John Grigg

Venue: Great Hall 2

09:30 - 10:00

L09—CORNEA UPDATE LECTURE

Title: DMEK, the Artificial Iris and the Virtual Cornea Clinic

Prof Donald Tan

Synopsis: Descemet's membrane endothelial keratoplasty (DMEK) has come of age as the potentially ideal approach to corneal endothelial replacement but is fraught with technical challenges in complex cases with anterior segment co-morbidities such as aniridia, peripheral anterior synechiae, glaucoma drainage tubes, an absent or unstable lens iris diaphragm and aphakia. A reconstruction of the anterior chamber with iris removal and placement of an artificial iris, followed by DMEK, is presented.

A series of cases is presented, in which recreation of a normalised AC with the use of the artificial iris, allows for simpler and more predictable DMEK surgery, especially when the DMEK pull-through approach is utilised. Such patients require prolonged and close subspecialty and multisubspecialty follow-up, and in this COVID-19 era of lockdowns and travel restrictions, the Virtual Cornea Clinic was established between two Asian countries to monitor and look after such complex corneal cases.

Chair: Dr Andrea Ang

Venue: Great Hall 2

10:00 - 10:30

Morning Tea

10:30 - 12:00

P04—PLENARY-CLINICAL CONTROVERSIES

Chair: Dr Ridia Lim

Venue: Great Hall 2

Speakers and Topics:

Prof Donald Tan—The Controversy of Dua's Layer... why should we bother?

Dr Janey Wiggs—Normal tension glaucoma risk factors and approach to therapy

Prof Sarah Coupland—Prognostication in uveal melanoma

Prof James Bainbridge—The value of face-down positioning after surgery for macular hole

Prof Debra Goldstein - tbc

12:00 - 13:30

Lunch

13:30 - 15:00

CONCURRENT SESSIONS

13:30 - 15:00

S20—SYMPOSIUM-Optimising the Management of Common Corneal Conditions: What do Corneal Specialists Tell their Patients Part II?

stephanie.watson@sydney.edu.au

Chair: Prof Stephanie Watson OAM

Venue: Great Hall 3

Synopsis: This symposium will follow a similar format to our successful symposium at RANZCO's virtual congress 2022 but discuss different common conditions. Expert presenters will communicate best practice by addressing the answers to questions commonly asked by patients with corneal disease. Patient reported outcome measures, an increasingly important tool for assessing the benefit to patients of treatments, will also be addressed. 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.

Speakers and Topics:

A/Prof Elaine Chong—Is there anything new in pterygium surgery? An update on pterygium surgery for the comprehensive ophthalmologist.

Prof Stephanie Watson—Does my patient with corneal ectasia need crosslinking? An explanation of the indications for crosslinking and what needs to be discussed with patients in need of the procedure.

Dr Himel Kandel—How can I use patient reported outcomes (PROMs) in my everyday practice. The why and how of using measures for understanding the benefit to patients of treatments in everyday practice.

Dr Tanya Trinh—Is there anything new for Fuch's corneal dystrophy? An update for the general ophthalmologist on new treatments available and emerging for Fuchs.

Dr Andrew Apel—Does my patient need a surgical solution or laser superficial keratectomy? When you can laser and when you need to surgically remove corneal lesions and irregularities.

Prof Richard Mills—What should I do with pigmented conjunctival lesions? An overview of how to manage pigmented lesions on the conjunctiva and key points to use when advising patients

Panel discussion and Q&A

13:30 - 15:00

S21—SYMPOSIUM-What Happens After You've Diagnosed...

dr.celia.chen@gmail.com

Chair: Prof Celia Chen

Venue: Great Hall 2

Synopsis: The aim is to provide a multi-disciplinary collaboration to discuss approaches to key neuro-ophthalmology conditions. 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. These patients may have life or sight threatening conditions that require immediate investigation and management.

Optic neuritis

Ophthalmology perspective

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

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

Ophthalmology perspective

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

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

Ophthalmology perspective

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

Immunology perspective

- What is the "recipe" for steroid taper?
- Discussion of tocilizumab and steroid sparing agents

Arterial occlusion to the eye

Ophthalmology perspective

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

Neurology perspective

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

**Speakers and Topics:**

Prof Lynn Gordon—Optic neuritis: Ophthalmology perspective

A/Prof Andrew Lee—Optic neuritis: Neurology perspective

Prof Helen Danesh-Meyer—Neuromyelitis optica: Ophthalmology perspective

Prof Simon Broadley—Neuromyelitis Optica: Neurology perspective

Dr Ioanne Anderson—Giant cell arteritis: Ophthalmology perspective

Dr David Heyworth-Smith—Giant cell arteritis: Immunology perspective

Prof Celia Chen—Central retinal artery occlusion: Ophthalmology perspective

A/Prof Andrew Wong—Central retinal artery occlusion: Neurology perspective

13:30 - 15:00

S22—COURSE—Advances in Ophthalmic Surgical Education—Where are We at in 2022?

rahul.chakrabarti@eyeandear.org.au

Chair: Dr Rahul Chakrabarti

Panel Members: Dr Callum Gin, Dr Nicholas Enright, Dr Jacqueline Beltz and Dr Thomas Campbell

Venue: Great Hall 4

Synopsis: The aim of this session is to update surgical supervisors and trainees on the latest developments in ophthalmic microsurgical education. The talks will encompass trainee perspectives on microsurgical simulation, reflections on five years of the new microsurgical training curriculum in Melbourne using virtual-reality simulation, returning to surgery after a break, development of the 21st century ophthalmic surgeon incorporating mind skills and non-technical skill development, and advances in surgical feedback. The session will complement the new RANZCO microsurgical training curriculum and will be of interest to Directors of Training, consultant ophthalmologists involved in surgical supervision, and trainees.

Speakers and Topics:

Dr Callum Gin—Trainee knowledge, attitudes, and practices towards virtual reality surgical simulation—the RANZCO perspective. Results from a bi-national survey of first-year ophthalmology trainees across RANZCO.

Dr Nicholas Enright—Back to the future. Five years on the complete journey of a Melbourne trainee in the new microsurgical program incorporating virtual-reality simulation embedded into a structured curriculum.

Dr Rahul Chakrabarti—Return to surgery after a break: An evidence-based approach. Structured approach to returning to surgery across all levels of expertise (trainee to consultant).

Dr Jacqueline Beltz—Developing 21st century ophthalmic surgeons: Structured courses for mind-training, professional skills development, and advanced intra-ocular lens selection courses.

Dr Thomas Campbell—Advances in surgical feedback in ophthalmology. Evidence-based approaches to surgical feedback. Applicable to surgical supervisors and trainees.

13:30 - 15:00

S23—FREE PAPERS—Glaucoma/Uveitis

Chairs: Dr Graham Hay-Smith and Dr Jennifer Fan Gaskin

Venue: M4

The effect of intraoperative intravitreal bevacizumab (Avastin) on surgical success of trabeculectomy at 3 years: The Avastin in trabeculectomy study

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Aim: To evaluate the effect of a single intraoperative intravitreal bevacizumab (Avastin) injection on trabeculectomy success during the first 3 years post-operatively.

Methods: We performed a double-blinded randomised controlled trial. Patients were recruited through the Flinders Medical Centre if they had progressing glaucoma or uncontrollable intraocular pressure (IOP) requiring trabeculectomy. Cases were randomised to either a single intraoperative intravitreal Avastin injection (1.25 mg in 0.05 ml) or balanced salt solution (0.05 ml). Success was defined as 'complete success' when IOP remained less than a pre-defined target IOP, with no additional medication and 'qualified success' if achieving target IOP with additional topical medication.



Results: A total of 131 patients were randomised, of whom 113 patients were available for follow up at the 3 years' time point (12 died and 6 were lost to follow-up). At 3 years, 91% of the Avastin group maintained complete success, compared with 69% in the placebo group ($p = 0.005$). In addition, 98% of the Avastin group maintained complete or qualified success compared with 89% in the placebo group ($p = 0.031$). The use of Avastin was an independent predictor of complete or qualified success after adjustment for age, preoperative IOP and type of surgery (first trabeculectomy, redo trabeculectomy, trabeculectomy combined with cataract surgery).

Conclusion: Avastin administered intravitreally during trabeculectomy surgery resulted in a significant reduction in the need for additional medication and further surgery in order to achieve target IOP. This effect is herein demonstrated out to 3 years postoperatively. This study provides randomised controlled trial level evidence that intraoperative intravitreal Avastin during trabeculectomy reduces risk of surgical failure.

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

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Purpose: The SPECTRUM Global Registry provided results for over 2900 eyes from implanted with the Hydrus[®] Microstent in patients from 18 countries. The purpose of this evaluation was to evaluate long term outcomes (up to 6 years) in eyes with primary open angle glaucoma and no prior glaucoma surgery who underwent Hydrus implantation as a standalone treatment.

Methods: Eligibility criteria for inclusion in this analysis included age >18 years, diagnosis of primary open-angle glaucoma, no prior history of incisional glaucoma surgery, standalone microstent implantation, ≥ 6 months postoperative follow-up.

Results: A total of 406 eyes of 353 patients were analysed. Mean (standard deviation) intraocular pressure (IOP) at baseline was 20.2 (6.1) mmHg. Follow-up from 6 through 72 months, resulted in mean IOP from 14.6 to 16.6 mmHg (mean IOP reductions of 3.5–5.8 mmHg, $p < 0.0001$ at every time point). Mean medication use was 2.5 (1.2) medications per eye at baseline and remained significantly lower from 1 through 60 months postoperatively (range 1.2–1.6 medications per eye,

$p < 0.005$ at all-time points), representing medication 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 microstent implantation in eyes with primary open-angle glaucoma in the real-world clinical setting produces significant and lasting reductions in both IOP and the need for IOP-lowering medications, with an excellent safety profile and low rate of failure requiring additional surgery.

Combined phaco-emulsification and trabecular micro-bypass stent (iStent inject) for management of cataract and glaucoma: Prospective longitudinal outcomes from the Fight Glaucoma Blindness Registry

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Eye Associates, Sydney, Australia

Purpose: To analyse the efficacy and safety of trabecular micro-bypass stents (iStent inject[®]) with phacoemulsification derived from the Fight Glaucoma Blindness Registry.

Materials and Methods: This point-of-care study of iStent inject implantation with phacoemulsification was conducted using data extracted from the Fight Glaucoma Blindness Registry. Eyes with cataract and mild to advanced glaucoma. Study assessments included intraocular pressure (IOP), number of ocular hypotensive medications and adverse events including secondary surgeries.

Results: A total of 1650 eyes underwent surgery and were assessed at 6 months ($n = 1118$), 12 months ($n = 969$), 24 months ($n = 558$) and 36 months ($n = 239$). At 6 months, IOP had reduced by 16.7% ($p < 0.001$) to 13.5 mmHg with the comparable reduction at 36 months being 7.1% ($p = 0.012$). Medication reduction at 6 months was 0.8 and this was persistent out to 36 months. Higher baseline IOP was associated with an increased likelihood of significant IOP lowering. Adverse events were few with the most frequent item "subsequent procedure" occurring in 9.7% of eyes.

Conclusion: This is the largest study to date on the efficacy and safety of trabecular micro-bypass stents (iStent inject) with phacoemulsification. It demonstrates that in a large heterogeneous cohort at point-of-care, this treatment is associated with both IOP and medication reduction up to 36 months after.



Online circular contrast perimetry: A comparison to standard automated perimetry

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Purpose: Online circular contrast perimetry (OCCP) provides perimetry on any computer that can access the internet. We aim to validate and compare the diagnostic accuracy of a novel 24-degree, 52-loci OCCP application to standard automated perimetry (SAP).

Method: A total of 220 participants (125 normal controls, 95 open-angle glaucoma patients) were included. Agreement, correlation, sensitivity, specificity and area under receiver operating curves (AUC) were compared for parameters of OCCP, SAP and optical coherence tomography (OCT) for the retinal nerve fiber layer (RNFL) and macular ganglion cell complex inner plexiform layer (GCC + IPL).

Results: Correlation for global indices and regional zones between OCCP and SAP varied between good to excellent. OCCP MD AUC was 0.885 ± 0.08 , similar to other instruments' parameters with the highest AUC: SAP MD (0.851 ± 0.08), OCT RNFL inferior thickness (IT) (0.908 ± 0.07), OCT GCC + IPL IT (0.849 ± 0.08); $p > 0.05$. Point-wise sensitivity for OCCP was less than SAP by 4.40 dB (95% confidence interval -4.11 to -4.63); 95% limits of agreement (LoA) -6.17 to -2.56 . At best cut-off, OCCP MD sensitivity/specificity were comparable to SAP (90/74% vs. 94/65%). For glaucoma diagnosis, Cohen's Kappa demonstrated moderate agreement with SAP MD (0.58), OCT RNFL IT (0.45) and OCT GCC + IPL IT (0.45).

Conclusion: OCCP demonstrates similar diagnostic accuracy to other instruments in distinguishing glaucoma patients from controls. OCCP holds promise as a glaucoma surveillance and screening tool, with the potential to be utilized for in-clinic perimetry and expand community testing.

Neuroglobin gene therapy for retinal ganglion cell neuroprotection in a rodent model of glaucoma

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Purpose: Developing a treatment capable of directly protecting retinal ganglion cells (RGC) would be invaluable

in glaucoma cases with progressive vision loss despite good intraocular pressure (IOP) control. In the ANZRAG clinical registry, we identified that mutations in neuroglobin (NGB) were associated with advanced glaucoma. We developed a recombinant adenoviral-associated (rAAV) gene therapy vector to over-express NGB in RGCs and achieve neuroprotection in a laser-induced raised IOP rodent model of glaucoma.

Methods: Sprague-Dawley rats ($n = 19$) received a 5 μ l intravitreal injection containing vehicle only or 5E+9 genome copies (gc) of rAAV2/2.CAG.NGB.HA.IRES.pA with 0.0002% Pronase E. The injected eye of each animal was laser treated to raise IOP. Two weeks post-laser the retina was assessed in vivo using cSLO and OCT. Ex-vivo retinal whole mounts were co-stained with the Brn3a for automated RGC cell counting.

Results: rAAV was successfully delivered to the retina by intravitreal injection and transgene expression was demonstrated throughout the retina in a dose-dependent pattern. Reliable IOP elevation ($p < 0.001$) and RGC loss occurred in the laser-induced raised IOP rodent model. rAAV treatment was not toxic in untreated eyes ($p = 0.58$). In eyes with raised IOP, rAAV treatment significantly preserved RGC counts ($n = 10$ eyes, 1813 ± 158 cells/field) compared to vehicle treatment ($n = 9$ eyes; 1416 ± 202 cells/field; $p = 0.046$).

Conclusion: rAAV injection successfully expressed Neuroglobin in RGCs and was not associated with retinal damage. Neuroglobin overexpression in eyes with raised IOP showed RGC neuroprotection.

Association of polygenic scores for glaucoma and its related phenotypes with measures of retinal ganglion cell integrity in young and older adults

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Purpose: To explore whether polygenic scores (PGS) for primary open-angle glaucoma (POAG) or its related



phenotypes (intraocular pressure [IOP], vertical cup-to-disc ratio), are predictive of IOP and optic disc measures in young and older community-based adults.

Methods: Young adults ($n \approx 600$) underwent tonometry and optical coherence tomography imaging at 20 and 28 years old. Middle-aged/older adults (45+ years; $n \approx 3600$) underwent tonometry and optical coherence tomography imaging at a single time point. Participants were genotyped and their PGS for three traits—POAG, IOP, vertical cup-to-disc ratio—generated. Outcome measures included IOP (single-trait analysis), retinal nerve fibre layer (RNFL) thickness and minimum rim width (MRW). In the young cohort, longitudinal change in IOP and RNFL thickness from 20 to 28 years was also available.

Results: There were limited associations of any of the three PGS with disc measures in the young cohort. In the older cohort, higher IOP-PGS was associated with thinner inferonasal RNFL ($p = 0.001$) and reduced MRW globally and at 4 sectors (all $p < 0.001$). Higher POAG-PGS was associated with reduced MRW (globally and all sectors: $p < 0.001$). IOP-PGS was significantly associated with cross-sectional IOP (each cohort: $R^2 \approx 0.02$, $p \leq 0.002$), but not with longitudinal change ($p = 0.52$, young cohort only).

Conclusions: Associations between the PGS for glaucoma-related traits and optic disc measures were limited in young adults, but strong in older adults, suggesting that glaucoma-related genetic effects on the optic nerve may not be apparent until older age; although the limited associations in young adults could be due to lack of statistical power.

Blood pressure measures and incident primary open angle glaucoma

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Purpose: Investigate the association of systemic blood pressure and incident primary open-angle glaucoma (POAG).

Methods: Prospective, cohort study of 484,268 participants from the UK Biobank. Incident POAG were recorded through repeat assessment visits, linked inpatient or primary care data. Blood pressure measures included systolic (SBP) and diastolic blood pressure, pulse pressure (PP) and mean arterial pressure (MAP).

Parameters were modelled as both categorical and continuous non-linear variables.

Results: There were 2390 incident POAG events with median follow up of 12.08 years per subject. In univariate analyses, SBP >130 mmHg (reference SBP 120–130 mmHg) was significantly associated with an increased risk of incident POAG, which remained significant in multivariate analyses for SBP 130–150 mmHg and for linear trend ($p = 0.038$) across categories. Diastolic blood pressure showed no significant association. In univariate analyses, PP <40 mmHg (reference PP of 40–50 mmHg) was associated with a reduced risk of incident POAG, while PP categories >50 mmHg were associated with incrementally higher hazards of incident POAG ($p < 0.001$ linear trend). In multivariate analyses, only PP ≥ 70 mmHg remained significantly associated with an increased hazard of incident POAG, although the linear trend remained significant across all categories ($p = 0.015$). A MAP <90 mmHg was associated with a reduced hazard, while MAP between 100–120 mmHg was associated with a higher hazard in univariate analyses, however, were subsequently not statistically significant in multivariate analyses. The findings were similar when blood pressure measures were modelled as continuous variables.

Conclusion: Higher SBP and PP were associated with a significantly increased risk of incident POAG.

Macular optical coherence tomography highlights potential neuroprotective benefits of physical activity in glaucomatous and normative cohorts

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Purpose: Multi-cohort investigation of the association between physical activity and structural change in a glaucomatous cohort and with total macular thickness in a population-based cohort.

Methods: A total of 402 participants from the PROGRESSA study wore an accelerometer for 1 week. Participants were split into tertiles based on daily steps. The retrospective rate of spectral-domain optical coherence tomography macular ganglion cell-inner plexiform layer (mGCIPL) thinning was compared between tertiles. Similar comparisons were made in the UK Biobank. Accelerometer measured physical activity from 7566 individuals were cross-sectionally correlated with total macular thickness using spectral-domain optical coherence tomography imaging.

Results: Following adjustment for ocular and demographic covariates, the most active tertile was associated with a thicker cross-sectional mGCIPL (multivariate $p = 0.013$) and demonstrated a $0.23 \mu\text{m}/\text{year}$ slower rate of mGCIPL thinning ($\beta 0.07 \mu\text{m}/\text{year}/\text{SD}$, 95% confidence interval $0.02\text{--}0.12$, $p = 0.004$). This association strengthened after adjusting for relevant cardiovascular and systemic co-morbidities ($\beta 0.08 \mu\text{m}/\text{year}/\text{SD}$, 95% CI $0.03\text{--}0.13$, $p = 0.003$). The most active tertile also exhibited a 2-fold lower risk of Guided Progression Analysis detected event based mGCIPL progression compared to the least active tertile (hazard ratio 2.01, 95% confidence interval $1.06\text{--}3.34$, $p = 0.027$). Assessment of the UK Biobank cohort revealed physical activity was positively associated with macular thickness ($\beta 2.28 \mu\text{m}/\text{SD}$ [$1.31, 3.24$], $p < 0.001$).

Conclusion: Greater physical activity was associated with both a thicker cross-sectional mGCIPL and slower rate of mGCIPL thinning in primary open-angle glaucoma. Furthermore, greater physical activity was associated with a thicker total macular thickness in the UK Biobank. These results implicate physical activity as a relevant covariate of neuroretinal degeneration, which may be relevant to glaucoma disease progression.

Longitudinal analysis of structural and functional outcomes of epiretinal membranes in patients with uveitis

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Purpose: To describe the rate of progression of epiretinal membranes (ERM) in patients with uveitis based on

optical coherence tomography parameters and visual acuity. To report the outcomes of the subgroup that underwent vitrectomy and epiretinal membrane peel.

Method: The prospective database that records consecutive patients referred to the uveitis service was interrogated to identify all patients with uveitis and epiretinal membranes from 2008 to 2020. Multivariate analysis of risk factors for epiretinal membrane progression was calculated. Outcomes of patient post-vitrectomy and epiretinal membrane peel were analysed.

Results: A total of 5450 eyes of 3925 patients were reviewed during the study period. A total of 267 eyes in 216 patients were identified to have an epiretinal membrane (4.9% of eyes, 5.5% of patients). Fifty-one (23.6%) patients had bilateral involvement. Seventeen (7.8%) patients met the criteria for epiretinal progression. At final follow-up, 73 patients had moderate visual loss (log-Mar ≥ 0.4), however, the majority were not associated with ERM progression. Of the 43 patients who underwent vitrectomy and ERM peel, 23% and 63% experienced an improvement in central macular thickness and visual acuity scoring at 12 months.

Conclusion: The rate of epiretinal membrane progression in patient with uveitis is low. The majority of patients that undergo vitrectomy and ERM peeling experience improvement in visual acuity.

Predictors of glaucoma in patients with uveitis and scleritis

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Purpose: To examine risk factors for development of glaucoma in a large cohort of subjects with uveitis and scleritis.

Method: Retrospective review of subjects diagnosed with uveitis or scleritis between 2006 and 2019 at Auckland District Health Board. Subjects were excluded if they had glaucoma due to another cause. Main outcome measure was development of glaucoma. Data for local steroid use was not available.

Results: A total of 3462 eyes of 2414 subjects were included in the study. Mean follow-up was 5.7 years (total follow-up time 19 897 eye years). Median age was 44.3 years and 1189 (49.3%) were female. Glaucoma developed in 222 eyes (6.3%) during the follow-up. Five-year cumulative risk of glaucoma was 6.2% (confidence interval [CI] 5.0–7.5%) for anterior uveitis,

5.4% (confidence interval [CI] 3.2–9.0%) for intermediate uveitis, 1.6% (CI 0.4–6.7%) for posterior uveitis, 8.7% (CI 6.5–11.7%) for panuveitis and 3.2% (CI 1.0–9.5%) for scleritis. Five-year cumulative risk of glaucoma was lowest in HLA-B27 uveitis at 0.9% (CI 0.4–2.1%) and highest in viral uveitis 15.1% (CI 10.1–22.3%), sarcoidosis 9.9% (CI 6.1–15.9%) and tuberculosis 9.7% (CI 5.4–17.0%). On multivariate analysis, risk factors for development of glaucoma were older age at presentation, higher presenting intraocular pressure, chronic inflammation and cystoid macular oedema.

Conclusion: Glaucoma is a common complication of uveitis and scleritis and was more frequent in older subjects, high presenting intraocular pressure, chronic inflammation and those with cystoid macular oedema. Targeted screening is required to avoid irreversible progression of glaucomatous optic neuropathy.

Uveitis recurrence following COVID vaccination

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Purpose: The current study aimed to investigate the recurrence rates of uveitis following the BioNTech Pfizer mRNA vaccine for COVID-19 in a retrospective analysis of a large database of uveitis patients in a New Zealand population.

Methods: Review of clinical notes of all subjects in uveitis database, recording date of last flare, COVID vaccination, and rate of flare 3 months prior to vaccine and for 3 months after each vaccine dose.

Results: Clinical notes of 1870 patients with uveitis were screened. Four hundred and six patients were excluded due to being deceased, moving out of area or to private follow up, or not having received vaccination. A total of 1464 patients were included in the study, receiving a total of 3936 vaccinations between them; 710 (48.5%) were female and median age at first vaccination was 55.0 years (interquartile range [IQR] 41.7–68.1). Median time from diagnosis with uveitis to first vaccine dose was 6.7 years (IQR 3.1–11.5) and median time of quiescence at first vaccination was 3.5 years (IQR 1.5–7.4). The rate of uveitis flare (per month) was 10.5/1000 months pre vaccine, 21.2/1000 months after the first vaccine, 14.4/1000 months after the second vaccine and 11.2/1000 months after the third vaccine.

Conclusions: Recurrence of uveitis was doubled following the first COVID vaccination in patients with a known history of uveitis. These results provide evidence for possible pre-treatment of uveitis in high-risk uveitis patients prior to receiving doses of COVID-19 vaccine.

Uveitic complications associated with smoking status

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Purpose: Smoking is an important public health issue that can predispose or worsen many health conditions. The primary objective of this study was to determine the association between the development of uveitic complications and smoking status.

Methods: Retrospective study including 2946 subjects presenting with uveitis with documented smoking status from January 2008 to December 2020.

Results: Current smokers accounted for 9.9% and ex-smokers for 15.5%. Māori and Pacific Peoples were over-represented in ex-smokers and current smokers ($p < 0.001$). On univariate analysis, current smoking was associated with higher odds of posterior synechiae (odds ratio [OR] 1.452, $p = 0.009$) and lower odds of occlusive vasculitis (OR 0.392, $p = 0.042$). When controlled for age and gender, current smoking was still associated with higher odds of posterior synechiae (OR 1.367, $p = 0.031$) and lower odds of occlusive vasculitis (OR 0.311, $p = 0.022$). When controlled for age, gender and ethnicity, posterior synechiae was no longer significantly associated with current smoking (OR 1.272, $p = 0.108$) but there were still lower odds of developing occlusive vasculitis in those who were current smokers (OR 0.343, $p = 0.037$).

Conclusions: Smoking may be an important factor in the development of some uveitic complications such as posterior synechiae. Ethnic disparities in smoking cessation need to be addressed in a culturally sensitive way and it is important for treating ophthalmologists to counsel patients on smoking cessation for their overall general health.



13:30 - 15:00

S24—PROFESSIONAL DEVELOPMENT**Title:** Two for one: Matching ophthalmology to a sustainable future AND patients—beyond the eyes**Venue:** Great Hall 1**Speakers:**

Dr Jesse Gale

Dr Michelle Gajus

Dr John McCoombes

Dr Sarah Welch

Dr John Landers

Dr Michael Loughnan

Mr Nabill Jacob

Dr Paul Beaumont

15:00 - 17:30

Afternoon Tea

15:30 - 17:00

S25—COURSE-Glaucoma Boot Camp: A Practical Refresher Course

seagreen@bigpond.com

Chair: Dr Catherine Green AO**Venue:** Great Hall 1**Synopsis:** The aims of this course are to:

1. To provide a practical and case-based refresher for ophthalmologists across all subspecialties on the diagnosis and management of glaucoma; and
2. 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 and building on the first iteration of the course presented in February 2022, 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 information on access to the various tools provided for later application.

Speakers and Topics:**Panellists:** Dr Bernardo Soares, Dr Aparna Raniga, Dr Nicholas Toalster, Dr Alp Atik and Dr Janey Wiggs

Diagnosis: when and what to treat

Target IOP management of glaucoma: common pitfalls, maximising adherence, minimising adverse effects, avoiding over-treatment, laser treatment, when to consider surgery

Angle closure and angle closure glaucoma

Update on surgical treatment including minimally invasive glaucoma surgery: what is the evidence and how do we determine efficacy and cost-effectiveness?

15:30 - 17:00

S26—SYMPOSIUM-Our Vision in Our Hands: Aboriginal and Torres Strait Islander Eye Health

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Chair: Dr Guy Gillor**Venue:** Great Hall 3**Synopsis:** This symposium features voices and perspectives of Aboriginal and Torres Strait Islander People working to improve Aboriginal and Torres Strait Islander eye care and health, and aims to explore the themes of self-determination and leadership, and the next steps and future plans for Aboriginal and Torres Strait



Islander eye care. The symposium is organised by Indigenous Eye Health Unit at the University of Melbourne, whose work for the past 10 years has centred around the implementation of the Roadmap to Close the Gap for Vision (2012). A comprehensive and co-designed evaluation of this work has identified the need to strengthen Aboriginal and Torres Strait Islander leadership as central to any efforts to improve the eye care system in delivering equitable outcomes. A National Expert Group in Aboriginal and Torres Strait Islander Eye Health has been established as one of the evaluation outcomes, and its members will also shape content and conversation in this session. This increased realisation of the criticality of Aboriginal and Torres Strait Islander leadership in eye health is part of a greater societal push towards self-determination and leadership in health and other public policy areas, which includes new national agreement on closing the gap, the Uluru Statement from the Heart, and the ongoing leadership of the Aboriginal Community Controlled Health Services sector. RANZCO has demonstrated commitment and activity to support these changes through its Reconciliation Action Plans and more recently identifying Aboriginal and Torres Strait Islander eye health in its future planning consultation Vision 2030 and beyond.

Speakers and Topics:

A/Prof Kristopher Rallah-Baker—‘Get up, stand up, show up’

Mr Shaun Tatipata—Self-determination in eye care

Ms Kerry Woods—Visiting services and local self-determination

Ms Nicole Turner—Aboriginal and TSI health workforce

Ms Jeriah Coutts

Mr Dennis Conlon

15:30 - 17:00

S27—SYMPOSIUM—An Update on Sarcoidosis for the Ophthalmologist

sfraserbell@gmail.com

Chairs: A/Prof Lyndell Lim and A/Prof Samantha Fraser-Bell

Venue: Great Hall 2

Synopsis: The aim is to provide an update on sarcoidosis for the ophthalmologist including diagnosis and management of ocular disease and systemic manifestations.

Speakers and Topics:

Prof Debra Goldstein - Posterior segment manifestations of sarcoidosis

Dr Rachael Neiderer - The importance of looking for sarcoidosis in a patient with uveitis

Prof Lynn Gordon - Neurosarcoid

Dr Thomas Hardy - Orbital Sarcoid

Prof Roger Allen - Systemic management of sarcoidosis - when to start treatment and with what?

Prof Debra Goldstein, Dr Rachael Neiderer, Prof Lynn Gordon, Dr Thomas Hardy, Prof Roger Allen, Dr Dean Cugley, Dr Sophia Zagora, Dr Jane Wells, A/Prof Anthony Hall, Dr Diana Conrad - cases

Management of ocular sarcoidosis including pros and cons of systemic and local treatment. This will be a panel-based discussion using cases to highlight various issues including the reluctance of physicians to start systemic steroids for lung disease, the use of systemic steroid-sparing agents and local treatments.

15:30 - 17:00

S28—Free Papers Session—Cataract/Cornea/Refractive

Chairs: Prof Gerard Sutton and Dr Judy Ku

Venue: M4



Long-term changes in refraction after cataract phacoemulsification surgery

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Purpose: After cataract phacoemulsification surgery, spherical equivalent refraction (SER) may be affected by factors including corneal curvature, effective lens position and axial length. While refractive outcomes have been assessed in the immediate postoperative period, long-term changes in refraction have not been reported. The purpose of this study was to investigate the timeline changes in refraction after cataract surgery over a period of 3 years.

Method: This was a retrospective observational study that included 344 eyes of 204 patients who underwent cataract emulsification surgery between 1 January and 31 December 2018. Keratometry, anterior chamber depth, central corneal thickness and axial length were measured at baseline and postoperatively at 1 week, 1 year, 2 years and 3 years. Changes in SER and ocular parameters were assessed at each postoperative timepoint.

Results: At 3 years postoperatively, an overall myopic shift (0.35 ± 0.20 D, $p < 0.001$) occurred in 34.3% of eyes and a hypermetropic shift in 48.0% of eyes (0.38 ± 0.22 D, $p < 0.001$). In 17.6% of eyes there was no change in SER between 1 week and 3 years. Significant changes in anterior chamber depth ($p < 0.001$) and central corneal thickness ($p < 0.001$) occurred during the first year after surgery.

Conclusion: The timeline changes in SER after cataract surgery were evaluated, with hypermetropic shift being the more common refractive change observed after 3 years.

Improving corneal astigmatism measures for keratoconic eyes

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Purpose: To evaluate whether it is possible to customise corneal astigmatism measurement for keratoconic eyes to better match the perceived visual image, which would

enhance outcomes of toric implants or laser vision correction of associated astigmatism.

Methods: Potential measures of corneal astigmatism are derived from raw total corneal power data (179 eyes from 124 patients) derived from a corneal tomographer. The measures are derived from varying regions on the cornea, both in extent and center position. The measures of corneal astigmatism are evaluated according to their vectorial difference from the manifest refractive cylinder, which is the ocular residual astigmatism (ORA). The lower the variability of the ORA, the better the corneal astigmatism measure corresponds to the manifest refractive cylinder. The variability of the ORA is quantified in this paper by the root-mean-squared distance (ORArms).

Results: ORArms are calculated for all possible corneal astigmatism measures, which are derived from varying inner and outer annular extents, and centered on corneal vertex, thinnest point, front apex and back apex, and pupil center, as well as various points between the corneal vertex and the corneal thinnest point. For each different annulus center, the annular extent that minimizes the ORArms is reported. Results are stratified by keratoconus severity.

Conclusions: For eyes with mild keratoconus, corneal astigmatism measures centered on corneal vertex tend to correspond more closely with manifest refractive cylinder. For eyes with moderate keratoconus midpoint between the corneal vertex and thinnest point corresponds more closely with manifest refractive cylinder.

Multinational evaluation of a new aspheric hydrophobic monofocal intraocular lens 3 years after implantation

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Purpose: To report the combined oculus dexter/oculus sinister or right/left visual acuity, refractive and safety outcomes of the Clareon® (Alcon Vision LLC) aspheric, hydrophobic, monofocal, intraocular lens (IOL) 3 years after implantation.

Methods: This was a prospective, multinational, single-arm trial assessing the long-term (3-year) safety and effectiveness of the Clareon IOL implanted bilaterally in adults (≥ 22 years of age) who required bilateral cataract extraction. Participants attended 12 study visits (9 post-implantation) over approximately 36 months. The primary study objectives were to demonstrate the long-term (3 year) visual acuity and adverse event (AE) outcomes of the Clareon IOL, and the 1-year visual acuity and AE outcomes compared to historical safety and performance endpoint rates as reported in EN ISO 11979-7:2014. Combined OD/OS data have not been previously reported.

Results: A total of 245 participants were enrolled and 215 implanted (424 eyes). At 3 years, 182 binocular and 1 monocular participant were analysed. At 3 years, mean corrected and uncorrected distance visual acuities were -0.032 ± 0.114 (93.4% of eyes $\geq 20/25$) and 0.089 ± 0.166 logMAR respectively. Mean manifest refractive spherical equivalent was within target (emmetropia) by 1 week and maintained at 0.097 ± 0.471 D at 3 years. 100% of eyes were glistening free (Grade 0/ <25 mv/mm²) at 3 years. There were no unanticipated AEs. A total of 20 eyes received an Nd:YAG for PCO at 3 years.

Conclusion: The 3-year visual outcomes were excellent with stable refractive results. There were no unanticipated AEs, all eyes had Grade 0 glistenings, and rates of PCO related Nd:YAG were very low.

Impact of implementation of an ophthalmic electronic patient record system on surgical safety incidents in a tertiary hospital

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Purpose: Ophthalmology is one of the busiest surgical specialties. For cataract surgery this generates significant risk of error around laterality and implant selection. Ophthalmic electronic patient record systems such as OpenEyes™ incorporate several design features to enhance surgical safety. These include: continuous simultaneous access to medical records; electronic theatre diaries with conditional operation scheduling; consent forms, operation checklists and operation notes that are linked to operation bookings;

integrated biometry to the patient database and electronic patient records (EPR); and large format digital “whiteboards” displaying patient and operation details intraoperatively.

Method: OpenEyes EPR was implemented in our hospital in 2018. We searched the hospital critical incident database for all ophthalmology incidents. The frequency of critical incidents related to the surgical pathway reported during 2015–2017 was compared with reports between 2019–2021.

Results: A total of 1132 incidents were evaluated (461 reported between 2015–2017 and 671 between 2019–2021). Eight critical incidents related to surgical safety were reported 2015–2017 (4 missing paper notes, 2 inappropriate surgery schedulings, 1 wrong intraocular lens implant, 1 wrong procedure near-miss). Following OpenEyes EPR implementation, there were 5 critical incidents 2019–2021 (2 missing paper notes which were pre-digital migration, 1 incorrect patient near-miss following booking from an incorrect patient record, 1 wrong eye near-miss from failure to complete standard preoperative checklists, 1 wrong intraocular lens implant occurring when the EPR was unavailable due to hardware failure).

Conclusion: Implementation of OpenEyes has reduced critical surgical safety incidents in our hospital. While EPRs confer benefits, they can also introduce novel risks, requiring training and clear standard operating procedures for effective mitigation.

Utility of a smartphone adaptor in the detection of cataracts and other anterior segment pathology

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Purpose: Teleophthalmology holds significant potential for ophthalmologists to provide healthcare to patients in rural locations. This study aims to validate the use of an effective smartphone adaptor in the detection and grading of cataracts. This validated adaptor can ultimately be used in rural settings to facilitate more timely diagnosis and treatment of cataracts. The Smart Eye Camera is a portable and recordable device that attaches to a smartphone camera and captures images of the anterior segment.

Methods: In this cross-sectional observational study, a total of 198 eyes from 99 subjects (54 male and 45 female, mean age 67.42 ± 14.46 years) were examined. Subjects were examined at the Lions Eye Institute in Western Australia from June to July 2021. Subjects were first examined with the Smart Eye Camera, and then



underwent examination at the slit-lamp microscope. During both sets of examination, the presence and severity of cataract was graded using the Lens Opacities Classification System III.

Results: In the analysis of all eyes, strong inter-rater reliability was observed for the detection of nuclear colour and nuclear opalescence cataracts (kappa value = 0.845 and 0.884). A moderate inter-rater reliability was observed for cortical and posterior subcapsular cataracts (kappa value = 0.788 and 0.691). Overall, there was a high inter-rater reliability observed for the detection of a significant cataract (kappa value = 0.85).

Conclusion: This study validates the use of the Smart Eye Camera and demonstrates that a portable smartphone adaptor can be used to facilitate teleophthalmology in rural and resource-limited settings in Australia and internationally.

Development of corneal endothelial cell therapy from the transition zone

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Purpose: In vitro expansion of corneal endothelial cells (CEC) is a promising alternative to donor tissue for corneal endothelial regeneration. The objective of this study was to direct the differentiation of transition zone (TZ) cells into CECs.

Method: TZ cells were cultured and characterised by protein and gene expression of pluripotent stem cell, neural crest cell, periocular mesenchyme and CEC markers. TZ cells were treated with 8 different media to drive their differentiation into CECs. Assessments include morphology, protein expression levels of stem cell and CEC markers, and protein by immunohistochemistry.

Results: TZ cells expressed low-medium levels of neural crest and periocular mesenchyme genes, and medium-high levels of CEC genes. The combination of Y-27632 and SB431542 produced maximum morphological change towards a CEC phenotype, followed by Y-27632 alone, SB431542 alone, and Y-27632 and DKK-2. Some treatments increased the expression level of CEC markers and reduced the expression of neural crest marker as expected. Protein levels of CEC markers ZO-1, Na⁺/K⁺ ATPase and CD166 were maximally increased by 3 combination treatments (Y-27632 + SB431542, H-1152 + SB431542, H-1152 + DKK-2). Protein expression of the neural crest stem cell marker Nestin was decreased by 3 groups (Y-27632 + SB431542,

SB431542, and H-1152). ZO-1 and Na⁺/K⁺ ATPase were localised to the cytoplasm in all groups.

Conclusion: TZ cells have the potential to be a source of cells for CEC cell therapy. The combination treatment with ROCK inhibitor Y-27632 and TGF- β inhibitor SB431542 seems to be the most promising in driving the differentiation of TZ cells into a CEC-like phenotype.

Addressing inequity in access to post-crosslinking care and visual rehabilitation for patients with keratoconus in the Auckland District Health Board—Preliminary results

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Purpose: To determine if post-crosslinking (CXL) care can be provided more equitably in a community optometry setting with ophthalmologist oversight for patients with keratoconus in the Auckland District Health Board (ADHB).

Method: Standard ADHB post-CXL model; first specialist assessment, CXL procedure, 1-month follow-up, 3-month follow-up including referral to separate service for visual correction. Community clinic, patients that reside <10 km from the optometry practice transferred to clinic; 3-month follow-up (including assessment for visual correction). Data compared between services; age, gender, ethnicity, proportion of appointments attended, better-eye habitual visual acuity and type of visual correction at 3-month follow-up.

Results: Demographics were similar between the ADHB (n = 200) and community clinic (n = 60); age, (24.6 $\pm$ 6.8 years|23.6 $\pm$ 6.1 years), ethnicity, Pacific Peoples (48%|51%), Māori (15%|22%), European (19%|7%), Asian (15%|22%) and gender, male (60%|50%). Attendance was significantly higher in the community clinic for Māori (68%|80%) and Pacific Peoples (58%|78%) (p < 0.001). At the 3-month follow-up: mean habitual visual acuity was better in the community clinic [LogMAR 0.24 $\pm$ 0.11 (6/10)|0.39 $\pm$ 0.19 (6/15)] (p = 0.009), a greater proportion of patients in the community clinic; achieved 6/12 (68%|55%), were provided with spectacles (44%|38%) and contact lenses (24%|7%) (p < 0.001).

Conclusion: Māori and Pacific Peoples are over-represented in both the ADHB and community clinics; however, their attendance was significantly higher in the community. All patients attending this clinic underwent

visual rehabilitation sooner. With ophthalmology support, a community optometry-based service has the potential to provide more equitable post-CXL care by combining assessment of treatment efficacy and visual correction.

Phorcides guided topographic phototherapeutic keratectomy combined with corneal cross-linking for keratoconus

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Purpose: To investigate the safety and efficacy of Phorcides guided topographic phototherapeutic keratectomy combined with corneal crosslinking (CXL) for keratoconus.

Methods: Retrospective single center consecutive case series of all Phorcides treatments performed by 2 surgeons in 2020/2021. Alcon WaveLight Contoura treatment plans, Pentacam anterior and posterior surface keratometry, and subjective refraction were used with the Phorcides planning software to calculate modified refractive corrections. Transepithelial topography guided phototherapeutic keratectomy was performed on the Wavelight EX500 excimer laser. An accelerated CXL protocol was performed on the same day.

Results: Forty-six eyes completed at least 3-month follow-up and were included in the analysis. The mean pre-operative spherical equivalent (SE) was $-2.00 \pm 3.01\text{D}$, and cylinder was $-3.25 \pm 1.51\text{D}$. Refractive cylinder reduced by $1.24 \pm 1.82\text{D}$ on average. The maximum reduction in refractive cylinder was 4.50D , and 7 eyes (15.2%) reduced by $\geq 3.00\text{D}$. Corrected distance visual acuity improved by 1 or more lines in 32 eyes (69.6%). Three eyes lost 1 line of corrected distance visual acuity and no eyes lost more than 1 line. On average, uncorrected distance visual acuity improved by 2 lines. In 11 eyes (61.1%), uncorrected distance visual acuity improved by 1 or more lines. KMax reduced from $54.6 \pm 4.53\text{D}$ preoperatively, to $50.6 \pm 3.9\text{D}$ postoperatively, and thinnest central corneal thickness reduced from $478 \pm 3\text{ }\mu\text{m}$ to $433 \pm 38\text{ }\mu\text{m}$. No adverse events were recorded.

Conclusion: The modified refractive correction produced by the Phorcides Analytic Engine is an effective variation to the established treatment protocol which results in a reduction in refractive cylinder and regularization of the corneal surface, providing significant improvements in vision compared to CXL alone.

Do dry eye signs and symptoms correlate in the real world?

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Purpose: The Save Sight Dry Eye Registry is the first international web-based multinational, interdisciplinary registry able to collect high-quality outcome data from patients in clinical settings. We report the characteristics of patients with dry eye disease at their baseline visit from 3 March 2020 to 26 April 2022.

Methods: The Save Sight Dry Eye Registry collected data from routine clinical practice in Australia, Spain, France, Germany and the UK. Primary outcomes were baseline demographic data, dry eye diagnosis. Secondary outcomes included ocular surface staining, ocular surface disease index (OSDI) scores. Data from 7 doctors (7 sites) were analysed.

Results: Data from 447 eyes of 224 patients (85% female, 72% White, 74% Australian, 8.5% with corneal neuropathic pain) were analysed. Mean (SD) age was 59 (17) years (range 18 to 94) and 159 (36%) eyes had mixed (aqueous deficiency and evaporative) dry eye and 218 (49%) eyes had only evaporative dry eye. OSDI scores were worse in aqueous deficiency than in evaporative dry eye (mean OSDI: 51.9 vs. 31.3 respectively t-test $p = 0.04$). The correlation between OSDI and Oxford ocular staining scores (Pearson's $r = 0.106$; $p = 0.134$), tear film break up time (Pearson's $r = 0.062$; $p = 0.271$), and Schirmer's Test value were not statistically significant (Pearson's $r = 0.077$; $p = 0.822$). The correlation between OSDI and VA was weak but significant (Pearson's $r = -0.128$, $p = 0.020$).

Conclusion: Evaporative dry eye was more common and less symptomatic than aqueous deficient dry eye in the



real-world setting. Overall, the OSDI score was not correlated with ocular surface staining, Schirmer test or tear film break up time.

One-year outcomes of corneal cross-linking in thin corneas with keratoconus: A Save Sight Keratoconus Registry study

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Purpose: To report the efficacy and safety of corneal cross-linking (CXL) in thin corneas ($\leq 400 \mu\text{m}$) with keratoconus, and compare the outcomes with thicker corneas ($> 400 \mu\text{m}$) one-year post-CXL.

Methods: Data from 24 practices in Australia, New Zealand, Italy and France were included. One hundred and thirty-eight eyes of 131 patients (mean age 28.7 ± 11.4 years; female 30%) had thin cornea, and 892 eyes (748 patients, 26 ± 10.3 years; female 30%) had thick cornea. Outcome measures: changes in visual acuity, corneal curvature and minimum corneal thickness were adjusted for age, sex, practice and laterality, and frequency of adverse events.

Results: In thin corneas, compared to baseline the visual outcomes were better ($p < 0.05$), the mean Kmax, K2 and minimum corneal thickness were unchanged (all $p > 0.05$). The adjusted mean changes (95% confidence interval) in visual and keratometry outcomes were similar (all $p > 0.05$) for thin and thick corneas: visual acuity [5.1 (2.7 to 7.5) vs. 3.3 (2.1 to 4.5) logMAR letters respectively], Kmax [-0.6 (-1.1 to -0.1) vs. -0.6 (-0.9 to -0.3) D respectively], and K2 [-0.5 (-0.9 to 0) vs. -0.4 (-0.6 to -0.1) D respectively]. Less corneal thinning occurred in thin corneas [mean adjusted change -2.5 (-9.3 to 4.3) vs. -15.3 (-19.7 to -10.9) μm]. The frequency of haze was similar between the groups (thin 8.0%, thick 10.5%; $p > 0.05$), corneal scarring was more frequent in thin corneas (5.1% vs. 1.8%; $p < 0.05$).

Conclusion: CXL improved visual and stabilised keratometry outcomes in thin corneas. Compared to thick corneas, thin corneas post-CXL had less corneal thinning and a greater frequency of corneal scarring.

Enterovirus and the eye: A case series

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Purpose: To describe the prevalence and clinical presentations of enterovirus PCR-positive ocular infections.

Method: This case series analysed the results from all ocular specimens between April 2019 and May 2020 from the Royal Victorian Eye and Ear Hospital, Australia where viral multiplex PCR (testing for herpes simplex type 1 and 2, varicella zoster, cytomegalovirus, adenovirus and enterovirus) was performed. All specimens were processed at St Vincent's Pathology, Melbourne, Australia.

Results: There was a total of 12,289 viral multiplex results available. Eighty-one were positive for enterovirus PCR (0.7%). Of these 81 enterovirus positive tests, there were 52 conjunctival samples (64.2%), 28 corneal samples (34.6%) and 1 positive aqueous sample (1.2%). Forty-nine cases were associated with conjunctivitis, 10% ($n = 5$) of these had co-infection with HSV-1 2% ($n = 1$), VZV 2% ($n = 1$), CMV 2% ($n = 1$), and adenovirus 4% ($n = 2$). Twenty-seven cases were associated with keratitis, clinical findings included epithelial defect 92.6% ($n = 25$), corneal infiltrate 51.8% ($n = 14$) and corneal oedema 33.3% ($n = 9$). Three cases were associated with endothelial failure. The mean time of resolution of clinical sign was 28 days for conjunctivitis, and 31 days for keratitis. Disease recurrence occurred in 4.0% ($n = 2$) of conjunctivitis and 7.4% ($n = 2$) of keratitis cases.

Conclusion: There are only a small number of published reports describing ocular enterovirus infections. While there is no specific treatment for enterovirus, it should be recognised as a possible pathogen associated with conjunctival and corneal infections.

Comparison of early visual results of small incision lenticule extraction using Visumax 800 versus Visumax 500

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Purpose: To compare the preliminary visual outcomes of SMILE performed using Zeiss VisuMax 800 (VM800) versus Visumax 500 (VM500) lasers.

Methods: Prospective comparison on eyes undergoing small incision lenticule extraction (SMILE). Primary outcome measures were uncorrected visual acuity (UCVA) in

logMAR units and efficacy index defined as postoperative UCVA divided by preoperative best corrected visual acuity.

Results: Eleven eyes undergoing SMILE using VM800 were compared to 11 eyes using VM500. Both treatment groups were matched according to the preoperative spherical equivalent in dioptres (D). Mean preoperative spherical equivalent was -3.5 ± 1.5 D for the VM800 group compared to -3.5 ± 1.6 D for the VM500 group ($p = 0.97$).

LogMAR UCVA day 1 postoperatively was 0.0 (6/6 Snellen) or better in 63.6% with the VM800 as compared to 36.4% with the VM500 ($p = 0.43$). At week 1, 100% were 0.0 or better with the VM800 and 81.8% with the VM500 ($p = 0.045$).

Efficacy indices at 1 day were 0.73 ± 0.14 and 0.70 ± 0.17 for the VM800 and VM500 treated eyes respectively ($p = 0.63$). Efficacy indices at 1 week were 1.04 ± 0.15 and 0.86 ± 0.23 for the VM800 and VM500 treated eyes respectively ($p = 0.50$).

Conclusions: Preliminary data suggests a more rapid visual acuity recovery at week 1 postoperatively with the VM800 and similar recovery at day 1 postoperatively. Quicker recovery may result from more rapid treatment times and reduced postoperative inflammation. Further study is required to refine outcomes with the VM800.

TUESDAY 1 NOVEMBER SPEAKERS

06:30 - 07:45

H09—ANZGS Morning Symposium (Sponsored by Allergan)**Title:** New Opportunities for Gene-Based Therapy in Glaucoma

Dr Janey Wiggs

Chair: Dr Paul Healey**Venue:** M3

Synopsis: The discovery of genetic defects that cause glaucoma or influence glaucoma susceptibility is providing new insight into disease mechanisms and identifying novel therapeutic targets. Gene-based therapies may alter a specific gene defect or may suggest a particular therapeutic approach based on the clinical outcomes associated with the genetic abnormalities. This talk will describe opportunities for development of gene-based therapies for defective genes known to cause glaucoma using gene-editing, gene-replacement or gene augmentation. Additionally, strategies for surveillance and treatment for patients with high genetic risk will be discussed.

08:00 - 08:30

L10—GLAUCOMA UPDATE LECTURE**Title:** Using Genetics for Glaucoma Risk Assessment and Stratification

Dr Janey Wiggs

Chair: Dr Paul Healey**Venue:** M4

Synopsis: Early disease detection and treatment are necessary to preserve vision in glaucoma patients, yet current methods lack the ability to pre-symptomatically identify people at risk and many people affected by glaucoma are undiagnosed. Genes that contribute to glaucoma development can be used for genetic testing and risk stratification. A number of genes causing early-onset forms of glaucoma have been discovered, and many genetic risk variants influencing disease susceptibility have been identified using genome-wide association studies. Genetic testing using early-onset glaucoma genes can identify pre-symptomatic mutation carriers as well as inform risk assessment and genetic counselling. Polygenic risk scores derived from genome-wide association studies are useful for risk stratification in adult populations, and high genetic burden as defined by the polygenic risk scores can impact disease features as well as interaction with other risk factors. This lecture will review currently known glaucoma genes and genetic risk variants as well as the clinical utility of genetic testing in glaucoma patients.

08:30 - 10:00

P05—PLENARY-Translating Ideas into Innovation with Real Impact

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Chair: Prof Gerard Sutton**Venue:** M4

Synopsis: This symposium is designed to encourage and help young ophthalmologists to innovate. To demonstrate a pathway to translational innovations that make a difference to patient care. The format will be in the form of a discussion panel. Examples of successful and unsuccessful ideas and innovations will be presented, including an idea that will be workshopped with audience involvement. Innovation is the key to enhancing eyecare. All ophthalmologists will have a novel idea to improve a treatment, surgery or process. 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, including patenting and commercialisation. The Australian Government has highlighted biotechnology as a focus for research funding.

Our panel includes two of Australia and the world's most successful ophthalmic innovators, Prof Graham Barrett and Prof Minas Coroneo. We aim to elucidate what have been the key elements in their and other members successful (and less successful) inventions and innovations. Other panel members will include Dr Jacqui Beltz, Prof Gerard Sutton, Dr Peter Sumich, Mr Andrew Batty and Dr Jill Hopkins. Dr Hopkins has been



involved in a number of international ophthalmic start-up companies as well as 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. While updates on common topics are an important part of a scientific program, so is the facilitation of an innovative culture that can nurture medical breakthroughs and impact eye health in the future.

10:00 - 10:30

Morning Tea

10:30 - 11:00

L11—THE COUNCIL LECTURE

Title: Towards a National Preschooler Vision Screening Program

Prof Frank Martin AM

Chair: Dr Caroline Catt

Venue: M4

Synopsis: The current status of preschooler vision screening in Australia will be reviewed. The development, implementation and independent evaluation of the Statewide Eyesight Preschooler Screening program (StEPS) will be described. The way forward to implement a national program will be addressed. Vision screening of preschool children is appropriate because reduced vision can be reliability identified at that age and the child is within the critical period of visual development. This allows for intervention at an optimal time in order to reverse visual loss from amblyopia and correct refractive problems by the time of school entry.

Current vision screening programs vary between Australian states and territories. StEPS was implemented in 2008 in New South Wales with an outreach model providing the service at preschools, childcare centres and community health centres bringing vision screening to the child. Screeners included nurses, orthoptists and lay-personnel. An independent evaluation of the StEPS program (2018) has endorsed the program as being cost-effective and universal, being offered to 96% of 4-year-old preschoolers. There were high screening rates in rural and regional centres of Polygenic risk scores (84%) and increasingly accessed by the Indigenous population. Vision 2020 established an early intervention committee (2021) to develop a national framework for vision screening in 3.5- to 5.0-year-olds based on StEPS protocol. Vision 2020 is advocating for this framework to become national. RANZCO has included early detection of vision problems in childhood as one of the two pillars of its Vision 2030 plan and will play a major leadership role in implementing a National Preschooler Vision Screening Program.

11:00 - 11:30

Congress Close

FILM ABSTRACTS

CATARACT

Marfan's syndrome—Hanging by a thread!

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Management of a subluxed crystalline lens with a double armed, sutured capsular tension ring.

No need to breach the vitreous face in a young patient and provision of intraocular lens stability with gore-tex suture to provide long lasting stability.

The flip technique—A controversial yet extremely effective method to break the unyielding backbone of a hard cataract during phacoemulsification

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Commonly the one problem with a hard nucleus, especially leathery ones, is to separate the backbone or the spine. This backbone, in spite of effective chops or cracks, tends to be attached in the centre posteriorly making it extremely difficult to handle during phacoemulsification, since the segments keep retracting into the bag while attempting removal.

There are many methods described to handle the spine and we describe a technique that is admittedly to be performed only by experienced surgeons.

In our method, after making multiple direct vertical chops and finding these segments attached in the centre posteriorly under the cover of protective OVD, we flip the entire nucleus within the AC bringing the posterior plate anteriorly and then targeting it with phacoemulsification. This is an extremely efficient way to handle the spine and will be demonstrated clearly with multiple examples video graphically.

Trans conjunctiva small incision cataract surgery—An instructional film for beginners and established surgeons

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Small incision cataract surgery is usually done after performing peritomy and cautery of the scleral bed. We demonstrate an alternate technique wherein the incision is performed via the conjunctiva without the need to perform peritomy or scleral cautery.

The video is an instructional video having a learning curve. The steps will be explained in detail making it a must see video. Further we will also show this technique being performed with small pupils, in tumescent mature cataracts and post PK. Post-operative pics will show it scores over conventional method.

In conclusion we will outline advantages over the conventional method of performing small incision cataract surgery as well.

Divide and conquer: The historical battle of restoring sight

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When time scuffs and scars our treasured gift of sight, we face tribulation. From first mentions in the ancient Babylonian Code of Hammurabi (2250 BCE) to the modern day, we have striven to preserve and restore the independence that sight brings us. As medical sciences advance, we are afforded the opportunity to reach older ages and more of us face the burden of cataracts. Surgical intervention is the only method we have to treat this affliction.

From the earliest intervention of couching to the development of intraocular lenses and modern phacoemulsification, this short film details the journey of cataract surgery through the ages.

CORNEA

Artiflex lens explantation technique

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Refractive surgery techniques for correction of high myopia not suitable for excimer laser include phakic intraocular lenses. There are a number of variations—angle-supported anterior chamber, sulcus posterior chamber intraocular lenses and iris-fixated intraocular lenses. In 1986, Worst et al. designed the first biconcave iris-fixated intraocular lens for myopia correction. The design progressed to a rigid polymethyl methacrylate Artisan lens and a foldable polysiloxane Artiflex lens. Both Artisan and Artiflex lenses are designed by Ophtec, and they share a convex-concave lens design to minimise lens touch and reduce the distance to the corneal endothelium. The Artiflex lens is foldable, which enables insertion through a sutureless smaller corneal incision.

The potential complication of the anteriorly fixated lenses is progressive endothelial loss. Artiflex lenses have been found to require explantation in 12% of cases over a 10-year follow-up. Previous Artiflex lens explantation techniques have involved removing the intact lens from an extended scleral tunnel or corneal incision. We present a novel technique for Artiflex explantation involving cutting the optic longitudinally to separate the haptics. This avoids the need for de-enclavation and enables the two pieces of the Artiflex lens to be removed through a 2.75 mm keratotomy. Routine phacoemulsification can then be performed with intraocular lens insertion in the bag.

Bubble, bubble toil and trouble

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Calcification of hydrophilic acrylic intraocular lenses following secondary surgical procedures has been well documented. A case series of 19 eyes undergoing endothelial keratoplasty in the presence of a hydrophilic intraocular lens will be presented. A simple change in surgical technique has led to a marked reduction in the risk of intraocular lens opacification.

Keratoplasty nightmares

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Over the last century, there has been significant advancement in the instrumentation and surgical technique of both penetrating and lamellar keratoplasty. Nonetheless, keratoplasty can still be associated with complications which can be challenging to manage, especially for the beginner cornea surgeon. This film will present various keratoplasty complications and how to manage them.

Limbal sparing keratolimbal graft in the management of large traumatic corneal scar

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Video depicts successful technique of a limbal sparing keratolimbal graft in a 30-year-old male patient with traumatic corneal scar resulting in keratoglobus.

In an attempt to preserve the patient's limbal stem cells, a partial central corneal trephination was performed followed by dissection of peripheral unscarred corneal tissue consisting healthy limbal stem cells.

Subsequently, a large keratolimbal graft was dissected from donor cornea and carefully sutured into maintained recipient cornea to ensure patient's stem cells are preserved.

The technique resulted in a shift of best-corrected visual acuity from hand movement to 6/30 post operatively and a healthy corneal surface.



GLAUCOMA

Conjunctival rhexis incision —A method to achieve posterior exposure with smaller limbal incision during fornix-based trabeculectomy

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Background: Achieving posterior scleral exposure for fornix-based flap trabeculectomy is desirable for the construction of a posteriorly located scleral flap. However, to achieve more posterior exposure, longer limbal conjunctival incision is often required. One solution is radial conjunctival incision, but it has the risk of inadvertent tearing outwards causing difficulty with final conjunctival closure.

Technique: Conjunctival rhexis incision (CRI) is a curvilinear incision on one or both corners of the standard conjunctival limbal incision that relaxes the conjunctival edge to allow greater posterior scleral exposure. Using CRI, a 4 mm limbal incision is able to achieve 4–5 mm posterior exposure compared to 2 mm without CRI.

Conclusion: CRI allows greater posterior exposure using small limbal incision, therefore allowing more limbal conjunctiva to be preserved and has implications for new filtrations devices such as Preserflo.

Luminal stenting with Nylon suture during Preserflo microshunt glaucoma surgery and postoperative removal at the slit lamp

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Postoperative hypotony remains a common complication following Preserflo microshunt glaucoma surgery. Here we detail a technique for intraluminal stenting using 10-0 nylon suture. An accessible external loop was buried at the limbus for easy removal at the slit lamp. We experienced reduced rates of postoperative hypotony using this technique. We also detail the convenient and safe removal of the stent suture at the slit lamp in a patient with postoperative pressure rise.

OCULAR ONCOLOGY

Iris melanoma—An all-in-one approach

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Treatment of iris melanoma, cataract and iris repair in a single procedure.
Patient from a rural area.

OCULOPLASTIC/ORBIT

Dacryocystectomy: A fibrin glue-assisted subfascial excision

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Purpose: To demonstrate a technique of dacryocystectomy that enables intact excision of the lacrimal sac and preserves the lacrimal fascia, thereby avoiding disruption of orbital fat.

Surgical Technique: The lacrimal sac cavity was directly injected with Tisseel fibrin glue mixed with trypan blue. Distension of the sac facilitated ease of dissection from surrounding periosteal and fascial attachments. Staining the lacrimal sac epithelium improved definition of the mucosal lining.

Conclusion: This technique was performed on five patients with chronic dacryocystitis associated with severe dry eye syndrome. It facilitates en bloc excision of the lacrimal sac without breaching the fascial plane that separates sac from orbital fat.

Retrobulbar amphotericin B for invasive fungal rhino-orbital sinusitis

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Orbital fungal infections are a rare and highly morbid disease that almost exclusively affects

immunosuppressed individuals. Conventional treatment includes reversal of immunosuppression, debridement of devascularised tissues and systemic antifungal therapy. Systemic antifungal therapy can be inadequate in setting of angioinvasive disease limiting local blood supply, and orbital exenteration has been performed for patients with significant orbital disease. Modified treatment algorithms employing the use of intraoperative irrigation and transcutaneous administration of amphotericin B have been reported with good outcomes.

This film demonstrates the successful endoscopic debridement of the maxillary and ethmoid cavities, transcutaneous sinus and retrobulbar injection of amphotericin B, and packing of amphotericin B-soaked gauze for invasive aspergillus rhino-orbital sinusitis in a patient with poorly controlled diabetes.

From eye to nose: An unusual case of nasolacrimal fistula

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A 17-year-old female with Pierre-Robin Sequence presented for examination under anaesthesia after multiple procedures for epiphora and was noted to have a conjunctivodacryocystorhinostomy fistula. This video demonstrates the external and endonasal findings, which have not been previously reported following dacryocystorhinostomy surgery. The prevalence of lacrimal disorders in facial clefting is surprisingly high, and it is important to consider anatomical anomalies when planning surgery.

Reconstructing lower eyelid defects with the new minimal and marginal approach to releasing the lid with closure handling technique (MARCH technique)

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These videos will demonstrate how to perform a lower eyelid reconstruction with minimal damage to periocular healthy tissue in the new MARCH technique. In cases where the defect involves up to 66% of the lower eyelid with around 30% of the lateral lower margin respected, this technique represents a conservative approach with promising results. This presentation shows how it's performed and what its results are.

OTHER

4eyesVision in Papua New Guinea: Trial of an innovative method of refractive care in remote and disadvantaged communities

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One billion people worldwide are visually impaired simply because they lack access to glasses. The 4eyesVision Kit contains everything a layperson needs to test vision and dispense customised affordable glasses on the spot in remote and disadvantaged communities. This film documents our first trial in Papua New Guinea.

A technique for safe and easy removal of retropupillary (Artisan) Iris clip intraocular lenses

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Iris clip lenses may cause chronic anterior chamber inflammation and cystoid macula oedema. This video depicts a safe and easy technique for removing a retropupillary (Artisan) iris clip lens. In a previously vitrectomised eye, the anterior chamber is filled with viscoelastic and both superior haptics are easily cut with 19 g scissors. The haptic clips and Artisan lens are then removed with forceps through a 6 mm corneal wound prior to implantation of a sutured intraocular lens. Corneal endothelial and iris trauma are both minimised with this technique.



RETINA

Intraoperative optical coherence tomography guided full-thickness chorioretinal biopsy for an intraocular tumour

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Most biopsies of intraocular tumours are achieved with the fine needle biopsy technique, sampling through the vitrectomy cutter, or using biopsy forceps. Occasionally a full-thickness chorioretinal biopsy is required for large tissue biopsy in cases where the diagnosis is not clear with small tissue sampling. With the advent of intraoperative optical coherence tomography (OCT) scans, the retinal and choroidal layers can be visualised during vitrectomy. We hereby describe a case of full-thickness chorioretinal biopsy with the help of intraoperative OCT scans. This case demonstrates the technique of biopsying a large intraocular tumour and the use of intraoperative OCT in localising and assessing the depth of the area for biopsy. The pros and cons of the technique are discussed.

Top tips on the use of intraoperative optical coherence tomography in vitreoretinal surgery

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Intraoperative optical coherence tomography (OCT) scan is a new imaging technique and its adaptation in vitrectomy is slow as it is unclear of its potential benefits. In this film, the background and future direction of intraoperative OCT scans will be explored. The top tips on the use of intraoperative OCT will be presented through a series of case illustrations. The indications, timing and techniques will be discussed. The pros and cons of intraocular OCT will be dissected with the aim to allow the audience to evaluate the potential benefits of intraoperative OCT scans in vitreoretinal surgery.

TRAINING AND EDUCATION

retinAR—An innovative way of tackling the paucity of ophthalmologic education in medical schools

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Current literature suggests that medical students and junior doctors have forgotten “the art of ophthalmoscopy” and are avoiding eye examinations where indicated.

To make up for this concerning trend, we are developing a free app from the ground up and are endeavouring to put a world class ophthalmological education in the pockets of medical students and junior doctors across Australia and abroad.

This app imbues clinical ophthalmologic education with vision, employing augmented reality technology and a smartphone's accelerometer to teach fundal examinations.

This film aims to provide insight into the paucity of education in this area at a University level and first-hand coverage of the immense learning curve which is stopping students from practicing one of the most important physical exams medicine has to offer. It also explores the journey of taking an app from an idea to the fingertips of students.

Tomatoes today, eye surgeons of tomorrow

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Introduction: In the field of ophthalmology, surgical simulation falls under the broad categories of virtual reality simulation, animal or cadaveric eye simulation and low-cost simulation. We demonstrate a high-fidelity, low-cost simulation for ophthalmic microsurgical suturing using a cherry tomato for medical students. The model was launched at the Australian Students Surgical Conference 2022 in Gold Coast, Australia.

Purpose: Equipment includes a cherry tomato, white plastic face mask, 7-0 Vicryl suture, 2× magnification lens or a smartphone with magnification, needle holder and scissors.



Discussion: Standard virtual reality simulators include MicroVisTouch simulation performance, PhacoVision simulator (Melerit Medical, Gothenburg, Sweden) and VitRet eye (Phillips Studio, Bristol, UK). The high cost of these devices poses a barrier to widespread usage. Our low-cost ophthalmic simulation provides a feasible alternative method for medical students and trainees to practise microsurgical suturing. Our model was demonstrated

at the Australian Students Surgical Conference for 106 medical students. The model provided a method to differentiate surgical skill level among medical students.

Conclusion: A low-cost, high-fidelity ophthalmic microsurgery suturing model can be utilised for hands-on wet labs for medical students and trainees.

POSTER ABSTRACTS

CATARACT

Comparison of the predictive refractive error and refractive outcomes using the IOLMaster-500 and Pentacam-AXL Wave

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Purpose: Cataracts are a major cause of morbidity worldwide. Clinicians heavily rely on instrument accuracy in predicting refractive error (RE) to ensure optimal post-operative outcomes. Here, we compare the predicting RE accuracy of the IOLMaster-500 against the Pentacam-AXL wave.

Method: Measurements were calculated using the SRK/T formula in 92 eyes receiving CNA0T0+ lenses. Post-operative subjective refractive errors were obtained in a subset of 21 patients. Mean predicted refractive error, median absolute refractive error and mean absolute refractive error were calculated to compare devices. The proportion predicting REs within ± 0.25 dioptres (D), ± 0.5 D and ± 0.75 D of the objective RE were also obtained.

Result: There was nil significant difference between mean predicted refractive errors, with the IOLMaster-500 predicting REs falling within $0.40\text{D} \pm 0.31$ (SD) of the objective refractive error, compared to 0.42 ± 0.29 D (SD) when using the Pentacam-AXL wave (p-value 0.35). Nonetheless, there is a trend of the IOLMaster-500 performing marginally better than the Pentacam-AXL wave, with 39.1% vs. 35.9%, 71.7% vs. 66.3% and 85.9% vs. 87.0% of predicting REs falling within ± 0.25 D, ± 0.5 D and ± 0.75 D of their objective RE respectively. Importantly, the Pentacam-AXL wave frequently calculates more hyperopic predicting REs for a given intraocular lens (>92%). This results in the Pentacam-AXL wave selecting more powerful intraocular lenses in ~90% of cases.

Conclusion: The IOLMaster-500 and Pentacam-AXL wave are comparable in terms of predicting RE accuracy. Nonetheless, clinicians wishing to avoid leaving patients hyperopic may benefit from relying on the predicting REs suggested by the Pentacam-AXL wave.

Ong-Yue toric intraocular lens corneal marker

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Purpose: It can be difficult to mark the axis for toric intraocular lens orientation in cataract surgery in eyes with small palpebral fissures or ptosis. Most toric intraocular lens (IOL) corneal markers mark the 3, 6 and 9 o'clock positions. In eyes with ptosis, the markings may erroneously be at 3.30 and 8.30 positions. Hence, it is ideal to include a 4th marking point at 12 o'clock in the superior cornea, and this helps with centration. Methods that utilise conjunctival blood vessels to identify the axis can be difficult to use in eyes with small palpebral fissures and reduced visualisation of conjunctival blood vessels.

Methods: Design criteria include: ease of orientation and centration, able to fit into small palpebral fissure without manually lifting eyelid too much, and corneal markings that last till the end of surgery.

Results: Design features include: vertical handle to assist in orientation, four marking points to help centration and orientation, circular frame smaller than cornea helps centration by referencing the limbus and allows placement of corneal marker on corneal surface without distorting eyelid position too much, and arks in peripheral cornea closer to IOL axis markings to reduce parallax error.

Conclusion: This corneal marker facilitates orientation and centration of the corneal marking for Toric IOL, especially in eyes with small palpebral fissures, and can be easily used by the anaesthetist in the anaesthetic bay. It is made by Epsilon USA and available through Farocare Australia

Long term stability of scleral-fixed intraocular lenses secured with a cow-hitch knot

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Purpose: In the setting of absent capsular or zonular support, in the bag placement of intraocular lens is not possible. Pathologies responsible for absent capsular or zonular support include trauma, prior complicated cataract surgery, congenital aphakia or aniridia and other conditions such as Marfan's syndrome, pseudoexfoliation and homocystinuria. Alternative intraocular lens placement includes iris-fixated lens, anterior chamber lens and scleral-fixated lens. We discuss our long-term experience with scleral-fixated intraocular lenses secured with a cow-hitch knot. Scleral-fixated intraocular lenses have potential complications such as knot erosion, endophthalmitis, retinal detachment, lens dislocation and suprachoroidal haemorrhage.

Methods: Retrospective case series of 21 patients who underwent two-point transscleral fixation of a CZ70BD lens using the modified cow hitch knot with a 10-0 Polypropylene suture from 2004 to 2014.

Results: The mean age of patients was 65 years, mean follow up time was 90 months, with a maximum follow up time of 10 years. The preoperative underlying ocular pathology included Marfan's and Pseudoexfoliation syndrome (9.5%), trauma related (23.8%), retinal detachment (4.8%), subluxed intraocular lens (19%), dislocated lens (23.8%) and other causes (19.1%). Postoperative complications included iris capture (19%), ocular hypertension (28.5%), retinoschisis (4.8%), cystoid macular oedema (9.5%) and corneal decompensation (4.8%). We reported no cases of postoperative hypotony. Despite reports of suture breakage using 10-0 polypropylene fixation, we reported no cases of suture breakage.

Conclusion: The modified cow-hitch technique for scleral-fixated intraocular lens provides an alternative suturing technique, which has long term stability and reduced incidence of suture breakage and hypotony.

Scleral fixated intraocular lenses in Brisbane's Metro North and Metro South Health Services: A three-year review

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Purpose: This study evaluates the visual acuity (VA) and refractive outcomes for patients who underwent ab externo scleral fixation of an intraocular lens (IOL) at two tertiary hospitals in Brisbane.

Methods: A three-year retrospective study of all public patients who underwent scleral fixation of an IOL at the Royal Brisbane and Women's Hospital and Princess Alexandra Hospital between January 2018 through to December 2021. Patients were identified from surgical records and analysed. Primary outcomes were VA, pre-operative astigmatism and postoperative refraction.

Results: A total of 95 eyes were identified from 85 patients who underwent scleral fixation of a Bausch & Lomb Akreos AO60, Micropure 123 or Alcon CZ70BD IOL from January 2018 through to December 2021. Mean age was 63.7 years $\pm$ 16.6. Mean preoperative VA was LogMAR 1.25 $\pm$ 0.80 improving to 0.65 $\pm$ 0.67 postoperatively ($p < 0.001$). Mean target spherical equivalent (SE) was -0.49 $\pm$ 0.54 diopters and the postoperative refractive SE was -1.07 $\pm$ 11.57 diopters ($p = 0.094$). The magnitude of preoperative and postoperative cylinder was statistically significant with a mean difference of 0.85 diopters ($p = 0.021$). Vector analysis of preoperative and postoperative astigmatism revealed a mean reduction of 2.51 $\pm$ 2.32 diopters of cylinder and a mean change in axis of 1.95 $\pm$ 55.62 degrees (counter clockwise rotation).

Conclusion: There is statistically significant improvement of VA following scleral fixation of an IOL. Interestingly, postoperative refractive astigmatism appears to improve. However, this assertion is limited by different modalities used for measuring astigmatism, remaining corneal sutures for some patients and differing postoperative intervals at time of refractions.

Gore-Tex suture complications: A case series

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Purpose: Scleral fixation of a posterior chamber intraocular lens (PCIOL) is a popular technique for lens implantation when capsular stability is inadequate. Noted to be less traumatic than anterior chamber and iris fixated lenses to other ocular structures. Gore-Tex is widely regarded as a safe suture material with greater longevity than traditional materials. Complications related to the intraocular use of Gore-Tex sutures is not well reported.



We endeavor to highlight the potential complications associated with Gore-Tex sutures.

Methods: Complications were identified from medical records of patients who underwent ab externo scleral fixation of a PCIOL, with scleral flaps and suture knot rotation, using Gore-Tex sutures from January 2018 to December 2021 at the Royal Brisbane and Women's Hospital and Princess Alexandra Hospital (Brisbane's two major tertiary hospitals). This is a case series of six patients, managed by different ophthalmologists, who had postoperative Gore-Tex suture related complications.

Results: A total of 76 eyes from 69 patients underwent scleral fixation of PCIOL using Gore-Tex sutures. Six developed suture complications. Postoperatively, all patient's visual acuity improved. Four patients developed suture exposure with three requiring patching and one requiring suture revision. Two developed suture track leaks with one requiring resuturing and the other requiring a lens exchange. Mean time to complication was 338 ± 318.4 days.

Conclusion: Despite suture knot rotation and scleral flaps, postoperative suture erosion occurred in approximately 5% of eyes. Furthermore, approximately 2.5% of eyes developed suture track leak. Notably, there were no cases with broken Gore-Tex sutures.

Effect of cumulative dissipated energy on short-term and long-term outcomes after uncomplicated cataract surgery

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Purpose: To investigate the effect of cumulative dissipated energy (CDE) on postoperative outcomes after uncomplicated phacoemulsification surgery.

Methods: In this single-surgeon, two-center retrospective study, non-glaucomatous participants who underwent uncomplicated phacoemulsification surgery were investigated. Best-corrected visual acuity (BCVA) and intraocular pressure (IOP) were measured at 3 separate time points: preoperative, day 1 and ≥ 1 month. Anterior chamber inflammation and corneal edema (CO) were assessed at 2 separate time points: Pre-operative and day 1. Short-term changes (day 1) in BCVA, IOP, anterior chamber and CO and long-term changes (≥ 1 month) in BCVA and IOP were evaluated as a function of CDE using a multivariate multiple linear regression model.

Results: One hundred and ten eyes from 97 non-glaucomatous participants were analysed. Sixty were female and 50 were male. The mean age of participants

was 73.40 years. Higher CDE counts were strongly associated with higher grades of nuclear sclerotic cataracts ($p < 0.001$), posterior subcapsular cataracts ($p < 0.036$), and day 1 CO ($p < 0.001$). Short-term and long-term changes in postoperative IOP did not demonstrate significant associations with CDE counts (all $p > 0.05$). Though there was no significant correlation between CDE counts and short-term changes in BCVA, higher CDE counts were strongly associated with greater improvements in long-term BCVA ($p = 0.011$).

Conclusion: Though higher CDE counts were strongly associated with higher grades of postoperative CO, there appeared to be no detriment to long-term BCVA. Correspondingly, the strong positive correlation between CDE counts and long-term BCVA was likely reflective of the greater severity of underlying cataract type and grade.

Incidence of fluid behind intraocular lens in eyes with posterior capsular opacification

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Background: Posterior capsular opacification (PCO) is a common adverse sequelae of cataract surgery and is treated by laser posterior capsulotomy (LPC). Some eyes which develop PCO may also develop a collection of fluid between the posterior chamber intraocular lens (PCIOL) and posterior capsule. The fluid may contribute to visual degradation through changes in refraction, in addition to any visual degradation due to PCO.

Purpose: We seek to characterise the incidence of PCO with and without a fluid collection, as well as the interval to laser capsulotomy and demographic factors for these eyes.

Methods: Retrospective cohort study of 135 eyes undergoing LPC in a single ophthalmology practice. Data obtained included demographics, presence or absence of fluid on examination, and IOLMaster700 measurements.

Results: 38.5% (52/135) of eyes undergoing LPC had fluid between the intraocular lens and posterior capsule. Eyes with fluid had longer median interval from cataract surgery to LPC compared to eyes without fluid (160 vs. 97 weeks, $p = 0.028$). No significant differences in prevalence of fluid were found between age, sex or ethnic groups.

Conclusions: It is common for eyes with PCO to have a fluid collection behind the PCIOL. Eyes with such a

collection have a longer interval from cataract surgery to laser capsulotomy. Potential explanations include: PCO causing more degradation of vision than fluid, the fluid pushing the opacified posterior capsule posterior from the PCIOL's refracting interface, and/or posterior opacification is less obvious when the opacified posterior capsule is displaced from the PCIOL's posterior surface.

Evaluating factors that influence the time interval between cataract surgery and laser posterior capsulotomy

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Purpose: Posterior chamber opacification is a common adverse sequela of cataract surgery, causing blurring of vision. It is treated by laser posterior capsulotomy (LPC), a procedure required in about 30% of patients. The purpose in this study was to investigate the average time interval from cataract surgery to LPC, and factors that influence this.

Method: A retrospective cohort study of patients who underwent LPC, using a single piece acrylic AlconSN60WF lens, at a private ophthalmology clinic in Sydney between January and June 2018. Medical records were reviewed for demographic, anatomical and pathological factors. Statistical analysis utilised Kaplan–Meier and Mann–Whitney-U tests to determine factors associated with time to LPC.

Results: The study group comprised 164 patients (169 treated eyes), with 100 females (59%). Mean $\pm$ SD, age was 66.1 ± 4.1 years. Mean interval between cataract surgery and LPC was 49.1 ± 47.2 months. Time to LPC was found to be significantly shorter in eyes with a narrow anterior chamber (anterior chamber depth <2.8 mm measured on intraocular lens Master 700) ($p = 0.023$), and in those with astigmatism <0.5 Dioptre ($p = 0.010$); other factors studied were not associated.

Conclusion: In this study, the time interval between cataract surgery and LPC ranged from 2 to 96 months, with an average of 49 months. Earlier development of posterior chamber opacification requiring LPC appear to be associated with a narrow anterior chamber and this could be related to the opacified capsule being more anterior or there are more residual lens epithelial cells after cataract surgery in eyes with narrow anterior chamber.

Early experience with Clareon toric monofocal intraocular lenses

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Purpose: The Clareon toric monofocal intraocular lens (IOL) has recently been released. The new hydrophobic acrylic material applies the Acrysof IQ IOL design which was developed to be rotationally and axially stable due to its stable force haptics and planar positioning under pressure respectively. For the first time, this study reports visual outcomes, refractive predictability and rotational stability for a range of Clareon toric monofocal IOLs.

Setting: Private practice in Adelaide, Australia.

Methods: Eighty eyes of 62 patients underwent cataract surgery and implantation of Clareon toric IOLs by a single surgeon. IOL cylinder powers of 1D (T2), 1.5D (T3), 2.25D (T4) and 3D (T5) were implanted in 40, 19, 17 and 4 eyes respectively. Eyes were assessed postoperatively at day 1, week 1 and month 1 when they had subjective refraction performed. Refractive results were vector analysed. Intraoperative images were compared to postoperative toric IOL alignment slitlamp images at each time point.

Results: Mean uncorrected distance visual acuity and intermediate visual acuity was -0.034 logMAR and 0.22 logMAR respectively. Overall 94% of eyes had 0.50D of target refractive astigmatism. Best refractive outcomes were in the T2 group. Mean absolute astigmatic prediction error was 0.23D. Surgically induced astigmatism centroid value was 0.04D. IOL rotation from operation to day 1 post-op was mean 0.98 degrees with 97.5% of IOLs rotating less than 4 degrees. No rotation was seen after day 1 post-op. No difference in stability was seen between subgroups.

Conclusions: The Clareon toric monofocal IOL provides excellent unaided visual acuity and astigmatic refractive predictability. Rotational stability is very good with minimal rotation occurring and this was limited to very early in the postoperative period.

CORNEA

Attitudes of eye health practitioners towards diagnostic tests and therapies for dry eye disease in Australasia

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Purpose: To assess the attitudes of eye health practitioners (EHP) toward dry eye disease and available diagnostic tests.

Method: An anonymous electronic questionnaire was disseminated to EHP in Australia and New Zealand between December 2020 to March 2021 through forums and mailing lists. Participants were asked to rate: the likelihood of characteristics associated with dry eye, the utility of various diagnostic tests, the importance of test characteristics, and their satisfaction with the current state of dry eye tests. Qualitative responses were also obtained and broadly categorised into positive, negative or neutral.

Results: A total of 144 responses from EHP were included, where 117 (81.3%) were based in Australia and 27 (18.7%) were based in New Zealand. Posterior blepharitis was significantly more likely to be associated with dry eye compared to other included factors ($p < 0.01$). Clinical history was rated to be significantly more useful in diagnosing dry eye compared to other tests ($p < 0.01$), except fluorescein staining ($p = 0.90$) and fluorescein/tear break-up time ($p = 0.06$). Test validity was significantly more important than other qualities. Qualitative responses of EHP attitudes towards dry eye presentations and the adequacy of diagnostic tests were of positive nature in 42.2% and 24.3%, negative in 32.4% and 41.9%, and neutral in 25.5% and 33.8% respectively.

Conclusion: The opinions of EHP regarding the utility of dry eye tests were variable, but most clinicians favour traditional methods of history and corneal staining for its diagnosis. There is a need to develop a consensus amongst real-world clinicians regarding an optimum diagnostic pathway for dry eye.

The effect of immunosuppression on the visual outcomes of peripheral ulcerative keratitis in Queensland, Australia

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Purpose: Peripheral ulcerative keratitis (PUK) is an inflammatory disorder that can cause significant ocular morbidity and mortality. Potential causes are myriad, and treatment can involve local medical, systemic and surgical measures. This study aimed to review the effects of systemic immunosuppression on visual outcomes.

Methods: A retrospective case series based in Queensland, Australia was performed. Patients who presented with PUK to the major tertiary ophthalmology referral centres between January 2015 and January 2021 were included.

Results: Twenty-two eyes of 26 patients (average age 69.81 ± 14.54 , 50% male) with PUK were included, with an average follow-up of 577 ± 686 days. Twelve patients (54.5%) had systemic autoimmune disease. Seventeen patients (77.3%) required inpatient treatment, 8 patients (36.4%) received topical steroids, and 15 patients (68.2%) received oral doxycycline. Eighteen patients (81.8%) were treated with systemic steroids and 10 patients (45.5%) were treated with steroid-sparing immunomodulatory therapy. Average logMAR best-corrected visual acuity at presentation and final follow-up were 0.63 ± 0.65 and 0.64 ± 0.82 respectively. Those with bilateral involvement had a borderline significant reduction in best-corrected visual acuity of 0.26 ± -0.25 logMAR ($p = 0.05$). Four of 5 perforations (80%) were surgically managed. Four patients (18.2%) were deceased at the time of review.

Conclusions: PUK poses significant clinical challenges and requires intensive medical treatment. Surgical treatment is required in a significant minority of cases. Systemic immunomodulatory therapy in consultation with specialist physicians can be effective in optimising visual and systemic outcomes.

Thirty-five years (1986–2021) of eye banking: The Lions Eye Bank of Western Australia

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Purpose: To review trends in preparation, storage and usage of donor corneal tissue at the Lions Eye Bank of Western Australia.

Methods: Donor and recipient records from July 1986 to July 2021 were evaluated with relation to donor demographics, cause of death, storage medium, corneal utilisation, type of graft and indication for graft.

Results: A total of 6209 eyes from 3328 donors were retrieved in the 35-year period reviewed. Sixty-six percent of donors were male, 33% were female and 1% were of



unspecified gender. Median age of donor was 61 years. The most frequent cause of death of donors was a cardiac event, followed by intracerebral haemorrhage and malignancy. A total of 5245 corneal transplants were carried out from July 1986 to July 2021, and 118 corneas were exported to other eye banks. Storage of corneal tissue was primarily in Optisol GS until 2010, when organ culture medium was introduced. Of 5245 recipients, 52% were male and 47% were female. Median recipient age was 63 years. Penetrating keratoplasty was the most common surgery performed over the 35-year period, followed by endothelial keratoplasty and anterior lamellar keratoplasty. The most common indications for grafts were ectasia/thinning, repeat corneal transplants, endothelial dystrophies and post-cataract surgery oedema.

Conclusions: We present trends in donor numbers, storage, preparation and utilisation of corneal tissue across 35 years at Lions Eye Bank of Western Australia. The most significant changes over this time period include methods of corneal storage and advances in surgical techniques that has led to a greater usage of endothelial grafts.

iStent and corneal graft

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Purpose: To investigate the effectiveness of iStents in the management of steroid associated ocular hypertension following penetrating keratoplasty surgery for keratoconus.

Methods: We conducted a prospective analysis of a patient who developed steroid associated ocular hypertension following penetrating keratoplasty. In the first instance topical medication management was pursued. However, medication inadequacy and intolerance proved an issue where all medication options were exhausted. We conducted a minimally invasive glaucoma surgery, introducing two iStents separated by 45 degrees, and chronologically documented intraocular pressure recordings at follow up visits.

Results: The iStents were well tolerated and achieved a sustained control of intraocular pressure, keeping to within normal limits (10–21 mmHg). There has been no evidence of endothelial cell decompensation, graft-rejection or glaucomatous change since introducing the iStent.

Conclusion: Ocular hypertension and glaucoma following penetrating keratoplasty is a well-documented complication, where multiple possible aetiologies exist. Our

case is the first documented in ophthalmology literature regarding the use of an iStent to control ocular hypertension following penetrating keratoplasty surgery. Forgoing the long-term financial burden and application of topical medication is a possibility, because minimally invasive glaucoma surgery devices such as the iStent could be considered a possible a first line management option for ocular hypertension and glaucoma resulting from penetrating keratoplasty surgery.

Repeatability and agreement of topometric parameters between a topographer, scheimpflug tomographer, and optical coherence tomographer in Keratoconus

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Purpose: To test repeatability and agreement of topometric/tomographic parameters in subjects with keratoconus, using the Revo NX (Optopol, New Zealand), Medmont (E300 Topographer, Medmont, Australia) and Pentacam AXL (Oculus, Germany).

Method: Prospectively, keratoconic subjects, topographic keratoconus classification grades 0–4, and no previous ocular surgery, had thinnest-corneal thickness (TCT), central-corneal thickness (CCT), maximum keratometry (Kmax), mean keratometry (Kmean), steep and flat keratometry (Ksteep, Kflat), measured with three devices. Three scans were acquired per device within the same session to assess intra-observer repeatability (within-subject standard deviation). The Bland–Altman method was used to evaluate agreement.

Results: Twenty-six eyes of 26 subjects were analysed, topographic keratoconus classification consisted of grades 0 (n = 1), 1 (n = 3), 2 (n = 10), 3 (n = 12), 4 (n = 0). Repeatability was highest in the Pentacam with CCT (4.79), Kmax (0.41), Kmean (0.27), Ksteep (0.29) and Kflat (0.45). Revo had the best repeatability with TCT (2.20). The Medmont had better repeatability than the Revo with Kmax (0.41, 1.25 within-subject standard deviation), Kmean (0.46, 0.99), Ksteep (0.66, 1.01) and Kflat (0.46, 0.97). Overall, device agreement was poor. However, there was high agreement between the Pentacam and Medmont Kflat (p = 0.06), Pentacam and Revo Kmax (p = 0.08) and Pentacam and Medmont Kmax (p = 0.48).



Conclusion: The Pentacam device has the highest repeatability, and Revo the least. However, the Medmont is unable to measure CCT and TCT, which are invaluable for clinical decision-making regarding disease progression and safety of crosslinking. Almost all parameters cannot be used interchangeably between devices, thus a new baseline must be established when changing devices to monitor progression or assess severity.

5-Fluorouracil in primary and recurrent pterygia: Efficacy and safety of a surgical adjuvant and intralesional antimetabolite

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Purpose: There is nothing quite as disheartening for the surgeon or patient than the recurrence of pterygium. This review provides a comprehensive update on the efficacy and safety evidence for 5-Fluorouracil (5-FU) as an antimetabolite agent in the armamentarium of pterygium management.

Methods: Literature searches of PubMed, Cochrane and EMBASE databases retrieved 682 articles. Full-text appraisal identified 38 published clinical studies on 5-FU in pterygium.

Results: 5-FU, a pyrimidine analogue that suppresses DNA replication, was synthesised in 1957 by Duschinsky and first employed in pterygium by Radda and Grasl in 1989. In-vitro and in-vivo studies have shown that 5-FU has a dose- and duration-dependent cytostatic and cytotoxic effect on human fibroblasts, corneal epithelial and limbal stem cells. The published evidence indicates a sub-optimal efficacy, and the authors do not recommend routine perioperative use of 5-FU as an adjuvant to prevent pterygium recurrence. In contrast, intralesional injections of 5-FU to arrest progression and improve cosmesis of primary and recurrent pterygia show more promising results. This treatment may avoid surgery but requires adherence to a dosing regimen. In pterygium surgery, 5-FU has a predilection for scleral thinning and granuloma formation, corneal toxicity and graft-related complications.

Conclusion: With emerging surgical techniques, which carry low recurrence rates and avoid antimetabolite-related complications, the role of adjuvant 5-FU in pterygium remains in question. However, 5-FU is

inexpensive, available and easy to administer. Therefore, it may still have a role in settings where a paucity of health resources, including surgical expertise, pose a barrier to pterygium management.

Weighty matter—The impact of body mass index on the repeatability and reliability of corneal tomography measurements in patients with keratoconus

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Purpose: The purpose of this study was to analyse data collected from corneal tomography for patients with keratoconus, with a view to establish whether body mass index (BMI) was associated with a statistically significant difference for key markers of disease severity and progression. The markers chosen were central corneal thickness, thinnest corneal thickness, K1, K2 and KMax readings.

Method: A retrospective analysis of 243 patients over a 5-year period was undertaken. BMI data calculated from height and weight were recorded at the time of assessment. Three scans of each eye were undertaken by qualified personnel using a standardised methodology using a Pentacam scanner. The eye chosen for analysis was the right eye, unless previous intervention had been performed, in which case the left eye was chosen. The data were extracted from the measuring device and stratified into groups based on the Ministry of Health BMI classifications of normal weight range (55 patients), overweight (58 patients) and obese (130 patients). Results were tabulated and measurements of standard deviation, repeatability and precision were obtained, and an analysis of variance analysis was performed on the within-subject standard deviation data.

Results: There was a statistically significant difference between BMI groups for measurements of K1 and KMax readings ($p \leq 0.05$) however a statistically significant difference was not demonstrated for the other markers chosen.

Conclusion: Clinicians should be aware that BMI has a statistically significant impact on corneal tomography data. This is a novel analysis and adds to the body of literature on this topic.

Corneal collagen cross-linking in Australia, before and during the COVID-19 pandemic

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Purpose: Corneal collagen cross-linking (CCXL) is a minimally invasive treatment for progressive corneal ectatic disorders, recently introduced on the Australian Medicare Benefits Schedule in May 2018. We aim to explore CCXL service rates over time in Australia and investigate potential changes during the COVID-19 pandemic.

Methods: Retrospective analysis of CCXL services in Australia between 2018 and 2021, as recorded by Medicare. We used Poisson regression to explore changes in service rates with time, and to compare differences in distribution by age, sex and state/territory.

Results: A total of 8009 CCXL services were performed during the study period, with the majority for males (66.5%), those aged 15–24 years (40.5%) and in Victoria (27.7%). CCXL rates tended to increase annually, rising from 7.55 (in 2018) to 9.15 (in 2021) services per 100 000 people. While CCXL rates increased by 14% between 2019 and 2020 (service rate ratio [RR] 1.14, 95% confidence interval [CI] 1.07–1.20), there was a 35% reduction between March and April 2020 when the COVID-19 pandemic began (RR 0.65, 95% CI 0.52–0.82). CCXL rates subsequently increased by 99% between April and August 2020 (RR 1.99, 95% CI 1.60–2.48).

Conclusion: CCXL service rates increased annually in Australia from 2018. This could be attributable to increased access to treatment for progressive corneal ectasia, and/or an increasing burden of disease. CCXL rates decreased transiently early in 2020, likely due to lockdowns and elective surgery restrictions during the initial COVID-19 pandemic.

Modified limbal-conjunctival autograft technique using a 23-gauge needle for primary and recurrent pterygium surgery: Long-term follow-up results of recurrence and complications

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Purpose: To report the long-term recurrence and complication rates of a modified limbal-conjunctival autograft (LCAG) technique for pterygium excision.

Method: Retrospective, single-surgeon cohort study of 176 eyes in 163 consecutive patients (95 men, 81 women) with a clinico-histopathological diagnosis of pterygium. Excision was performed with a modified technique using a 23-gauge needle to “behead” the pterygium, followed by a large LCAG where 50% of the palisades of Vogt were dissected using a 23-gauge needle. Kaplan–Meier survival analysis of the recurrence rate and binary logistic regression models to correlate preoperative and intraoperative factors with postoperative recurrence were performed.

Results: Of the 176 pterygium, 136 (77.3%) were unilateral, 122 (69.3%) were primary and the morphology was classified as Type I (30, 17%), II (66, 37.5%) and III (80, 45.5%). Mean age was 59.1 ± 16.94 years, mean corneal extension was 3.16 ± 1.00 mm, mean intraoperative conjunctival defect was 9.83 ± 1.63 mm and mean LCAG width was 11.09 ± 1.58 mm. The success rate of the modified LCAG was 98.3% with recurrence observed in 3 eyes. Regrowth was limited to the conjunctiva without involving the visual axis. The mean follow-up period without pterygium recurrence was 723 days. No serious complications were noted. No preoperative or intraoperative factors significantly correlated with postoperative recurrence.

Conclusion: Modified LCAG using a 23-gauge needle is a less invasive alternative technique that offers a very low recurrence rate with no serious complications over long-term follow-up. It appears to be effective in both primary and recurrent pterygia. Future studies should include comparisons to other techniques.

Double trouble? Practical management guidelines for excision of double-headed “kissing” pterygium

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Purpose: The management of double-headed pterygium is technically challenging and requires extended dissection, harvesting of large grafts, prolonged operating time and may result in greater postoperative inflammation, suboptimal cosmesis and higher recurrence. The authors summarise



the efficacy of different published surgical procedures and synthesise practical management guidelines.

Methods: Critical full-text appraisal of literature searches of Pubmed, Cochrane and EMBASE databases identified 23 clinical studies of techniques used to excise double-headed pterygium.

Results: In published studies, conjunctival autograft (CAG) had the lowest recurrence (split 0–5.2%, sequential 0–5.5%, single 6.3–17.5%), followed by conjunctival rotational autograft (CRA) (4–17.5%), amniotic membrane transplant (AMT) (9–25.8%), and finally the bare sclera technique with adjuvant mitomycin C (7.7–28.1%) (BST/MMC). CRA appears more difficult and has worse cosmetic outcomes than CAG. AMT may be beneficial when CAG/CRG is not possible due to extensive excision or previously scarred conjunctiva. Emerging techniques like P.E.R.F.E.C.T provide very low recurrence with good cosmetic outcome and conjunctival preservation.

Conclusion: First, confirm the diagnosis. Second, confirm the indication/s for surgery. Third, select the appropriate surgical procedure: (i) If able to harvest a large graft, then perform a split CAG. (ii) If only able to harvest a small graft and the contralateral eye is normal, perform one CAG from each eye. If the contralateral eye is abnormal, then consider sequential CAG surgery or performing a CAG combined with a CRA/AMT/primary closure. (iii) If unable to harvest a CAG, then consider CRA combined with CRA or AMT, with or without MMC.

Corneal collagen crosslinking in keratoconus: Epithelium on or off? A systematic review and meta-analysis

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Purpose: The primary treatment for progressive keratoconus is corneal collagen crosslinking (CXL). Evidence is emerging on the efficacy and safety of epithelium-on vs. epithelium-off CXL to treat keratoconus. The aim of this study was to assess the efficacy and safety of these CXL protocols.

Methods: We searched Pubmed, Medline, EMBASE, Web of Science and Scopus databases. The studies included for systematic review compared epithelium-off with epithelium-on CXL to treat keratoconus and were published in the last 10 years in English. To compare epithelium-off and epithelium-on CXL, a meta-analysis was performed for the primary outcomes of corrected

distance visual acuity and maximum keratometry at a 12-month follow-up.

Results: The search led to 887 publications that were screened with 88 publications then assessed for eligibility and 27 studies included in the systematic review. The mean change in corrected distance visual acuity from baseline to 12 months was 0.13 logMAR (CI 0.11, 0.15; $p = 0.04$) and 0.09 logMAR (CI 0.07, 0.11; $p < 0.01$) for epithelium-off and -on, respectively. At the 12-month follow-up time point, the mean change in visual acuity was higher in the epithelium-off group (mean difference, 0.07 [confidence interval 0.11, 0.02; $p = 0.004$]). There was no statistically significant difference in maximum keratometry change at 12 months (mean difference 0.55D; confidence interval -1.8, 0.7; $p = 0.39$).

Conclusion: Epithelium-off and epithelium-on CXL protocols were effective and safe in stabilising keratoconus progression.

Diagnostic utility of corneal parameters measured with pentacam in the diagnosis of early keratoconus

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Purpose: To determine the diagnostic utility of various corneal parameters measured using Pentacam (Oculus) imaging in differentiating early keratoconus from normal cornea.

Method: A retrospective review of patients at Sydney Eye Hospital with early keratoconus (patients with a maximum keratometry of less than 48 dioptres) was conducted utilising the Save Sight Keratoconus Registry. The control group consisted of students who had Pentacam imaging for educational purposes. Data from 31 corneal parameters were extracted and statistically analysed to determine Area under the receiver operating characteristics curve, sensitivity and specificity for each parameter in differentiating normal corneas from early Keratoconus.

Result: Imaging data using Pentacam from 54 eyes with early keratoconus and 49 controls were extracted. The receiver operating characteristics analysis exhibited the ratio between mean radius values in the upper and lower half of the cornea (also known as the keratoconus index) to have the highest area under the curve (AUC) value at 0.87, followed by index of vertical asymmetry with an AUC of 0.86 and corneal thickness at the thinnest point with an AUC of 0.85. After optimising cut-off thresholds

for all parameters, keratoconus index had a sensitivity and a specificity of 78% and 84% respectively, while index of vertical asymmetry demonstrated a sensitivity and specificity of 80%, and corneal thickness at the thinnest point exhibited a sensitivity of 87% and a specificity of 71%.

Conclusion: Keratoconus index, index of vertical asymmetry and corneal thickness at the thinnest point demonstrated the highest discriminative power in differentiating normal corneas and early keratoconus.

Knowledge and attitudes toward eye donation in the general population: Challenges and opportunities

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Purposes:

1. To investigate knowledge and attitudes toward eye donation, common reasons for willingness or barriers to donating eyes and the source of eye donation.
2. To identify the source of eye donation in the general population.

Methods: A systematic literature review was conducted using a 3-step search strategy. The major databases were searched, and database entries were from January 2010 and March 2021. The inclusion criteria for this review were, quantitative studies that had participants aged 16 years or older from the general population and had a sample size >200. The study of knowledge and attitudes toward eye donation and sources of eye donation information was included in this review. Methodological quality was assessed using Joanna Briggs Institute criteria, and the data were analysed using SUMARI software.

Results: A total of 25 studies were included in this review. Pooled data from 6 studies demonstrated that 30.8% (95% confidence interval [CI] 11.0, 55.4) of participants had appropriate knowledge of eye donation. Seven studies reported awareness of eye donation specifically, 40.6% of participants were willing to donate (95% CI 39.8, 41.3) and 5 studies demonstrated that only 7% (7.3%) (95% CI 6.5, 8.3) had already pledged their eyes. The 11 studies reported on the source of eye donation information that 50.9% (95% CI 49.8, 52.1) of participants received information from mass media.

Conclusion: Understanding eye donation knowledge and attitudes is essential in order to develop interventions or tools to increase eye donation rates. Further studies in different populations are required.

In-vivo regional variation of biomechanical properties in ectatic eyes

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Purpose: Ocular biomechanics were assessed at nine different areas across the cornea in advanced keratoconic eyes—preliminary analysis provides a descriptive overview of the first 10 participants before crosslinking. CorvisST measurements evaluated regional variation across the cornea of newly developed biomechanical parameters for in-vivo analysis.

Methods: Ten subjects with grade 3 keratoconus (age 18–31 years; 80% female, 20% male) were assessed using the CorvisST. Nine corneal locations were analysed across 3 zones (Central, Paracentral, Peripheral) and 4 meridians (Nasal, Temporal, Superior, Inferior). A dynamic fixation target was developed using a semi-transparent digital display to bring the various corneal locations into normal alignment with the device. One eye was chosen randomly for the preliminary analysis (ratio 1:1). CorvisST movie of every measurement were imported into MatLab to quantify the corneal displacement caused by the air puff. Based on the displacement matrix, novel in-vivo biomechanical parameters were calculated (Corneal Hysteresis, Damping, Dynamic Young's modulus).

Results: Intraocular pressure and central-corneal thickness were 14.3 ± 1.8 mmHg and 401 ± 35.8 μ m, respectively. Applanation length was found to be highest and time-delayed in Peripheral Inferior. Corneal hysteresis and damping were found to be lowest in Peripheral Inferior. Dynamic Young's modulus decreased significantly from central to the periphery in all meridians.

Conclusion: Analysis showed that in-vivo material-dependent parameters could be determined reliably using conventional NCT air-puff measurements across different regions of the keratoconic cornea.

EPIDEMIOLOGY/PUBLIC HEALTH

Acute occipital lobe stroke—A 6-year retrospective review from a large tertiary centre in Brisbane, Australia

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Purpose: Visual field disturbance secondary to acute isolated occipital stroke can cause patients to present to an eye casualty for evaluation instead of the emergency department (ED), potentially delaying diagnosis and treatment. We present data on the incidence, clinical characteristics, and outcomes of patients with acute isolated occipital lobe stroke who presented to the eye casualty and ED within a major tertiary centre in Brisbane.

Method: A retrospective consecutive case series analysis from the Princess Alexandra Hospital, Australia. Magnetic resonance imaging and computer tomography (CT) scans reporting acute isolated occipital lobe infarcts were reviewed over 6 years from June 2015 to June 2021. Location of presentation, clinical characteristics, referral pathway, time to diagnosis and treatment were measured.

Results: Sixty-five patients were identified to have acute isolated occipital stroke. Fifty-one (78%) presented to ED compared to 14 (22%) who presented to the eye casualty. Mean time to diagnosis was significantly longer ($p < 0.005$) for patients who presented to the eye casualty (6.36 hours) compared to those who presented to ED (3.47 hours). Only 2 patients underwent thrombolysis, both of which presented to ED. Factors associated with patients presenting to the eye casualty included patient symptoms (visual) and referral type (optometrist).

Conclusions: Presenting to an eye casualty with an acute isolated occipital infarct can delay time to diagnosis and potential eligibility for thrombolysis. Further education for patients, optometrists and general practitioners on the symptoms of acute isolated occipital stroke can help to direct patients to ED instead of an eye casualty.

Te Hauora Karu o Te Iwi Māori (The State of Māori Eye Health)

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Purpose: To summarise the current evidence on the state of Māori eye health.

Methods: Narrative literature review. A literature search was conducted using MEDLINE and PubMed on 28 May 2022.

Results: Data on Māori eye health is patchy and there is a lack of robust national data. Māori are significantly more likely to develop diabetes (age-adjusted hazard ratio 1.85), more likely to develop sight threatening retinopathy and more likely to have disease progression. Keratoconus is likewise more frequent in Māori (approximately 4 times more frequent) and Māori are overrepresented in corneal transplants. Māori patients present for cataract surgery

10 years earlier than non-Māori and with more advanced disease. Limited data exists for macular degeneration and glaucoma but there is the suggestion that these may be lower in Māori. Whether this is due to decreased disease prevalence or under diagnosis is unclear.

Conclusions: Significant differences in disease prevalence exist for Māori. There is a need for further data at a population level.

Barriers to accessing a tertiary keratoconus and crosslinking clinic in Auckland, and associated visual outcomes, to assess health inequity

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Purpose: To investigate inequity in accessing care, including barriers to first specialist assessment (FSA) and follow-up clinics monitoring keratoconus progression and post-crosslinking care, and their effect on visual outcomes for keratoconic subjects.

Method: Data were collected prospectively from subjects attending the keratoconus and crosslinking service at Auckland District Health Board, including gender, ethnicity, NZ Deprivation Index (NZDep; area-based measure of socioeconomic status, 1 = low deprivation, 10 = high deprivation), disease severity (maximum keratometry and thinnest-corneal thickness), proportion of appointments attended, distance travelled and worse-eye habitual visual acuity.

Results: A total of 119 subjects, 54% males, were recruited from FSA clinic. Distance travelled was 13.3 ± 10 km, and NZDep was 6.8 ± 2.7 . Pacific Peoples (PP) and Māori were overrepresented and had significantly lower attendance (Ethnicity (%) FSA, follow-up/attendance (%) FSA, follow-up): PP (42%, 48%/58%, 75%), Māori (26%, 15%/66%, 77%), European (21%, 19%/88%, 88%), Asian (9%, 15%/91%, 93%) and Other (2%, 3%/75%, 84%). Mean worse-eye habitual visual acuity at presentation was 6/32. One hundred and forty-four subjects, (59% males) were recruited from follow-up clinic. There was no difference between ethnicities in time to first offered and attended FSA from referral, or disease severity at attendance. However, PP and Māori had worse disease severity at follow-up. NZDep was significantly higher for PP and Māori (7.7 ± 2.4 , 7.1 ± 2.4 , $p < 0.001$).

Conclusion: Māori and Pacific Peoples constitute most subjects attending this service and have significantly

higher NZDep scores and lower attendance. Despite not having worse disease severity at presentation, vision significantly worsens with follow-up possibly due to increased non-attendance. Further studies are required to determine the cause of this inequity in outcomes and to further explore possible solutions.

Conclusions from a systematic review of artificial intelligence deep learning algorithms for diagnosing retinopathy of prematurity: recommendations for future artificial intelligence algorithms

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Purpose: Artificial intelligence (AI) algorithms offer considerable potential for streamlined diagnoses of retinal diseases. Promising results in the literature has resulted in considerable popularity among research groups in diabetic retinopathy and retinopathy of prematurity. The 'black-box' problem commonly encountered in these AI studies, however, remains a major limitation. For this reason, guidelines should be developed for ensuring high quality data that are translatable into clinical practice.

Method: Systematic review evaluating performance of AI models in detecting retinopathy of prematurity.

Results: Diagnostic performance of AI algorithms was high amongst the 12 studies identified with average sensitivity and specificities of 95.72% and 98.15% respectively. A large range of images from 289–39,029 were used to train each algorithm and no studies reported sample size calculations. On average, 2.6 human graders formulated reference standards. Five studies obtained external validation and of these, 4 revealed inferior algorithm performance. Only 1 study completed a prospective evaluation.

Conclusion: This systematic review reveals a lack of well-designed, externally validated, randomised studies comparing AI to human performance. It identifies the importance of robust study design with reliable reference standards developed by multiple clinicians. A large dataset should be used to train algorithms and meticulous exclusion of poor-quality images should be avoided to reflect real-world routine screening. External evaluation with an image set naive to the training set is crucial to precisely validate the performance of an algorithm. Finally, a prospective evaluation comparing AI performance to human

performance is integral to determining the generalisability of an algorithm into the clinical setting.

Ophthalmic acyclovir utilisation in Aotearoa New Zealand

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Purpose: The purpose of this study was to analyse data from a national pharmaceutical dispensing dataset in order to establish whether statistically significant differences in acyclovir dispensing exist between age, socioeconomic status and ethnicity, among others.

Methods: The study used anonymised data from a national pharmaceutical dispensing dataset. Population counts from the 2013 and 2018 censuses were used. Ethics approval was granted by the Auckland Health Research Ethics Committee (reference AH21886). This analysis included every subsidy-eligible community dispensing of acyclovir 3% eye ointment in Aotearoa New Zealand between 1 January 2017 and 31 December 2019. These were then stratified by the patient's domiciled District Health Board (DHB). Multiple sub-group analyses were then performed, including whether the DHB was classified as urban/rural, the prescriber type, and socio-economic status. Analysis was undertaken using IBM SPSS statistics version 26. The independent t-test and one way analysis of variance with post-hoc Hurdley's HSD where applicable were used to determine whether statistically significant differences arose, with $p \leq 0.05$ being used as the threshold.

Results: There were 12,035 dispensations of acyclovir throughout the study. There was a 6-fold increase in dispensing for individuals over 65. Differences between age groups were statistically significant, as were dispensings in non-rural areas, and for Māori patients. The most deprived quintile accounted for 5-fold more dispensings than the least deprived quintile in non-urban DHBs.

Conclusion: This novel study highlights significant differences in acyclovir dispensation across multiple areas and serves to highlight areas for further investigation and public health policy analysis.

The burden of inherited retinal dystrophies in Queensland: the pilot project of the Queensland inherited retinal dystrophy registry

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Purpose: The Queensland inherited retinal disease (IRD) Registry was created to comprehensively evaluate affected patients to guide service provision and identify suitable candidates for emerging clinical trials.

Method: Data from the Queensland Electro-Diagnostic and Imaging Centre was accessed from 2014 onwards. This is Queensland's primary referral hub for adult and paediatric patients undergoing electrophysiology testing, thus theoretically capturing all diagnoses. Patient referrals and reports were screened for inclusion, and data extracted included demographics, family history, Queensland Health catchment, rurality, visual status, examination, tests completed, genetic information and diagnoses.

Results: A total of 1993 patients underwent electrophysiology from 2014 onwards. Of these, 115 paediatric and 325 adult patients were definitively diagnosed with an IRD from available data. The commonest dystrophy was retinitis pigmentosa (176), 79% of which were of either autosomal recessive or unknown inheritance. Other common dystrophies were cone dystrophies (45), cone-rod dystrophies (43) and Stargardt's (41). 40 patients presented with legal blindness, while 25 were asymptomatic. 70% of patients were from Modified Monash Model 1 areas, with 25% from Metropolitan North alone. There was no statistically significant relationship between health service or Modified Monash Model score and presenting as blind or asymptomatic.

Conclusion: IRD's cause significant blindness and visual impairment in Queensland, and geographic distribution follows overall population trends. This pilot study demonstrated this registry's feasibility, with further direction to include accessing pre-2014 data from the previous electrodiagnostic centre, compiling genetic and electrodiagnostic data to identify suitable clinical trial patients, and prospectively recruiting from both Queensland Electro-Diagnostic and Imaging Centre and Queensland Health Facilities.

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.

Causes of childhood vision impairment in Victorian School children between 2013 and 2022

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Purpose: To present 10 year data on causes of vision impairment in primary and secondary school students in Victoria, Australia. The Education Vision Assessment Clinic (EVAC) at the Royal Victorian Eye and Ear Hospital is a service of the Department of Education that reviews school-aged children with low vision. Students

with best corrected visual acuity worse than 6/18 in the better eye and/or visual field constricted to less than 20 degrees are eligible for specialist teaching assistance to support their integrated community school learning.

Method: Retrospective audit of data collected from students attending the EVAC between 2013 and 2022. Information analysed include clinical diagnosis and eligibility for educational assistance as determined by best corrected visual acuity and/or visual fields.

Results: A total of 617 patients (227 females, 390 males) were seen at the EVAC, of which 512 were deemed eligible for the visiting teacher service. Age range at presentation was 5 to 18 years old. Of the patients seen, major diagnoses included 105 (17.1%) retinal dystrophies, 79 (12.8%) albinism, 32 (5.2%) cortical vision impairment and 9 (1.5%) retinopathy of prematurity.

Conclusion: The EVAC is a service to help students with vision impairment reach their full potential in education. It is also a valuable source of information on childhood visual impairment in the Victorian population. A preponderance of male students continues a previous trend that may be attributable to X-linked conditions that are currently not treatable. The downward trend in treatable conditions such as retinopathy of prematurity continues.

Epidemiology, clinical outcomes, surgery, and the economic burden of ophthalmic trauma: A scoping review of Australian trends with a global comparison

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Purpose: Ophthalmic trauma is a leading cause of preventable blindness in Australia and globally. The clinical heterogeneity and small samples of published studies make conclusions challenging to draw. A scoping review will facilitate identification of trends and gaps in knowledge to direct further clinical research. Furthermore, a contemporary understanding of Australian trends in epidemiology, clinical outcomes and costs with a global comparison, will have meaningful impact on optimising practice, training and public health policy.

Method: Evidence-based synthesis using the Preferred Reporting Items for Systemic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR). All studies

and reviews investigating ophthalmic trauma in Australian populations will be included, and then compared to major global trends.

Results: Within Australia, Indigenous Australians, occupational- and sport-related injuries in young males, falls in the elderly, and individuals residing in regional/remote areas represent high-risk populations. Ophthalmic trauma, especially open globe injuries, have poor clinical outcomes and often require multiple surgeries. There is a distinct paucity of economic cost of ophthalmic trauma in Australia and globally. Furthermore, the societal costs, psychological burden, and quality of life following ophthalmic trauma remain an incompletely understood area. Registries such as the International Globe and Adnexal Trauma Epidemiology Study will further our understanding of ophthalmic trauma.

Conclusion: It is imperative that ophthalmologists and optometrists, their organisational bodies, and governments work collaboratively to ameliorate the disproportionate medical and societal burden of ophthalmic trauma. This scoping review identifies key epidemiological trends and populations where health legislation and further clinical research can be focused.

Open and closed globe injuries: Epidemiology, visual and surgical predictive variables, prognostic models and economic cost analysis

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Purpose: To report the epidemiology, predictive variables, prognostic models and economic cost of open and closed globe injuries (OGI/CGI).

Method: Retrospective tertiary-centre study from 2008 to 2020 of OGI/CGI in individuals aged 16 and older was performed. Application of Ocular Trauma Score (OTS) and Classification and Regression Tree Analysis (CART) and cost analyses were undertaken. Outcomes measured included visual acuity, number of surgeries, prognostication using OTS and CART and estimated costs.

Results: Younger males at work with inadequate protective eyewear and falls in the elderly were at-risk. For OGI, inferior visual outcomes were associated with a more severe OTS score, a larger injury zone, increasing age, the presence of retinal detachment, extraocular



muscle involvement, intraocular foreign body and globe rupture ($R^2 = 0.723$, $p < 0.001$). Multiple operating theatre visits were required in the presence of retinal detachment, lens or orbit involvement, work-related injury, globe rupture and a history of previous intraocular surgery ($R^2 = 0.0423$, $p < 0.001$). In OGI, both OTS and CART prognosticated outcomes ($p < 0.001$). The OTS predicted for no vision (no light perception/enucleation/evisceration) and profound visual loss (worse than 6/120; specificity: both 100%, sensitivity: 88.2% and 88%) whereas the CART predicted for visual survival (light perception or better) and minimal-to-severe visual loss (6/120 or better; specificity: 88.5% and 81.7%, sensitivity: 97.7% and 100%). Estimated annual cost for Australia was over AUD48.1–60.5 million.

Conclusions: OGI/CGI imposes a significant burden on healthcare and society. Implementation of targeted public health preventative measures may be cost-effective.

Providing ophthalmology outreach services in the Top End during a pandemic: 2020–2021

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Purpose: The Royal Darwin Hospital's Department of Ophthalmology provide a regular outreach service to the remote communities of the Top End of the Northern Territory throughout the year. COVID-19 travel restrictions and community lockdowns has impacted the provision of scheduled outreach services typically provided to those patients residing in remote Top End communities.

Method: A two-year retrospective analysis of patients booked into the Royal Darwin Hospital Department of Ophthalmology outreach clinics for consultations and procedures, over 2020 to 2021, were included. Records were used to identify outreach trips (number and location), patient demographics, waitlists, clinic attendance, intravitreal injections, and surgical procedures.

Results: The Royal Darwin Hospital Department of Ophthalmology continued to provide outreach services to the remote Top End over 2020 and 2021. 6 remote communities were serviced in 2020, where 140 patients were reviewed. Eight communities were serviced in 2021, 113 patients were reviewed. Outreach services to Katherine Hospital and Gove District hospitals increased due to reduced community services. Two hundred and thirteen and 214 intravitreal injections were administered in 2020, and 2021 respectively. Total surgical procedures in 2020 and 2021 were similar, 68 and 70 respectively.

Conclusion: The COVID-19 pandemic reduced the provision of regular outreach services provided by the Royal Darwin Hospital Ophthalmology Department, to the remote population of the Top End. Clinic reviews, intravitreal injections and surgical procedures continued at a reduced rate to the remote population of the top end.

GENETICS

Cornea plana: A case series and literature review on the principles of management

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Purpose: Cornea plana is a rare ocular condition existing in two distinct clinical and hereditary forms: a milder autosomal dominant type I and a severe autosomal recessive type II. The condition is more commonly found in Finnish, Saudi and Czech families. Being a rare condition its management is poorly understood

Methods: We report three brothers from a consanguineous marriage that presented with complaints of decreased vision of varying degrees. Diagnosis was made by a consultant ophthalmologist. A comprehensive literature review was conducted for the management of cornea plana.

Results: All three patients had blue, thick, hazy corneas with shallow anterior chamber depths. Additional features of cornea plana type II were seen in the older two brothers including arcus lipoides, ill-demarcated limbus and accommodative squint. They were managed by correction of refractive errors via spectacles and detailed counselling with follow up visits to look for progressive complications.

Conclusion: The management is mainly centered around optically or surgically correcting the developmental anomalies. This is complimented with proper genetic counselling and regular follow up visits to look for and manage complications. There are however, novel therapies that can be considered in these patients including corneal transplants or corneal stromal stem cellular therapies.

Inosine monophosphate dehydrogenase-related autosomal dominant retinitis pigmentosa: Understanding the natural history

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Purpose: Inosine monophosphate dehydrogenase (IMPDH) is a key regulatory enzyme in the de novo synthesis of guanine nucleotides. Mutations in IMPDH1 cause photoreceptor degeneration. We report the natural history associated with a novel IMPDH1 variant and compare to literature.

Methods: Retrospective review of a 2-generation family with childhood onset retinitis pigmentosa (RP) and a novel IMPDH1 variant. Evaluation included: best corrected visual acuity (BCVA), ultra-wide field fundus photograph and fundus autofluorescence, full field electroretinogram (ffERG), optical coherence tomography and visual field testing. Literature search identified all published cases with variants in IMPDH1.

Results: The index case was clinically diagnosed at 7.25 years. Her 2 sons presented ≈ 3.5 yrs of age with nyctalopia or fundus abnormality. Genetic testing identified a heterozygous IMPDH1 variant (p.Lys314Gln). This variant is located in exon 10 similar to the majority of IMPDH1- RP reports. BCVA loss was 0.06 LogMAR per year during 11.7 (4.2) years follow up. The FAF showed a central area of hyperAF encircled by a ring of hypoAF with diffuse hyperAF extending to the vascular arcade. Optical coherence tomography showed ellipsoid zone loss at the fovea. Severely constricted VFs with reduced central sensitivity were found. Initial ffERG were almost extinguished (rod system affected most).

Conclusion: IMPDH1 causes an early onset RP. Visual deterioration is slow in first 4 decades with progressive BCVA loss. FAF varies between reported cases with our series demonstrating central hyperAF rather than macular ring. The visual field and the ffERG suggested peripheral to central disease progression.

Glaucoma due to TBK1 duplication is associated with optic disc pits

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Purpose: To describe an association of optic disc pit with *TBK1* duplications.

Method: We performed a retrospective cohort study of normal-tension glaucoma (NTG) patients with *TBK1* duplications (N = 16 patients from 3 pedigrees, 92 *TBK1*-negative NTG controls). Optic discs were assessed by experienced clinicians using stereo photography and OCT. Statistical testing was performed using Fisher's exact test of probands.

Results: Three cases of unilateral optic disc pit were identified in our *TBK1* duplication group (3/16; 18.7%) and none (0/92) in controls ($p = 0.001$). The three cases (2 males, 1 female) were aged 32, 36, and 72. Two of the three pedigrees with *TBK1* duplications had at least one individual with a pit (2/3). This prevalence is higher than previously reported rates amongst NTG (12.7%) or a normative population cohort (Blue Mountain Eye Study, 0.19%), acknowledging methodological differences between studies. Optic disc pits amongst patients aged <40 are rare. Herein, we report two cases with pits (one superior and one inferior) presenting with sub- and intraretinal fluid, with one requiring laser treatment. The third case with advanced glaucoma had a temporal pit complicated by macular retinoschisis requiring surgery.

Conclusion: We describe a relatively high prevalence of optic disc pits in NTG individuals harbouring *TBK1* duplications. The presence of pits in these patients under 40 suggests an incompletely penetrant congenital aetiology which may be linked to *TBK1* duplications. Further studies are required to conclude whether this is due to structural developmental disc anomalies in *TBK1* duplication, or is simply a manifestation of early-onset NTG.

Synergistic effect of thalidomide and doxycycline oral therapy in the management of ocular and cutaneous manifestations of junctional epidermolysis bullosa laryngo-onycho-cutaneous syndrome

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Purpose: Junctional epidermolysis bullosa laryngo-onycho-cutaneous (JEB-LOC) is an overlap multisystem disorder characterised by extensive granulation tissue

formation in the dermis, larynx and eyes. Ocular complications in JEB-LOC are devastating and recalcitrant to many available treatment modalities.

Method: Interventional clinical study on the novel use of oral thalidomide and doxycycline in an 18-year-old male with JEB-LOC. Ocular and cutaneous tissue samples were collected pre- and post-treatment and underwent histopathological and immunofluorescence analyses.

Results: Ocular involvement was observed at 15 months of age with eyelid ulcerations and granulation tissue formation in the conjunctiva bilaterally. By 13 years of age, this had progressed to recurrent, painful corneal erosions with associated cicatrising conjunctivitis with symblepharon, epiphora, severe photophobia and visual loss (Right: 1/60, Left: 2/36). This occurred despite multidisciplinary management with numerous ocular surgical excisions and maximal medical therapy. He was commenced on thalidomide (50 mg/day) and doxycycline (100 mg/day) at 15 years of age. Within 3 months, he experienced significant symptomatic and visual improvement (Right: 6/12, Left: 6/18). He had accelerated physical growth and no new cutaneous lesions formed. Cognisant of long-term safety, treatment was ceased but resulted in symptom resurgence. Reintroduction of the therapy every second day was well tolerated and controlled symptoms. Histopathological and immunofluorescence analyses demonstrated significant decrease in tumour necrosis factor (inflammatory marker) and laminin V expression in both ocular and cutaneous tissues following treatment.

Conclusion: Thalidomide and doxycycline may have potential in managing the previously refractory cutaneous and ocular complications of JEB-LOC and extend the length and quality of life.

Pathognomonic lamination of the outer plexiform layer in optic atrophy is caused by heterozygous variants in *WFS1*

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Purpose: In Wolfram-like syndrome, dominant *WFS1* variants lead to sensorineural hearing loss, optic atrophy and diabetes mellitus. A previous publication described a novel outer plexiform layer (OPL) lamination on optical coherence tomography (OCT). In this report, two further patients are described.

Methods: This was a retrospective study of two probands with detailed ophthalmic examination, optic nerve and

retinal imaging and neuroimaging. Molecular investigations included targeted Sanger sequencing and next generation gene panel sequencing.

Results: Two female patients with a background of congenital sensorineural hearing loss were incidentally diagnosed with optic atrophy age 10 years and 16 years on routine examination. Visual acuities were mildly reduced at 0.2–0.3 logMAR with reduced colour vision. OCT of the nerve fibre layer demonstrated generalised thinning. OCT macula was remarkable for a linear splitting abnormality of the OPL. Neuroimaging demonstrated no intracranial cause of optic atrophy. Molecular investigations found heterozygous *WFS1* variants specifically c.937T>C; (p.His313Tyr) and c.2590G>A;(p.Glu864Lys), both variants having been previously reported in affected patients. Diagnosis of the optic neuropathy led to targeted diabetic investigation identifying previously undiagnosed diabetes mellitus in one proband.

Conclusion: In optic atrophy, OCT macula may identify pathognomonic OPL lamination that is associated with dominant Wolfram disease.

Genotype, phenotype and natural history of *PROM1* inherited retinal dystrophies

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Background: Prominin-1 encoded by *PROM1* plays an important role in disc morphogenesis of photoreceptors and autophagy in the RPE. Disease-causing variants in *PROM1* result in a broad spectrum of retinal dystrophies and may be suitable for genetic therapies.

Methods: Retrospective review of patient records referred to the Children's Hospital Westmead and the inherited retinal dystrophies service at Save Sight institute with *PROM1* variants. Assessment included best-corrected visual acuity, central macular thickness, length of disruption to the ellipsoid zone, electroretinography and fundus autofluorescence. Genomic testing was conducted by retinal dystrophy panel investigation of exome sequence data, and variant interpretation assisted by laboratory, clinical genetics and inherited retinal dystrophies specialist multidisciplinary team review where required.

Results: Nine patients were identified with PROM1 variants (3 novel). Two patients had heterozygous variants and a maculopathy phenotype. Three patients had compound heterozygous variants and two were homozygous, with phenotypes including widespread retinal dystrophy ($n = 2$), cone-rod dystrophy ($n = 2$) and macular dystrophy. Median age of onset of symptoms was 11.1 years ($SEM = 1.3$ years) for those with biallelic mutations, with duration of follow-up of 12.25 years ($SEM = 4.83$ years). Visual acuity ranged from 6/60 at presentation to LogMAR 0.2 (6/9). There was progressive visual decline, reflected in visual function, multimodal imaging and electrophysiology during the period of observation.

Conclusion: This well-observed cohort demonstrated a full spectrum of PROM1 variants. PROM1 variants may be a suitable candidate for genetic therapies given the natural progression of visual loss and the ability of the gene to be packaged into an adeno-associated virus vehicle.

Allied health clinician awareness of usher syndrome

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Purpose: Usher syndrome is the most common cause of deaf-blindness, affecting up to 1 in 10 000. Anecdotally, many families report that healthcare professionals are often unaware of the full spectrum of symptoms. This can delay appropriate referrals to other professionals. Our study assessed awareness of Usher syndrome and its multidisciplinary care amongst the key allied health professions of optometry, orthoptics and audiology.

Method: Practitioners in 12 Australian teaching clinics were surveyed in late 2021/early 2022 (7 optometry, 1 orthoptics and 4 audiology). Questions included the cause, common symptoms, and types of health practitioners involved in Usher syndrome care.

Results: Seventy-four clinicians (53 female) completed the survey: 40 optometrists, 27 audiologists and 7 orthoptists. Average age was 37 years (range 24–70) and clinical experience 13 years (range 1–45 years). Eighty-six percent

correctly identified the genetic cause, but fewer than half identified all key senses that can be affected (vision, hearing and vestibular). Almost all (>85%) identified the visual and hearing characteristics, but less than half were aware of the vestibular sequelae of Type 1 (e.g., gross motor delay; postural instability). Most identified ophthalmologists and audiologists as key, but fewer identified the frequent need for occupational therapists (62%), physiotherapists (24%) and psychologists (33%).

Conclusion: This study has shown clinicians in key professions may lack full awareness of Usher syndrome symptoms and treatment options, particularly with regard to vestibular dysfunction in Type 1 and the common need for psychosocial support. This highlights a gap for future professional education and advocacy.

Advancing natural history studies to prepare for inherited retinal disease therapies: Genomics, human retinal organoids and finding the missing variants

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Purpose: Genetic therapies for inherited retinal diseases highlight the need for accurate natural history studies, with full knowledge of the correct causative genetic variants. For example, *RPE65* gene therapy, voretigene neparvovec-rzyl (Luxturna™), requires pathological, biallelic variants in *RPE65*. Stargardt studies require biallelic *ABCA4* pathogenic variants. To enable participation, natural history phenotypic data combined with advanced genomic tools and focussed molecular assays supplemented with human induced pluripotent stem cells differentiated to retinal organoids, provide valuable resources to accurately classify genetic variants and test new therapy approaches.

Method: We used exome and genome sequencing, and retinal organoids to find and classify missing genetic variants, to enhance our natural history studies. The techniques were focused on autosomal recessive cases where there was a missing second allele, or X-linked cases with GC rich regions. Tailored molecular assays were developed for GC rich regions.

Results: In seven families, genome sequencing, including careful review of intronic regions was valuable in detection of the hidden variant. Novel copy number variants and previously classified hypomorphic alleles were identified in *ABCA4*. Novel variants were detected in the GC rich region of *RPGR*. Intronic variants were also identified and RNA studies in patient-derived retinal organoids revealed splicing aberrations.

Conclusion: These findings support a comprehensive approach to accurate genetic diagnosis providing increased value to natural history studies and application of specific novel genetic therapies and clinical trials. In the families with variants in *ABCA4* and *RPGR*, this work provides eligibility for clinical trials available in Australia and internationally.

GLAUCOMA

The role of nicotinamide adenine dinucleotide and nicotinamide (vitamin B3) in glaucoma: A review

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Purpose: Glaucoma is a collection of irreversible optic neuropathies which, if left untreated, lead to severe visual field loss. These diseases are a leading cause of blindness across the globe and are estimated to affect approximately 80 million people, particularly women and people of Asian descent. This represents a major burden on healthcare systems worldwide. Recently, there has been increasing interest in the potential of nicotinamide (vitamin B3) as a novel option in the management of glaucoma.

Method: This review aims to analyse the currently available literature to determine whether there is evidence of an association between nicotinamide adenine dinucleotide and glaucomatous optic neuropathy, and whether nicotinamide has the potential to prevent or reverse these effects.

Results: The literature showed a strong connection between reduced nicotinamide adenine dinucleotide levels and retinal ganglion cell dysfunction through multiple different studies. There is also evidence of the positive effect of nicotinamide supplementation on retinal ganglion cell function in models of mouse glaucoma and in a study involving humans.

Conclusion: Based on the literature findings, a recommendation has been made that more research into the efficacy, appropriate dosing, and potential side effects of nicotinamide supplementation is needed before it can be

definitively determined whether it is appropriate for widespread prophylactic and therapeutic use against glaucoma in humans.

Comparing the anterior chamber depth between East Asian and non-East Asian eyes

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Purpose: To identify if a statistically significant difference exists in the mean anterior chamber depth (ACD) between East-Asian and non-East-Asian populations.

Method: A retrospective cohort study was conducted on a sample of 4276 eyes. Data spanning 7 years was obtained from a private ophthalmology practice in Sydney using the Zeiss IOLMaster700. Patient files were stratified into three age groups (<40-years, 40–60 years, >60-years) and then further sub-divided by ethnicity (East-Asian and non-East-Asian). Analysis was conducted using IBM SPSS Statistics-26.

Results: The results demonstrate that age, gender and ethnicity impact the ACD. ACD decreases with age uniformly across both genders and ethnic groups. East-Asians have a significantly shallower ACD compared to non-East-Asians in the >60-year age group. Females were demonstrated to have a shallower ACD compared to males at every age group.

Conclusion: The populations (female, East-Asian, >60 years) which this study shows to have shallower ACD. Eyes with shallow ACD are known to have a higher incidence of PACG. This study explains the higher incidence of PACG in East Asian eyes. Shallow ACD may contribute to a more anterior effective lens position of intraocular lens after cataract surgery, and this fact should be considered when choosing intraocular lens power.

Ocular amyloidosis: Uncontrolled glaucoma post-vitreectomy

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Purpose: To present a case of intractable secondary glaucoma post-vitreectomy of a patient with ocular amyloidosis.

Method: Retrospective review of clinical examination, investigations, pathology, and treatment course over 5-year multidisciplinary monitoring and treatment.

Results: A 53-year-old man with familial amyloid polyneuropathy. Exam findings include amyloid deposits in pupil border, anterior capsule, scalloped iris and amyloid vitreous deposits. He had bilateral secondary open angle glaucoma with left advanced field loss. Visual acuity was right 6/9 and left 6/18. Intraocular pressure (IOP) was right 14 mmHg, left 36 mmHg. He had left selective laser trabeculoplasty in 2015 and left trabeculectomy in 2016. Despite initially doing well his bleb failed early 2019, possibly exacerbated by amyloid related fibrosis. His left eye vision became 6/60. In 2019 his right eye vision deteriorated due to cataract and vitreous amyloid deposits. He underwent a right phacoemulsification, lens insertion and pars plana vitrectomy. Day 1 right eye vision was 6/6 with IOP 22 mmHg. Within one-month IOP became 32 mmHg despite maximal medical treatment. His right eye developed corneal haze due to uncontrolled IOP and he lost navigational vision. A right eye Baerveldt tube was inserted with good results. On review in January 2021, his visual acuity was right eye 6/5, left eye HM and IOP 18 mmHg in both eyes.

Conclusion: This case highlights the rapid progression of glaucoma post vitrectomy and corroborates the literature findings that vitrectomy in ocular amyloidosis may induce progression of glaucoma. Medical therapy alone is often unsuccessful in controlling IOP and surgical manipulation should be cautiously undertaken.

Impact of trabeculectomy on corneal endothelial cell density

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Purpose: Trabeculectomy, the most effective surgical intervention for advanced glaucoma, has been associated with alterations to corneal endothelium, including a decrease in cell density. The purpose of this study was to investigate the changes in corneal endothelium after trabeculectomy and the factors affecting cell loss.

Method: This retrospective study included 72 eyes of 60 patients who underwent trabeculectomy between January 2018 and June 2021. Corneal specular microscopy was performed preoperatively and at 6 months after

surgery. Cell density was evaluated and compared between groups to quantify changes to corneal endothelium and identify significant factors affecting decreases in cell density.

Results: Mean corneal endothelial cell density was 2284.66 ± 375.59 preoperatively and 2129.52 ± 401.96 after 6 months ($p < 0.001$). A greater decrease in cell density ($p = 0.005$) was observed in phakic eyes (235.45 ± 118.32) compared to pseudophakic eyes (137.82 ± 107.30). The amount of cell loss was negatively correlated with preoperative central corneal thickness ($p = 0.009$) and anterior chamber depth ($p = 0.033$). There were no significant correlations between corneal endothelial changes and patient age, gender, number of preoperative glaucoma medications and number of postoperative antifibrotic agents.

Conclusion: Significant decreases in corneal endothelial cell density occurred after trabeculectomy. Less corneal endothelial cell loss occurred in pseudophakic eyes. Hence, if patients need trabeculectomy and cataract surgery, it may be better to perform cataract surgery first.

Development of a novel surgical instrument for achieving consistent opening and closing pressures of glaucoma drainage devices

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Purpose: This study aimed to investigate opening and closing pressures of tube fenestrations that were created using a novel surgical instrument.

Method: Silicone tubing from Baerveldt and Molteno glaucoma drainage devices was tested in a water bath and in air. Fenestrations created using two iterations of a novel surgical instrument were observed for leakage of green dye infused through the drainage devices.

Results: Opening and closing pressures for Baerveldt silicone tubing were 13.29 ± 11.37 mmHg and 5.15 ± 8.35 mmHg using the first version of the surgical instrument, and 14.16 ± 4.82 mmHg and 5.08 ± 7.18 mmHg using the second version. Opening and closing pressures for Molteno silicone tubing were 2.08 ± 3.80 mmHg and 0.39 ± 0.43 mmHg using the first version of the surgical instrument, and 11.52 ± 10.20 mmHg and 6.31 ± 7.43 mmHg using the second version.

Conclusions: Opening and closing pressures of fenestrations created in Molteno and Baerveldt silicone tubing were variable. The opening and closing pressures achieved in Baerveldt tubing may have clinical utility whereas those achieved in Molteno tubing would be



anticipated to cause hypotony if applied clinically. Further refinement of the novel surgical instrument and ongoing in vitro trials are required before clinical trials.

Ong square scleral punch

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Purpose: In trabeculectomy, it is ideal to make a sufficiently large internal opening to facilitate exit of aqueous, complemented by a scleral flap that is sutured so as to cover this opening to prevent excessive outflow.

Methods: The maximum dimensions of the internal scleral opening of the fistula is dictated by the cornea anteriorly and iris root-ciliary body posteriorly. Shapes and sizes of tissue cut by various scleral punch designs were analysed – round, square and triangle.

Results: The optimal design found was a square cross-section scleral punch to cut a square block of tissue $0.8 \text{ mm} \times 0.8 \text{ mm}$. This size was chosen so that the instrument will fit into a 3 mm wide limbal incision under the scleral flap. A round scleral punch would have to be of similar dimensions.

A 0.8 mm square cross-section opening has a cross-section area of $0.8 \text{ mm} \times 0.8 \text{ mm} = 0.64 \text{ mm}^2$. A 0.8 mm diameter cross-section round opening would have a cross-section area of $3.14 \times 0.4 \text{ mm} \times 0.4 \text{ mm} = 0.50 \text{ mm}^2$.

Success of trabeculectomy can be enhanced by combining with groove sclerectomy (YouTube “Groove Sclerectomy in Trabeculectomy”).

Conclusion: A square cross-section scleral punch will give a larger effective opening than a round profile scleral punch when the same number of scleral cut-bite is used – one or two is usually sufficient with this design. The Ong Square Scleral Punch for Trabeculectomy is available from Farocare Australia and Epsilon USA.

Diagnosis of glaucoma in cross-sectional prevalence studies: Protocol for a systematic review in the context of the Australian eye and ear health survey

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Purpose: Glaucoma prevalence studies define unmet need and inform resource allocation. Inter-study variability in diagnostic criteria may significantly affect population estimates. Appraising these criteria is crucial to ensure scientific rigour and inform design of new studies, such as the Australian Eye and Ear Health Survey.

Method: The systematic review protocol was registered with PROSPERO (CRD42022333008). Pubmed, Embase, Web of Science and Scopus were searched (see PROSPERO registration for search strategy) for relevant articles which were independently screened by two reviewers, with conflicts resolved through open discussion or using a third arbitrator if necessary. Only descriptive cross-sectional prevalence studies of general adult populations, using a random or clustered sampling procedure, with an English abstract were included. Articles eligible for inclusion then underwent full review, including reference list review for further relevant studies. Where methods were not detailed, we searched for articles related to the same study and/or contacted authors. The main outcome of interest was glaucoma diagnostic classification criteria. Data regarding examinations successfully performed will also be collected.

Results: A total of 10,544 articles were retrieved. 4936 duplicates were identified, leaving 5608 currently undergoing screening. Kappa statistics of inter-reviewer reliability will be calculated.

Conclusion: This review will facilitate exploration of study methods and diagnostic definitions in prevalence studies over time. It will also enable discussion of the uniformity/heterogeneity in diagnostic criteria, impacts of newer technologies, and the impact of the International Society of Geographical and Epidemiological Ophthalmology's criteria.

The association between microcystic macular edema and glaucoma: Real-world evidence from a systematic review and meta-analysis of 3118 eyes

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Purpose: To determine the occurrence rate and presentation patterns of microcystic macular edema (MME) in glaucoma.

Method: The protocol of this review was registered on Prospero (CRD42022316367). On 10 March 2022, nine databases were searched for articles reporting MME in glaucoma patients. The primary outcome was the prevalence of MME, while secondary outcomes included the identification of clinical characteristics of MME as compared to non-MME glaucoma patients. Data are reported as mean difference (MD) or log odds ratio along with their corresponding 95% confidence intervals (CI) for continuous and dichotomous outcomes, respectively. All analyses were conducted per eye, and the risk of bias was assessed using the NIH tool.

Results: Eleven studies reporting MME in 3118 glaucomatous eyes were meta-analysed, revealing a pooled rate of 6% (95% CI 0.04:0.09). Subgroup analysis based on the type of glaucoma was not feasible due to lack of relevant data. Except for age (MD -5.91; 95% CI -5.29: -6.62), MME patients did not significantly differ from non-MME glaucoma patients in all measured parameters of intraocular pressure (MD -0.04; 95% CI -1.04:0.96), axial length (MD: 0.00; 95% CI -0.61:0.61), spherical equivalent (MD -0.52; 95% CI -1.93:0.89), mean deviation (MD -3.36; 95% CI -6.91:0.19), mean deviation slope (MD -0.09; 95% CI -0.46:0.28), or glaucoma severity/advanced (log odds ratio 0.52; 95% CI -0.90:1.94). All studies were of low risk of bias.

Conclusion: MME in glaucoma passes the rare event assumption and yet there are no distinct presentation patterns that could distinguish this subpopulation from non-MME glaucoma patients. More research is still needed to confirm its confounding effect on glaucoma screening.

Fasting-related intraocular pressure changes in healthy volunteers: Eye- and time-adjusted meta-analysis of 1252 eyes

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Purpose: To provide evidence on the true effect of Ramadan fasting on intraocular pressure (IOP) and ocular parameters in healthy individuals.

Methods: The protocol of this review was registered on Prospero (CRD42022331757). On 5 March 2022, six databases were searched for articles measuring the IOP of normal individuals during fasting (Ramadan month) and non-fasting periods. Our primary outcome was comparing the IOP between fasting and non-fasting periods, with subgroup analyses based on laterality and measurement time. Secondary outcomes included measuring the variability in other ocular parameters during fasting and non-fasting periods. Data are reported as mean difference (MD) and its corresponding 95% confidence interval (CI).

Results: Thirteen studies (1252 eyes) were meta-analysed, revealing no significant change in IOP between fasting and non-fasting periods (MD -0.38; 95% CI -1.49:0.72). This observation remained insignificant based on laterality [right (MD -0.55; 95% CI -1.37:0.27) vs. left eye (MD -1.01; 95% CI -2.85:0.83)] and measurement time [morning (MD 0.08; 95% CI -0.77:0.92) vs. night (MD -0.83; 95% CI -1.83:0.16)]. Other ocular parameters revealed no significant difference including anterior chamber depth (MD -0.04; 95% CI -0.11:0.03) and volume (MD 1.94; 95% CI -6.11:9.99), central corneal thickness (MD 1.47; 95% CI -3.57:6.52), corneal resistance factor (MD -0.03; 95% CI -0.59:0.53), lens depth (MD -0.04; 95% CI -0.13:0.05), axial length (MD 0.00; 95% CI -0.20: 0.21), spherical equivalent (MD 0.02; 95% CI -0.26: 0.30), or retinal nerve fiber layer (MD -0.63; 95% CI -4.56:3.29).

Conclusions: Ramadan fasting does not result in a statistically, nor clinically significant change in IOP among healthy individuals. Therefore, the beneficial impact of fasting on glaucoma patients is questionable, and conducting future studies in this regard is not justified.

Gonioscopy-assisted transluminal trabeculotomy, efficacy and safety across a range of glaucoma subtypes

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Purpose: To assess the safety and efficacy of gonioscopy-assisted transluminal trabeculotomy (GATT) across a range of glaucoma subtypes.



Method: A retrospective surgical audit was performed on patients who had GATT surgery, alone or combined with phacoemulsification, between June 2021 and June 2022 at Vancouver General Hospital, Vancouver, Canada.

Results: Two surgeons performed 104 operations of which 44% were stand-alone GATT procedures and 56% were combined phaco/GATT procedures. The most common preoperative glaucoma diagnosis was primary open angle glaucoma (45%), followed by pseudoexfoliation (17%), post intra-vitreous injection (12%) and uveitic glaucoma (10%). Other diagnoses included JOAG (5%), PACG (4%), pigment dispersion (3%), silicone oil (2%) and traumatic glaucoma (2%). The mean preoperative intraocular pressure (IOP) was 24 mmHg with 85% of patients using maximally tolerated topical glaucoma medications prior to surgery and 39% of the cohort having had previous SLT. A significant reduction in IOP was seen postoperatively, with a mean IOP of 13 mmHg at one month and 12 mmHg at 6 months ($p < 0.001$). There was also a significant reduction in the number of drops used 6 months postoperatively ($p < 0.001$). Glaucoma diagnosis did not significantly impact the IOP outcome at 6 months ($p = 0.397$, 95% confidence interval -0.81 to 0.33).

Postoperative complications included microhyphaema (98%), transient IOP spikes (10%), cataract (4%), retro-pseudo-lenticular haem requiring YAG (2%). Failed GATT requiring further glaucoma surgery was identified in 11% of patients.

Conclusion: The results of this surgical audit demonstrate that GATT is both safe and efficacious in lowering IOP in a wide range of glaucoma sub-types.

Luminal stenting with nylon suture during Preserflo microshunt glaucoma surgery reduces postoperative hypotony

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Purpose: Postoperative hypotony following Preserflo microshunt surgery remains an ongoing challenge in up to 19% of patients in reported case series. Symptomatic macula folds, choroidal effusions and iridocorneal touch impair recovery. Here we described a technique of intraluminal stenting using 10-0 Nylon to reduce postoperative hypotony.

Methods: All consecutive patients who received the Preserflo microshunt with mitomycin-C 0.4 mg/mL from

March 2022 in a single Australian tertiary centre ($N = 14$; recruitment ongoing). After an early patient experienced symptomatic hypotony, all subsequent cases were stented with intraluminal 10-0 nylon suture. An accessible external loop was buried at the limbus for easy removal at the slit lamp.

Results: Preserflo patients without luminal stenting had a higher rate of symptomatic hypotony (1/4) than stented patients (0/10). Day 1 reduction in LogMAR corrected distance visual acuity was greater in the unstented (1.2 ± 0.4) than stented patients (0.6 ± 0.5). Across both groups, LogMAR corrected distance visual acuity recovered from day 1 to week 1 (-0.6 ± 0.5 ; $p < 0.001$). One patient with elevated intraocular pressure in the first month had uncomplicated stent removal at the slit lamp and promptly achieved target intraocular pressure.

Conclusion: Intraluminal stenting with 10-0 Nylon during surgical implantation of the Preserflo microshunt may help reduce the incidence of early postoperative hypotony and assist in preventing early postoperative decline in visual acuity. The nylon stent can be conveniently removed at the slit lamp if required.

Clinical outcomes of the glaucoma community collaborative care program (G3CP) between a large Victorian tertiary glaucoma service and optometrists

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Aims: To evaluate the clinical outcomes of the G3CP and determine the level of agreement between community optometrists and specialty clinic ophthalmologists.

Method: Retrospective chart review of patients recruited through the G3CP between March 2019 and March 2022. Data collected included patient demographics, intraocular pressure, visual field mean deviation (MD) and the number of glaucoma agents in use.

Results: One hundred and twenty-nine patients, of which 64% were males, with a mean (SD) age of 72.29 (11) were recruited over 3 years. Of the 90 patients who have had at least one visit to the G3CP optometrist review, 21 (23%) were referred back to the Royal Victorian Eye and Ear Hospital due to likely progression of their glaucoma or a secondary eye condition. Of these, four (19%) were booked for cataract surgery, three (14.3%) had age related macular degeneration and two (9.5%) underwent selective trabeculectomy. There was no significant difference between

intraocular pressure, MD and the number of glaucoma agents at time of consent to the program and the latest G3CP optometry review ((14.28 vs. 13.37), (-3 vs. -2.28) and (1.37 vs. 1.36) respectively, $p > 0.05$). There was 98.8% agreement between the enrolled G3CP optometrists and the specialty glaucoma clinic plans.

Conclusion: The G3CP provides safe and timely care to patients with early to moderate glaucoma, and demonstrates good agreement between community optometrists and glaucoma specialist virtual review.

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 encouraged eye-health examinations in FDRs, evaluated a personalised, educational program and recorded FDR glaucoma screening results.

Methods: Index cases were those with definite 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 3343 index cases were invited to participate with 1249 (37%) respondents. Contact and glaucoma information was provided for 3732 FDRs (3 per index) and glaucoma information for 4163 FDRs not participating (77% deceased). Feedback of eye-checks ($N = 989$) favoured children (53%) and siblings (41%), and 64% of FDRs were diagnosed with glaucoma or suspicious signs. Parents recorded the highest 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 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.

Outcomes of slow coagulation cyclophotocoagulation compared to standard

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Purpose: We present a retrospective audit of cyclophotocoagulation (CPC), comparing the outcomes of standard technique (Std-CPC) as compared to slow-coagulation (SC-CPC) technique.

Methods: Single centre, retrospective audit of consecutive patients undergoing CPC at the Royal Victorian Eye and Ear Hospital, Melbourne, Australia between September 2019 and March 2022. Mean outcome measures included intraocular pressure (IOP), use of IOP-lowering medications, and need for further glaucoma procedures. Std-CPC was administered via a diode laser over 2000 milliseconds (ms), with power ranging from 1500–2000 milliwatts (mW) compared to SC-CPC (4000 ms, 1250–1500 mW). Number of quadrants treated was individualised for each patient, 10 shots were given per quadrant.

Results: A total of 139 patients were identified (46 SC-CPC and 93 Std-CPC). Mean follow up was 9.2 months SC-CPC and 8.7 months Std-CPC. The aetiologies for glaucoma included neovascular ($n = 60$), primary open angle glaucoma ($n = 26$), pseudoexfoliative glaucoma ($n = 17$) and angle closure glaucoma ($n = 16$). At 6 months, those with IOP > 22 mmHg were similar between cohorts (SC-CPC 27.9%, Std-CPC 27.1%). At final follow up, the reduction in number of classes of topical medications was -1.24 SC-CPC and -0.7 Std-CPC. Cessation of acetazolamide at final review occurred in 95.7% SC-CPC and 92.5% Std-CPC. Repeat CPC required was greater for Std-CPC (8.6%) compared to SC-CPC (2.2%). Further glaucoma surgery was required at similar rates 13% SC-CPC and 14% Std-CPC.

Conclusions: In our series, SC-CPC was as effective as Std-CPC in reducing IOP and lead to an overall greater reduction in drop burden and reduced rates of subsequent CPC procedures.

Agreement and clinical comparison between glaucoma visual field criteria: Analysis of established risk factors using the PROGRESSA study

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Purpose: Various visual field progression criteria have been published, yet no clinical comparison of these criteria exist, posing a major challenge in interpreting the literature. We compared the agreement and clinical validity between commonly reported criteria using established glaucoma progression risk factors

Methods: Primary open-angle glaucoma suspects and early-manifest glaucoma cases enrolled in the national longitudinal study of glaucoma progression (PROGRESSA) were included in this study. Participants underwent a 6-monthly clinical assessment including Humphrey Visual Field (HVF). We compared 5 event-based progression criteria (cluster-based criteria used in the PROGRESSA study; PoPLR; PLR; AGIS; CIGTS) using a time-to-event analysis (Cox hazard), with a minimum of 5 reliable fields required.

Results: A total of 2325 eyes of 1211 individuals were included (median number of HVF per eye, 11, interquartile range 7–15). A cluster-based criteria identified progressing eyes most frequently (46.5%), whereas AGIS and CIGTS identified the least (3.7% and 9.4% respectively). Inter-criteria agreement was fair-moderate (mean Cohen's kappa coefficient 0.26, range 0.08–0.43). When ≥ 3 criteria identified progression, cluster-based criteria had the shortest mean time to progression (3.6 years), whereas the AGIS and CIGTS had the longest (7.2 and 6.1 years). All criteria strongly correlated with age, optical coherence tomography retinal nerve fibre layer rate, baseline HVF MD, anti-glaucoma treatment intensity, and somewhat with intraocular pressure, with associations generally strongest for cluster-based and CIGTS.

Conclusion: While all commonly reported progression criteria correspond to known glaucoma risk factors, they vary greatly in their utility. A cluster-based approach offers a validated and fast method of detecting progression in early glaucoma.

A glaucoma polygenic risk score is strongly associated with glaucomatous family history, and disease severity amongst affected siblings

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Purpose: To investigate the relationship between a glaucoma polygenic risk score (PRS) and family history of glaucoma amongst individuals with glaucoma.

Methods: Cross-sectional analysis of 1990 unrelated individuals with primary open-angle glaucoma with no identified 'monogenic' cause of glaucoma from the Australian and New Zealand Registry of Advanced Glaucoma. Analysis amongst affected relatives included 281 participants (with 96 sibling pairs). A glaucoma PRS was analysed in relation to self-reported family history of glaucoma and to compare glaucoma phenotype amongst affected siblings.

Results: The glaucoma PRS was positively correlated with the number of family members with glaucoma, and a closer degree of relatedness. 14% of the cohort were identified as being at high-risk using the PRS (top quintile) but had no known family history of glaucoma. PRS varied between affected relatives, including first-degree relatives (correlation coefficient of PRS between siblings = 0.46, $p < 0.001$). Amongst affected siblings, those with a high PRS were diagnosed 4.1 years earlier (95% confidence interval [CI] 0.16–8.05, $p = 0.042$), had a higher maximum-recorded intraocular pressure by 3.1 mmHg (95% CI 0.95–5.22, $p = 0.005$) and were more likely to require incisional glaucoma surgery (incident rate ratio 1.83, 95% CI 1.07–3.13, $p = 0.027$) compared to the intermediate-risk siblings.

Conclusion: Glaucoma PRS is correlated with family history of glaucoma. Its quantitative nature provides a more granular risk stratification of number of family members and glaucoma severity, which supports its use to guide glaucoma screening guidelines, in addition to family history.

Clinical differences in rebound tonometry and Goldmann applanation tonometry measurements of intraocular pressure in adult patients

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Purpose: While Goldmann applanation tonometry (GAT) is the gold standard of intraocular pressure (IOP) measurement, rebound tonometry (RT) is preferred by orthoptists due to ease. Central corneal thickness (CCT) and IOPs impact IOP measurement. We aimed to assess the clinical differences in IOP measured by GAT and RT.

Method: A prospectively-maintained database from The Alfred Hospital between 2017–2019 was used to identify participants. Inclusion criteria were adult patients with a diagnosis of glaucoma or glaucoma-suspect. RT was measured with the iCare IC100; GAT was measured with a

slit-lamp-mounted Goldmann tonometer. A single senior orthoptist performed all measurements.

Results: Seven hundred and five eyes from 353 patients were identified. The mean GAT IOP was 13.9 mmHg (SD 3.8), RT IOP was 15.1 mmHg (SD 4.8) and CCT was 531 μ m (SD 37.7). Overall correlation was high (intraclass coefficient 0.8), with a mean RT overestimation of 1.3 mmHg (SD 2.8). Increased CCT was associated with increased RT overestimation ($p < 0.01$). In 93.2% of patients, RT did not underestimate by more than 2 mmHg, however this increased in low CCTs ($<500 \mu$ m) and raised IOPs (>23 mmHg). IOP measurements were not associated with a greater IOP discrepancy.

Conclusion: Agreeing with previous studies, while RT and GAT measurements are generally similar, results can be significantly different. Increased CCT was associated with increased RT overestimation; high IOPs did not affect the difference. We recommend GAT to confirm IOP in patients with low CCTs ($<500 \mu$ m) and raised IOPs.

Dynamic and static retinal vessel analysis in primary open-angle glaucoma

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Purpose: To explore the nature of retinal vessels in primary open angle glaucoma eyes given the previously reported increase in retinal venous pressure in glaucoma.

Method: Thirty-five eyes from 35 participants enrolled in the Progression Risk of Glaucoma: RElevant SNPs with Significant Association (PROGRESSA) study underwent retinal vessel analyser assessment. 100 s measurement was captured, from which 10–15 s of continuous data was used to obtain pulsatility (μ m) of vessels within each peripapillary sector, using a specialised application. Central retinal artery (CRAE) and vein (CRVE) equivalent diameters were determined from fundus images using the retinal vessel analyser software. Relationships between these outcomes and with both glaucomatous features and hypertension were explored.

Results: Greater inferotemporal arteriolar pulsatility was significantly associated with global ganglion cell inner plexiform layer thinning ($r = -0.459$, $p = 0.027$). Inferotemporal arteriolar and venous pulsatility was significantly increased in participants with treated hypertension compared to those without ($p = 0.005$ and $p = 0.030$, respectively). Average arteriolar and venous pulsatility was significantly

associated with age ($r = 0.501$, $p = 0.003$ and $r = 0.443$, $p = 0.008$, respectively). CRAE correlated significantly with global retinal nerve fibre layer thickness ($r = 0.366$, $p = 0.031$). CRAE and CRVE did not significantly correlate with hypertension. Pulsatility indexes, CRAE and CRVE were not significantly associated with intraocular pressure, cup-disc-ratio or mean deviation.

Conclusion: This study suggests a relationship between inferotemporal pulsatility and both global ganglion cell inner plexiform layer thinning and hypertension, and between retinal arterial width and retinal nerve fibre layer thickness. Yet further research in a larger cohort longitudinal study is needed to elucidate the nature of retinal vascular change and structural loss in primary open angle glaucoma.

Liquid chromatography mass spectrometry illustrates novel correlations between lipidomic processes and visual field change in primary open angle glaucoma

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Purpose: To assess whether components of the lipidome are associated with visual field change in primary open angle glaucoma.

Participants: One thousand, three hundred and two participants of the PROGRESSA study were characterised as either suspect or early manifest glaucoma.

Methods: Liquid chromatography mass spectrometry measured the serum concentration of 821 individual lipid species across 46 lipid classes. Differential analysis using multivariate linear modelling correlated individual lipid species with the classification of suspect or early manifest glaucoma. Lipid set and metabolic pathway enrichment scores and significance were calculated by ranking lipid species by their log fold change. All analyses were adjusted for age, gender, intraocular pressure and treatment status.

Results: Two hundred and fifty-six participants were characterised as glaucoma suspect, 613 participants were characterised as early manifest glaucoma. Ten participants were excluded following quality control analysis, and 423 participants were excluded due to insufficient reliable visual fields. One hundred and fifty-six lipid species were significantly associated with visual field progression following multiple hypothesis correction. Lipid set enrichment analysis identified upregulation of Triacylglycerol, Alkyl Diacylglycerol, and Diacylglycerol; and down regulation of Acylcarnitines, Ceramides, Dehydrocholesterol



Esters, Free Fatty Acids, Monohexosylceramides, and Sphingomyelins amongst early manifest cases. Metabolic pathway analysis identified increased activity of biosynthesis of Phosphatidylethanolamine, biosynthesis of Phosphatidylcholines, and the Kennedy pathway amongst early manifest glaucoma cases.

Conclusions: This study illustrated novel associations between lipid classes and metabolic processes, previously implicated in neuronal regeneration, with visual field change in primary open angle glaucoma.

Genetic risk of glaucoma is associated with focal patterns of vascular loss

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Purpose: To evaluate the association between genetic risk for glaucoma and localised retinal nerve fibre layer (RNFL) and vascular loss, using a polygenic risk score stratification.

Method: Nine hundred and twelve eyes from 456 suspect and early glaucoma patients enrolled in the Progression Risk of Glaucoma: RElevant SNPs With Significant Association (PROGRESSA) study were evaluated for focal RNFL loss and wedge-shaped vascular defects using spectral domain optical coherence tomography and optical coherence tomography angiography, respectively. The presence of structural and/or vascular defects was analysed with regard to a previously derived multi-trait polygenic risk score (PRS) for primary open angle glaucoma.

Results: Regression analyses indicate that the presence of vascular wedge defects is associated with a higher PRS for glaucoma ($p = 0.030$) even after accounting for age ($p = 0.015$). Further, multiple vascular wedge defects per eye is associated with an increased PRS ($p = 0.019$). Vascular wedge defects are strongly associated with both RNFL focal loss ($p < 0.001$) and age ($p < 0.001$). RNFL defects are not independently associated with PRS ($p > 0.05$).

Conclusion: This study indicates that vascular wedge defects are a feature of increased risk of primary open angle glaucoma. Future studies should further investigate the relationship between vascular and RNFL focal loss and explore whether this vascular phenotype is consistent in more advanced glaucoma cohorts.

Effect of pan retinal photocoagulation on trans scleral diode laser cyclophotocoagulation outcomes in patients with neovascular glaucoma

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Purpose: To evaluate the effect of pan retinal photocoagulation (PRP) on outcomes of cyclophotocoagulation (CPC) in eyes with neovascular glaucoma (NVG).

Methods: Retrospective chart review of patients with underlying NVG who underwent primary CPC between 2017 and 2019. We recorded patient demographics, extent of PRP prior to CPC and use of perioperative anti-vascular endothelial growth factor (VEGF). Three groups were compared: proliferative diabetic retinopathy, retinal vein occlusion and retinal artery occlusion/ocular ischaemic syndrome. Failure was defined as return to operating theatre. Perioperative anti-VEGF was defined as anti-VEGF at the time of surgery and/or regular anti-VEGF injections from 6 weeks prior to CPC to the period studied. Logistic regression analysis was used to evaluate the relationship between PRP, anti-VEGF, extent of new vessels in the angle and surgical outcomes.

Results: Sixty-six eyes of 61 patients, of which 41 (62%) were males, with a mean (SD) age of 70.56 (16.45) years, were included in the study. Of these, 12 (18%) had completed PRP prior to cyclodiode, 29 (44%) had peri-operative anti VEGF injection, and 30 (45%) eyes had either complete or segmental new vessels in the angle. Of the 23 (34%) eyes who required further intervention, 15 (65%) underwent repeat CPC. The failure rate was significantly higher in the proliferative diabetic retinopathy group (55%) compared to other groups (26%), $p < 0.05$. Neither PRP nor perioperative anti-VEGF or accounting for angle status, significantly influenced the success rate of CPC in any group—in either univariate or multivariate models.

Conclusion: PRP does not appear to alter the outcome of CPC in patients with NVG.

Circular contrast perimetry via a web application: A patient appraisal and comparison to Standard Automated Perimetry

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Purpose: Online Circular Contrast Perimetry (OCCP) provides perimetry on any computer with internet access. We aim to compare a novel, 24-degree, 52-loci OCCP application against standard automated perimetry (SAP) in terms of diagnostic accuracy and patient attitudes.

Method: Ninety-five participants (42 controls, 53 open-angle glaucoma patients) performed both perimetry tests and completed an online survey. Rasch analysis assessed the survey's psychometric properties and intergroup variability. Agreement, correlation, sensitivity, specificity and area under receiver operating curves (AUC) were compared for parameters of OCCP, SAP and optical coherence tomography (OCT) for the retinal nerve fibre layer (RNFL) and macular ganglion cell complex inner plexiform layer (GCC + IPL).

Results: OCCP mean deviation (MD) AUC was 0.959 ± 0.02 . Compared to other instruments' parameters with the highest AUC, it was superior to SAP MD (0.871 ± 0.04 , $p = 0.03$), OCT GCC + IPL (0.871 ± 0.04 , $p = 0.03$) and similar to OCT RNFL inferior thickness (IT) (0.917 ± 0.03 , $p > 0.05$). Point-wise sensitivity was less than SAP by 4.30 dB (95% confidence interval 4.02–4.59); 95% limits of agreement ranged from –6.28 to –2.33 dB. At best cut-off, OCCP MD sensitivity/specificity was 98/85% for detecting glaucoma. Cohen's Kappa demonstrated good agreement with SAP MD (0.69), OCT RNFL IT (0.62) and moderate agreement with OCT GCC + IPL IT (0.57). Participants preferred OCCP across most survey parameters ($P < 0.0001$). Rasch analysis demonstrated no differential item functioning for clinical group, gender, or age.

Conclusion: With similar diagnostic metrics to SAP, OCCP offers an improved user experience with the potential to improve the provision of care.

Deep learning artificial intelligence models for prediction of visual field progression

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Purpose: Better predictive methods for visual field loss are desirable to guide management, so we investigated the utility of deep learning neural networks (DL).

Methods: We used visual fields from 1526 patients that had 6–14 consecutive Humphrey visual field tests from a general cohort of 9569 patients. That set then had the left eye results mirrored to a right configuration and all were filtered to produce six sequential 'test window' sets, then split into a training set (4304 tests from 2348 sequences) and a test set (3576 tests from 596 sequences). We trained 7 different DL models which examined the first 3 fields in a sequence to predict tests 4, 5, and 6. The root mean square error was used to compare the results with ordinary linear regression (OLR).

Results: All DL models were significantly better than OLR. The 4th test had the best predictions, error increased for the others. The best 4th test result was from the C3D CNN (RMSE 2.376 dB cf 3.936 dB for OLR) although no one model was clearly superior. The single layer conv-LSTN performed slightly better for the 5th and 6th predictions (2.681 dB cf. 4.155 dB for OLR and 2.838 dB cf. 4.476 dB for OLR).

Conclusion: Patients often have variability in the test-to-test performance. Relating the Jensen's inequality to the prediction error, Wen et al. describe the theoretical point-wise mean absolute error lower limit as 2.32 dB, which suggests our C3D CNN result for the 4th sequence was close to the limit of predictability.

NEURO-OPHTHALMOLOGY

Central and branch retinal artery occlusion aetiology, prognosis and ocular neovascular complications: A retrospective cohort study

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Purpose: The aim of this retrospective study was to determine the aetiology, treatment and outcomes of central retinal artery occlusion (CRAO) and branch retinal artery occlusion (BRAO) in a South Australian cohort.

Methods: Patients who attended the Central Adelaide Local Health Network between 1 March 2020 and 1 March 2021 with either a new presentation or previous diagnosis of CRAO/BRAO were included. Data were collected on aetiology, treatment, visual acuity outcomes and the development of complications including neovascular glaucoma (NVG).

Results: The cohort comprised 80 patients, of whom 55 were diagnosed with CRAO and 25 with BRAO.



Aetiology was known in 21.3% of cases, with vasculitis (10%) and carotid artery thromboembolism (6.3%) being the most common confirmed causes respectively. Median visual acuity at presentation was >6/60 and 6/9 in CRAO and BRAO subgroups respectively. Visual acuity at presentation was the only predictive factor significantly associated with follow-up visual acuity for both CRAO ($p = 0.047$, coefficient 0.45, 95% confidence interval 0.007–0.884) and BRAO ($p < 0.001$, coefficient 1.03, 95% confidence interval 0.585–1.468). Ten patients with CRAO developed NVG and one patient with BRAO had NVG. No factors associated with the development of NVG after CRAO/BRAO were identified.

Conclusions: Visual acuity outcomes for patients with retinal artery occlusion are poor. The only significant predictor of visual acuity prognosis was the visual acuity at the time of the initial assessment. NVG is an uncommon complication of retinal artery occlusion and may be difficult to predict.

Evaluation of clinical predictors in temporal artery biopsies in the diagnosis of giant cell arteritis

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Purpose: The challenge for diagnosis giant cell arteritis (GCA) is problematic for clinicians given the non-specific signs and symptoms patients often present with. While there are several clinical features on history, examination, and laboratory tests, the gold standard of diagnosis is through the histopathological analysis of a temporal artery biopsy (TAB). The purpose of this project is to analyse the clinical predictive factors for a positive TAB, and for patients with biopsy negative GCA.

Methods: Retrospective electronic database review of all patients who had a TAB at the Royal Victorian Eye and Ear Hospital, from 2016 to 2020. Binary logistic regression analyses for positive TAB and biopsy negative GCA.

Results: A total of 368 TABs were analysed: 81 biopsies were positive and 287 were negative. Clinical predictors that increase the odds of a positive TAB included, age (odds ratio [OR] 1.067, 95% confidence interval [CI] 1.030–1.106), jaw claudication (OR 2.715, 95% CI 1.332–5.536) and elevated C-reactive protein (OR 6.643, 95% CI 3.462–12.747). Clinical predictors that increase the odds of a final diagnosis of biopsy negative GCA ($n = 25$) include, headache (OR 3.515, 95% CI 1.088–11.352), and jaw claudication (OR 3.136, 95% CI 1.055–9.320).

Conclusions: The clinical features of increasing age, the presence of jaw claudication, and an elevated C-reactive protein are likely to predict a positive TAB. The clinical features that would predict a final diagnosis of biopsy negative GCA are the presence of headache and jaw claudication.

Association between retinal biomarkers and Alzheimer's disease: A systematic review and meta-analysis

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Purpose: To perform the first systematic review and meta-analysis assessing the association between multimodal retinal imaging biomarkers and Alzheimer's disease (AD) in patients with well-defined AD.

Methods: PubMed, EMBASE and Scopus were systematically searched from inception to 11 September 2021 for studies investigating retinal imaging in AD. Only studies in which AD diagnosis aligned with the National Institute on Aging and Alzheimer's Association Research Framework were included. Statistical analysis was performed.

Results: Of 8457 studies identified, 38 studies met the inclusion criteria. The most common retinal imaging modalities assessed were optical coherence tomography (OCT), OCT-angiography and fundus photography. Analysis of OCT studies found significant thinning of the macular retinal nerve fibre layer in cases compared to controls across the inferior-temporal (standardised mean difference [SMD] -0.56), superior-temporal (SMD -0.51) and temporal (SMD -0.46) quadrants. Most studies investigating OCT-angiography reported decreased vessel perfusion density in cases compared to controls, across the superficial (SMD -0.81), intermediate (SMD -0.86), and deep (SMD -0.86) capillary layers. Fundus photography identified reduced first branching arterioles and venules (SMD -0.60 and SMD -0.62) and total fractal dimension (SMD -0.56), in cases compared to controls.

Conclusion: Retinal structural and vascular changes appear to be associated with AD, however heterogeneity in imaging parameters, small subject numbers and lack of specificity make it difficult to determine the clinical utility of these changes as diagnostic biomarkers.

Multimodal retinal imaging in Alzheimer's disease

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Background: Alzheimer's disease (AD) is the most common form of dementia, accounting for an estimated 60% to 80% of cases. The current diagnostic methods for AD involve positron emission tomography and cerebrospinal fluid analysis, which are expensive, time consuming and not widely available. The retina is a developmental extension of the brain and manifests features of central nervous system diseases, highlighting the potential for retinal imaging to diagnose AD.

Purpose: To create a novel screening tool to detect AD through multimodal retinal imaging including optical coherence tomography (OCT), OCT-angiography, fundus photography and hyperspectral imaging.

Methods: Cross-sectional study of 35 AD cases, defined in accordance with the National Institute on Aging and Alzheimer's Association biomarker framework, and 37 healthy controls with bilateral retinal imaging comprised of OCT, OCT-angiography, fundus photography and hyperspectral imaging. Images were manually co-registered using proprietary software to allow for corresponding areas to be viewed and annotated simultaneously. Retinal parameters analysed included retinal layer thickness, hyperspectral reflectance intensity, as well as vessel density, diameters, and branching patterns.

Results: Image analysis is in progress and will be complete in the coming weeks. Preliminary analysis shows positive findings for retinal layer thickness, macular capillary density and hyperspectral reflectance intensity.

Conclusion: This project aims to be the gold standard study investigating retinal imaging biomarkers in AD, by only including patients with well-defined AD and being the first study to include multimodal retinal imaging modalities.

Homonymous visual field loss and visual phenomena: more than meets the eye. Non-ketotic hyperglycaemia-induced electroclinical occipital lobe seizures

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Purpose: Visual phenomena and homonymous visual field defects are common in ophthalmology and usually relate to strokes or structural lesions of the afferent visual pathway. Hyperglycaemia-induced homonymous visual field defects associated with electroclinical seizures are rare, but real.

Method: Case series of three patients (67 M, 68 M, 52 F) who presented with complex visual phenomena or blurred vision of 3 days to 6 weeks of duration.

Results: One patient (typical of all three patients) described vivid, colourful, non-stereotyped hallucinations in the left visual field, lasting 30-60 secs, that occurred up to 15 times daily. Examination demonstrated dense left homonymous hemianopias in two patients and a left inferior homonymous quadrantanopia in one, all confirmed by Humphrey 30-2, with no other ophthalmological or neurological abnormalities. Blood glucose levels ranged from 13.5–35 mmol/L and the HbA1c from 14.6–16.8%, without ketosis. In each case, CT brain was normal. Magnetic resonance imaging brain was normal or demonstrated changes consistent with seizure activity. EEG demonstrated focal epileptiform discharges over the right occipital region in all patients. These episodes coincided with the patients' experiences of symptoms, during which they remained responsive, providing unequivocal evidence that their symptoms were due to seizure activity. Oral hypoglycaemic and antiepileptic medications were commenced with rapid and complete reversal of the seizures and visual field deficits, confirmed by repeat Humphrey 30-2 and magnetic resonance imaging.

Conclusion: Hyperglycaemia-induced occipital lobe seizures with ictal visual hallucinations and inter-ictal homonymous visual field defects, is a rare but clinically important diagnosis. This report highlights the importance of prompt recognition and treatment to facilitate recovery.

Pembrolizumab associated optic neuropathy

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Purpose: To describe two cases of pembrolizumab associated optic neuropathy.

Methods: The authors present two clinical cases, followed by a literature review of reported ocular side effects of immune check-point inhibitors, including pembrolizumab.

Results: A 71-year-old female presented with acute unilateral loss of vision (best-corrected visual acuity [BCVA] counting fingers), left relative afferent pupillary defect, dense left global field defect and florid unilateral optic disc oedema. She commenced treatment for metastatic lung cancer 3 months prior to ocular findings, with cycles of pembrolizumab, carboplatin and pemetrexed. At 3 month follow up, the left BCVA improved to 6/90 with remaining temporal optic disc pallor. The second case is of a 69-year old male on pembrolizumab treatment for metastatic melanoma who presented with a subacute six-week history of reduced right eye vision and was found to have bilateral optic disc oedema, bilaterally he had BCVA of 6/5, normal visual fields and no RAPD. While a direct causative link between pembrolizumab and the optic nerve changes cannot be confirmed, extensive investigations failed to find any other cause of the optic neuropathies. Such cases require careful consideration in balancing the threat to vision as well as ongoing management of systemic disease. Ocular adverse events of immune checkpoint inhibitors are rare, ranging in incidence between 1–3%, with uveitis and blepharitis being the most common. There is limited evidence for pembrolizumab's related neuro-ophthalmic side effects.

Conclusion: The two cases documenting pembrolizumab associated optic neuropathy is of clinical relevance as it contributes to the existing knowledge of potential pembrolizumab related adverse events.

Temporal artery biopsies at Sydney Eye Hospital—An 11-year review

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Purpose: To evaluate Sydney Eye Hospital temporal artery biopsy length and timing to biopsy from commencement of steroids through a clinical audit over an 11-year period.

Methods: A retrospective review of 263 temporal artery biopsies at Sydney Eye Hospital between 1 January 2010 to 31 December 2020.

Results: Biopsy positive rate at Sydney Eye hospital was 27%, with a mean age of 73 years and 65% female gender distribution. Mean length of biopsy was 17.35 mm, with 35% being greater than 20 mm, while 64% were greater than 15 mm and 89% were greater than 10 mm in length. The mean length of stay in hospital was 4.14 days.

Out of 71 biopsy positive cases, the majority 83.10% were arranged within 7 days after commencing steroid treatment. The mean time to biopsy was 3.76 days and 69% of biopsy positive cases required admission to hospital. Intravenous methylprednisolone treatment was given to 78% of biopsy positive cases that presented with visual symptoms. Within biopsy positive cases, the mean ESR was 55.06 and mean C-reactive protein was 63.78. In our clinical practice, there was a limited use of fluorescein fundus angiography in only 5.63% of biopsy positive cases and a limited role of PET scan at Sydney Eye Hospital given the feasibility of timely temporal artery biopsies.

Conclusion: Sydney Eye Hospital temporal artery biopsies are of good length and are completed in a time effective manner with highly satisfactory mean timing to biopsy from commencement of steroid treatment. Majority of cases have the minimum requirement of 10 mm biopsy length.

Ocular findings in cryptococcal meningitis

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Purpose: (i) To determine the ocular findings of patients with cryptococcal meningitis and their final visual prognosis. (ii) To understand the utility of routine ophthalmic screening in this group.

Method: A retrospective chart review of all patients with cryptococcal meningitis over a 5-year period (2016–2021) at the Royal Melbourne Hospital.

Results: Twenty-two cases of cryptococcal meningitis were identified, 88% male with a mean age 52 ± 15.7 years. Fifteen patients had detailed initial ophthalmic assessment. Total mortality rate was 14% (n = 3).

On presentation, mean visual acuity was logMAR 0.09. 8 patients had papilloedema on clinical assessment. Of these, 4 had elevated mean RNFL thickness on OCT and 3 had a visual field defect on formal perimetry.

Five patients had follow-up ophthalmic assessment (4 of 8 patients with papilloedema). Follow up mean visual acuity was logMAR -0.075 (equivalent 6/4.8). Three patients had improvement in best-corrected visual acuity by 1 or more lines. Of the 3 patients with visual field defects, 2 had repeat testing showing normalisation and 1 was followed up at another hospital.

All patients had induction and long-term antifungal therapy. Seven developed immune reconstitution inflammatory syndrome requiring steroids, 8 underwent surgical intervention to manage raised intracranial pressure.

Conclusion: Papilloedema associated with cryptococcal meningitis caused reduced visual acuity and field defects in 5 out of 22 patients (23%) in our cohort. Acuity loss and visual field defects subsequently improved in patients with long term treatment. Our data was limited to patients well enough to cooperate with ophthalmic examination at presentation.

Distinguishing laboratory characteristics in consecutive eyes with giant cell arteritis: A real-world retrospective cohort study

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Purpose: To understand the laboratory characteristics of giant cell arteritis (GCA) in our population where GCA was suspected after being referred from the community.

Method: The registry was established using natural language processing to identify cases in which the diagnosis of GCA was suspected across two tertiary centres. These cases were either referred in from general practitioners, optometrists, emergency department or through inpatient consults. Demographic and laboratory results were extracted with case notes being followed up for at least 6 months.

Results: Total of 101 suspect GCA cases of which 14 were confirmed and 87 were non-GCA after investigations and consults. In our population there is a 14% pre-test probability of patients referred with possible GCA are found to have GCA (inclusive of biopsy positive and negative cases). WCC ($p = 0.01$), absolute neutrophil count ($p = 0.02$), platelet count ($p = 0.02$), ESR ($p = 0.004$) and C-reactive protein ($p = 0.002$) were different between CA and non-GCA cases. Haemoglobin, mean cell volume and absolute lymphocyte count were

not statistically significant. Subgroup analysis was conducted comparing GCA cases that were TAB positive ($n = 6$) and negative ($n = 8$), there were no statistically significant differences in the laboratory parameters compared.

Conclusion: We found a significant difference in the above laboratory parameters in a real-world cohort of suspected GCA cases. This study demonstrates the value that automated registries may provide through the identification of real-world retrospective cohorts. Further research with large cohorts may be beneficial to quantify the composite scores of these laboratory investigations in a suspect GCA cohort to develop prediction models.

OCULAR ONCOLOGY

Combined photodynamic therapy and transpupillary thermotherapy for small choroidal melanoma

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Purpose: To investigate whether combination laser therapy with photodynamic therapy (PDT) and transpupillary therapy (TTT) achieves adequate tumour control in small choroidal melanomas, while maintaining visual acuity and low rates of complications.

Methods: Individuals with posterior choroidal melanomas up to 3 millimetres in height underwent Verteporfin-based PDT followed by immediate TTT. Follow-up assessment occurred ideally at 6 weeks (average 10 weeks), with regular clinical reviews thereafter to determine tumour response.

Results: Four of the 46 individuals had recurrence of their tumour following combined PDT and TTT therapy. Following treatment, there was no statistically significant difference in visual acuity. There were no baseline characteristics that predicted treatment outcome. Twelve individuals developed complications. One individual progressed to metastatic disease. The mean follow-up time was 18 months.

Conclusions: Combined PDT and TTT achieves adequate tumour control with minimal side effects along with visual acuity preservation, however studies with longer follow-up periods are required to confirm this result.



OCULOPLASTIC/ORBIT

The use of the paramedian forehead flap alone or in combination with other techniques in the reconstruction of periocular defects and orbital exenterations

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Purpose: The paramedian forehead flap (PMFF) is a reconstructive option for large eyelid defects and orbital exenterations. We report a series of cases where PMFF reconstruction was carried out at various institutions in Australia.

Methods: This study was a multi-centre, retrospective, non-comparative case series investigating the clinical outcomes of the PMFF for reconstructing periocular defects and orbital exenterations.

Results: This case series describes twenty-seven patients (female = 15, male = 12), operated between 1991 and 2019, with a median age of 81 years (range: 45–93 years). Indications for a PMFF included periocular repair following excision of tumours including basal cell carcinomas (17/27, 63.0%), squamous cell carcinomas (7/27, 25.9%), metastatic anaplastic meningioma (1/27, 3.7%) and an anaplastic carcinoma of lacrimal gland (1/27, 3.7%). One patient had reconstruction following a severe facial abscess leading to tissue loss related to previous complete squamous cell carcinoma excision (1/27, 3.7%). Defect locations involved combinations of the medial canthus (16/27, 59.3%), upper eyelids (7/27, 25.9%), lower eyelid (4/27, 14.8%), both upper and lower eyelids (5/27, 18.5%) and orbital (7/27, 25.9%). There were no cases of flap necrosis. Minor post-operative complications were observed in 10 patients with the most common being lagophthalmos. Median duration of follow-up was 17 months (range: 2 months–23 years).

Conclusions: The PMFF is a versatile reconstructive tool for a range of periocular defects and orbital exenterations with minor postoperative complications.

Tolosa-Hunt syndrome following COVID-19 vaccine

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Purpose: To report a case of Tolosa-Hunt syndrome following administration of a COVID-19 vaccine.

Methods: A retrospective case review of a 58-year-old female who developed Tolosa-Hunt syndrome 14 days after a COVID-19 vaccination.

Results: Onset of symptoms of Tolosa-Hunt syndrome occurred fourteen days following a third (booster) COVID-19 vaccination (Comirnaty, Pfizer-BioNTech). There were no adverse effects following her previous COVID-19 vaccinations (Comirnaty, Pfizer-BioNTech). The patient reported a 3-week history of left sided periorbital pain, ptosis and painful cranial nerve III palsy. She had a previous episode of biopsy-proven bilateral idiopathic dacryoadenitis treated with steroids 6 years prior. She did not have any history of autoimmune disease, had no active medications, including statins and bisphosphonates, and had not received any other vaccinations prior. Laboratory investigations, including autoimmune serology, were unremarkable. Magnetic resonance imaging orbital scans revealed enhancement and enlargement of the left cavernous sinus and clinoid, dural enhancement, with extension through the superior orbital fissure to the orbital apex with mild apical nerve sheath enhancement. Complete resolution of symptoms was achieved following the commencement of oral prednisolone (1 mg/kg), with no recurrence at 2-month review.

Conclusions: Orbital inflammation has been recognised as a rare adverse effect following COVID-19 vaccination. Tolosa-Hunt syndrome is a rare complication following a COVID-19 vaccination. We report a unique case occurring after the third (booster) vaccination.

Periocular necrotising fasciitis after traumatic laceration and concurrent COVID-19 infection

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Purpose: To report a case of periocular necrotising fasciitis (NF) associated with a concurrent COVID-19 infection.

Methods: A retrospective review of a 33-year-old female who developed periocular NF while infected with COVID-19.

Results: A 33-year-old previously healthy female presented with right-sided progressive periocular swelling,



erythema, pain and fever, two days after sustaining a laceration to the right superolateral brow from a clenched fist. She had a concurrent COVID-19 infection, detected on nasopharyngeal PCR swab thirteen days prior to presentation and again at presentation. She did not have an oxygen requirement. There was a large bulbous collection of the right upper lid with fluctuance and overlying erythema, and a communicating sinus drained frank pus from the superolateral brow. Preoperative T2-weighted Magnetic resonance imaging demonstrated fascial hyperintensity involving the pre-septal tissues and extending to the anterior temporal fossa. She was commenced on intravenous meropenem, clindamycin and vancomycin, and underwent early surgical debridement. Initial debridement demonstrated right upper lid necrosis involving the dermal and pre-septal layers, including the orbicularis, but sparing the tarsus. *Streptococcus pyogenes* was isolated, and she was continued on a prolonged course of intravenous benzylpenicillin. Periocular defects were repaired with a right-sided brow adipo-fascial flap based on the supratrochlear artery, browpey and dual full thickness skin grafts on the right upper lid and flap.

Conclusion: NF is an acute fulminant infection rarely affecting the periocular tissues. This represents a case of periocular NF with a concurrent COVID-19 infection.

Idiopathic dilated superior ophthalmic vein

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Purpose: To describe cases of idiopathic dilated superior ophthalmic veins (SOV).

Method: Retrospective chart review of patients who had idiopathic dilated SOVs with a diameter of ≥ 5.0 mm. Patients with a dilated SOV secondary to orbital, cavernous sinus or neurological disease were excluded. The maximum diameter of the SOV was taken perpendicular to the long axis of the SOV.

Results: Three cases with a dilated SOV of ≥ 5.0 mm were identified. Patients ranged in age from 58 to 80 years and two out of three were female. The left side was involved in two out of three cases and the right side in one case. The dilated SOV was an incidental finding in all cases. The mean diameter of the dilated SOV was 5.9 mm (5.3–6.8). Follow up imaging was conducted in all the patients after a mean period of 9-months (4.8–

14.4) after the initial scan and showed no significant increase in the size of the SOV.

Conclusion: A dilated SOV can occur secondary to vascular malformations, inflammatory orbital conditions and raised intracranial pressure. Patients with a dilated SOV require clinical and radiographic work up to exclude secondary causes. Some patients may have dilated SOVs in the absence of an underlying cause and it may be reasonable to observe such patients with interval clinical and radiographic follow up.

Approach to an intracanalicular vascular malformation

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Purpose: Intracanalicular venous malformations are rare. We present a case of an intracanalicular venous malformation causing compressive optic neuropathy, managed via endoscopic transsphenoidal optic canal decompression.

Method: Interventional case report with clinical, radiographic and intraoperative findings.

Results: A 43-year-old female presented with an 18-month history of decreasing vision in her right eye. Examination was consistent with a right compressive optic neuropathy. Magnetic resonance imaging revealed the presence of a well-circumscribed, homogenous lobulated lesion superomedial to the optic nerve in the region of the optic canal. This was isointense on T1, hyperintense on T2 and demonstrated patchy enhancement following administration of intravenous contrast. A transsphenoidal optic canal decompression was performed. Following spheno-ethmoidectomy, the optic nerve sheath was incised and a purple lesion was identified. This had visible linear horizontal channels and could be compressed, emptied of blood, and appeared to refill. The ophthalmic artery was detected inferior to the malformation and inferomedial to the optic nerve using Doppler. At 3-months follow up, her best-corrected visual acuity and colour vision had improved.

Conclusion: Intracanalicular vascular malformations are challenging lesions to manage due to their proximity to neurovascular structures. The risks of a transsphenoidal optic canal decompression, including injury to the internal carotid and ophthalmic arteries, must be weighed against



the risks of a craniotomy. The endoscopic transsphenoidal approach may be a safe and effective treatment for intracranial lesions medial to the optic nerve.

Normative globe position values on orbital computed tomography in Australians

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Purpose: To determine the normal globe position values, interzygomatic distance (IZD) and globe axial length and width on computed tomography in an Australian cohort.

Method: Retrospective review of patients who underwent computed tomography of the orbits. Patients with bilateral disease, previous orbital surgery or poor scan quality were excluded. An axial slice through the mid-globe was used to conduct the globe position measurements. Anterior globe position was defined as the perpendicular distance from the anterior globe margin to the interzygomatic line and posterior globe position as the perpendicular distance from the posterior globe margin to the interzygomatic line.

Results: The normal measurements (mean $\pm$ SD) were: IZD 97.4 ± 4.1 mm; anterior globe position 18.8 ± 2.8 mm; posterior globe position 6.2 ± 2.9 mm; axial globe length 24.9 ± 1.1 mm and axial globe width 25.9 ± 1.2 mm. A significant positive correlation was seen between the IZD and the anterior globe position ($r = 0.15$, $p = 0.03$), axial globe length ($r = 0.33$, $p < 0.01$) and axial globe width ($r = 0.30$, $p < 0.01$).

Conclusion: This normative globe position data may be used to diagnose radiological exophthalmos or enophthalmos.

Peripheral ophthalmic artery aneurysm associated with multifocal intracranial and extracranial vascular anomalies: Case report and literature review

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Purpose: Peripheral ophthalmic artery aneurysm (POAA) is extremely rare and poorly understood. We report a rare case of POAA and conduct a literature review on all reported cases.

Method: Relevant clinical information was collected for the purpose of case presentation. For literature review, the PubMed database of National Library of Medicine, Embase and Ovid MEDLINE were used to search for reported cases of peripheral ophthalmic artery aneurysm. Cases were categorised by location and type of aneurysm, presence of aneurysm rupture, demographic, relevant trauma history, clinical presentation, concurrent angiopathy, treatment and outcome.

Results: We report a case of compressive optic neuropathy caused by a thrombosed fusiform aneurysm involving the entire intraorbital ophthalmic artery, in association with multiple intracranial and extracranial aneurysms, diagnosed on digital subtraction angiography. Forty-seven cases in the literature were included in this review, of which 12 cases involved the intracranial segment, four intracranial, 23 intraorbital and 8 of terminal branches. Most cases were saccular (39/47) and solitary (42/47) aneurysms. Haemorrhagic presentations were uncommon (36/47). POAAs associated with compressive optic neuropathy, and rarely, central retinal artery occlusion, have been associated with adverse outcomes. Best treatment option remains controversial.

Conclusion: We report a rare case of fusiform POAA associated with multiple intracranial and extracranial vascular anomalies. We summarise the current knowledge on this disease entity based on literature review.

A novel surgical option in the armamentarium against a challenging foe: Minimally invasive, indirect, corneal neurotisation using an ipsilateral sural nerve autograft for neurotrophic keratopathy

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Purpose: Neurotrophic keratopathy is a degenerative disease of corneal nerves leading to corneal hypoesthesia and anaesthesia. The resultant progressive visual deterioration is refractory to conventional treatment options.

Corneal neurotisation represents a novel and effective surgical procedure that directly targets the underlying pathophysiology by stimulating corneal nerve growth.

Methods: We present the outcomes, surgical video, and in-vivo confocal microscopy (IVCM) findings of a 11-year-old boy diagnosed with Mackie Stage 1 neurotrophic keratopathy following intracranial surgery. He had developed recurrent red eye and microbial keratitis and ulceration secondary to foreign bodies sustained during contact sports. At presentation, he reported photophobia and dry eye symptoms, corrected-distance visual acuity was 6/18, Cochet-Bonnet aesthesiometer demonstrated reduced corneal sensation (5–15 mm), Schirmer's I test was 15 mm, and IVCM showed a complete absence of a subepithelial corneal plexus.

Results: He underwent indirect, minimally invasive, corneal neurotisation using a sural nerve autograft with end-to-end coaptation to the ipsilateral supratrochlear nerve. Subjective improvement in corneal sensation was noticed at 2 months, while objective improvement was first observed at 6 months with steady progress to 20–35 mm by 21 months. His symptoms resolved and Schirmer's I test was 30 mm at 12 months. At 15 months, corrected-distance visual acuity was 6/5 and IVCM showed evidence of nerves in the subepithelial space surrounded by keratocytes. He had no further corneal complications over 4 years of follow-up.

Conclusion: Corneal neurotisation represents an exciting development in the armamentarium for the treatment of neurotrophic keratopathy and can be considered for younger patients with early-stage disease.

Recurrent dacryoadenitis associated with VEXAS syndrome

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Purpose: VEXAS (vacuoles, E1 enzyme, X-linked, auto-inflammatory, somatic) syndrome is a newly recognised adult-onset multisystem inflammatory disease caused by a somatic mutation in the UBA1 gene in myeloid or erythroid precursor cells. This case will describe an atypical presentation of recurrent dacryoadenitis associated with VEXAS syndrome.

Methods: Case report and review of the literature.

Results: A 68-year-old male presented with three episodes of unilateral alternating dacryoadenitis followed by bilateral involvement over a 4 year period. Each episode of orbital inflammation was characterised by upper lid swelling, oedema and enlarged lacrimal glands. His medical history was significant for autoimmune pancreatitis, mild splenomegaly and venous thrombosis. In addition, he experienced intermittent flares of angioedema-like lesions involving the face and extremities, recurrent jaw aches, rash, progressive pulmonary fibrosis, and myelodysplastic syndrome resulting in pancytopenia. His inflammatory symptoms lessened with prednisolone but were refractory to methotrexate. Mycophenolate was subsequently trialled with a reasonable clinical response. Given the multisystem involvement, genetic testing was performed which confirmed the UBA1 gene variant and established the diagnosis of VEXAS syndrome. Tofacitinib, a JAK inhibitor, was commenced with resolution of inflammatory symptoms.

Conclusions: VEXAS syndrome is a newly recognised condition and secondary orbital inflammation is rare. Most ophthalmic manifestations pertain to uveitis. To our knowledge, this is the first report of recurrent dacryoadenitis associated with VEXAS syndrome.

Leech versus eye – A case report

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Purpose: To present a unique case of ocular injury following overnight leech attachment in regional Australia.

Method: An observational case report describing the experience of a single patient.

Results: A 29-year-old man with no significant ocular or medical history reported a leech attached to his left eye in regional Victoria. He did not try to remove the leech and it remained attached to the eye for over 12 hours, before self-detaching. Subsequently, the patient presented to the emergency department at the Royal Victorian Eye and Ear Hospital in Melbourne, Victoria, complaining of left orbital pain and peri-orbital erythema. Visual acuity in the affected eye was 6/9 with significant pre-septal oedema and erythema visible, along with significant temporal conjunctival swelling, ecchymosis and purulent discharge. No retained leech material was identified. The patient was managed with intravenous ceftriaxone and a tetanus diphtheria booster, and discharged from the emergency department with topical ofloxacin, oral ciprofloxacin and oral augmentin duo forte. The ofloxacin was



quickly tapered, and peri-orbital and conjunctival erythema and swelling rapidly improved over a one-week period.

Conclusion: Limited literature is available to guide clinicians on the presentation, sequelae and management of ocular leech attachment. This case report may provide guidance for other clinicians who encounter similar patients.

Orbital artifacts on magnetic resonance imaging

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Purpose: To describe artifacts on orbital magnetic resonance imaging (MRI) which led to an incorrect radiology report.

Method: Retrospective review of patients identified from the orbital databases at the Royal Adelaide Hospital and University of Wisconsin Hospital. Records were evaluated for age at imaging, gender, MRI sequence, laterality and location of artifact, radiological characteristics, and cause of artifact.

Results: Data were collected from seven patients (3 male) who had a median age of 61 years at the time of imaging. Five artifacts resulted from fat suppression failure with four of these cases misdiagnosed as inflammatory changes and one misdiagnosed as neoplastic infiltration. The other two cases resulted from susceptibility artifact and water-suppression failure. The right eye was involved in four cases. Six cases were in the inferior orbit region.

Conclusion: Areas of apparent enhancement in the inferior orbit may be due to fat suppression failure artifact. These can be mistaken for inflammatory or neoplastic orbital disease prompting additional investigations such as orbital biopsy. Clinicians should be aware of artifacts which can affect orbital MRI and lead to potential misdiagnosis.

A rare case of paediatric orbital myofibroma

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Purpose: To report a rare case of orbital myofibroma in a paediatric patient.

Method: A retrospective chart review of patient records and neuroimaging.

Results: An 18-month-old girl presented with a two-month history of right periorbital swelling and bruising associated with mucoid discharge and epiphora, with an occasional blood-stained appearance. She was otherwise well with an unremarkable neonatal history. There was no family history of neoplasms. On examination, there right hyperglobus and lateral dystopia, in the absence of proptosis and ophthalmoplegia. Dilated fundus exam showed healthy discs with no swelling or atrophy. Magnetic resonance imaging brain/orbits/sinuses showed a 32 × 23 × 29 mm orbito-nasal mass originating from the lacrimal apparatus or anterior ethmoid cells. Diffusion-weighted imaging showed intra-lesional restricted diffusion in comparison to grey-matter. Computed tomography sinuses defined this mass to the right anterior ethmoid with bony remodelling suggestive of a long-standing process. Myofibroma was confirmed on an endoscopic biopsy of the lesion. Through an endoscopic midfacial degloving approach, the tumour was removed with the medial maxilla, lamina and nasal bone. Residual medial canthus tumour was removed through a transcutaneous approach. Histology showed clear margins and at two-months postoperatively, there was resolution of globe dystopia with residual scar tissue only.

Conclusions: Orbital myofibroma is an extremely rare infiltrative neoplasm occurring in the paediatric population, with the majority of children presenting within the first two-years of life. Its progressive local invasion with bony erosion can masquerade as malignancy. Meticulous, complete excision with close clinical follow-up heralds a low rate of recurrence, as demonstrated in the above patient.

Extensive orbital inflammation in an anophthalmic patient: Is the bioceramic implant a bystander or a participant?

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Purpose: Porous orbital implants are commonly used materials following enucleation or evisceration, due to their biocompatibility with orbital tissue. We report a case of extensive orbital inflammation following

implantation of a Bioceramic (aluminium oxide) sphere, a complication which has not previously been reported.

Method: Clinical, radiological and histological records of a patient with an extensive fibroinflammatory reaction to an orbital implant were reviewed.

Results: A 60-year-old anophthalmic patient developed extensive orbital inflammation six-months following implantation of a vicryl mesh-wrapped Bioceramic implant. She reported a two-month history of progressive left retro-orbital pain and ill-fitting ocular prosthesis. On examination, there was mild, non-tender oedema and erythema of the left upper lid with conjunctival hyperaemia. Magnetic resonance imaging revealed diffuse soft tissue infiltration of the left orbit which was T1 isointense, intermediate on T2 and intensely enhancing. The left medial and inferior recti were swollen and hyperintense on T2, indicating muscle oedema consistent with an inflammatory process. An orbital biopsy demonstrated an extensive fibroinflammatory reaction with multinucleated giant cells. Removal of the implant resulted in complete resolution of symptoms.

Conclusion: The present case describes a florid orbital inflammatory response to a Bioceramic implant. Given the prolonged time course between implantation and inflammatory symptoms, we surmise that following absorption of the vicryl mesh, the orbital implant became increasingly exposed to the surrounding soft tissue, thereby inciting an inflammatory foreign-body reaction. Severe orbital inflammation secondary to a Bioceramic implant has not been described previously.

Orbital infantile haemangioma—A case report and radiological pearls in its diagnosis

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Purpose: To report a case of a deep retro-orbital infantile haemangioma and describe the utility of radiological features in its diagnosis.

Methods: Retrospective review of patient medical records and imaging.

Results: A one-month-old presented with a two-week history of progressive right eye proptosis. She was otherwise well with an unremarkable neonatal history. On examination, there was a 5 mm proptosis of the right eye with no globe dystopia. Cycloplegic refraction was +3.00/-2.50 × 180 in both eyes. Dilated fundus exam showed pink discs bilaterally with no retinal folds.

Magnetic resonance imaging (MRI) brain and orbits showed a 29 mm × 22 mm × 21 mm well-defined, lobulated right intraconal mass with inferolateral extraconal expansion. There was no restricted diffusion on diffusion-weighted imaging. The MRI was performed as a non-contrast feed and wrap study but there was suggestion of prominent vessels within. Ultrasound confirmed the mass to be highly vascular, with both arterial and venous Doppler waveforms within. The lobulated contour and heterogenous echogenicity supported an infantile haemangioma in the proliferative phase. Rhabdomyosarcoma was deemed less likely due to the lobulated contour, lack of diffusion restriction on MRI and relative echogenicity on ultrasound. She was started on oral propranolol 2 mg/kg three-times daily. There was an excellent response to treatment with a significant reduction in the degree of proptosis.

Conclusions: Infants who present with unilateral subacute proptosis often pose a diagnostic dilemma. Diffusion-weighted imaging MRI and ultrasound can be useful in the differentiation between benign and malignant tumours, through the provision of information regarding tumour cellularity.

Sinonasal teratocarcinoma with orbital invasion – Case series with literature review

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Purpose Sinonasal teratocarcinoma (SNTCS) is a rare anterior skull base malignancy of triphasic (ectoderm/mesoderm/endoderm) origin arising from the sinonasal cavity. We present 4 cases with literature review on this rare and newly classified tumour.



Method A retrospective descriptive case series from two large tertiary head and neck centres in New South Wales, Australia. Literature review of this rare and newly classified entity was undertaken including histology and long term prognosis.

Result A 68-year-old man underwent right total maxillectomy with ALT free flap reconstruction for a poorly differentiated SNTCS, followed by chemoradiotherapy. 11-months post-surgery he presented with biopsy proven recurrence of SNTCS involving right inferior orbit and arising from maxillary sinus. He underwent further radiotherapy with continued disease progression. He is under palliative care. 3 further cases of SNTCS were identified from pathology databases at two tertiary centres and all 4 cases are analysed with radiological, histological features described. The tumours showed an admixture of teratomatous and carcinosarcoma elements including immature neuroepithelial rosettes. The actual diagnosis may be limited by adequate sampling of all components in the initial biopsies, which may include a single or at the most two components of the tumour only. SNTC is a highly malignant tumour with rapid aggressive growth; recurrence within 3 years is common and the 3-year average survival rate is <60%.

Conclusion SNTC is a recently classified sinonasal malignancy with poor prognosis and potential for orbital involvement. Coupled with its locally aggressive nature, metastatic potential and high recurrence rate, it represents a malignancy of unfavourable prognosis.

Conjunctival smooth muscle hamartoma—2 cases and literature review

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Purpose: Conjunctival smooth muscle hamartoma (SMH) is rare with only 4 reported cases in the literature.

We report 2 additional cases of conjunctival smooth muscle hamartoma.

Method: A retrospective descriptive case series of 2 cases and literature review of conjunctival smooth muscle hamartoma.

Results: Case 1. A 7-year-old boy presented with a 4 week history of a pigmented cystic lesion involving the left inferior conjunctival fornix. Excisional biopsy with margin control was consistent with a completely excised smooth muscle hamartoma. There is no evidence of recurrence at 2-year follow up. Case 2. An 88-year-old female had right lower lid tarsal conjunctival stellate lesion extending into the fornix. Biopsies confirmed smooth muscle hamartoma of conjunctiva. SMH represent a benign, non-cancerous overgrowth of mature, specialised and disorganised tissue that is normally present at the site in which they originate. Histologically, SMH are characterised by benign proliferation of well-defined smooth muscle cell bundles, within collagen and interdigitating fat, haphazardly arranged within the dermis. They are largely asymptomatic cutaneous lesions, usually manifesting as hyperpigmented or skin coloured plaques, often with prominent vellus hairs. Conversely, periorbital SMH, which appear to be hairless, cystic lesions involving conjunctiva and ocular adnexa, potentially lead to compromised ocular function. Its diagnosis is complex due to its rare occurrence and shared similarities with other cutaneous diseases, thereby mandating histological confirmation.

Conclusion: Periocular SMH are exceptionally rare, typically manifesting at birth. We report a paediatric and adult patient with conjunctival SMH and highlight the histological and clinical findings in this condition.

Orbital inflammatory disease associated with relapsing polychondritis: a case series

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Purpose: To report the clinical presentation, management, and outcome of orbital inflammatory disease in a series of patients with relapsing polychondritis (RP).

Methods: This is a retrospective case series. Patient records were reviewed from the Royal Victorian Eye and Ear Hospital and eye surgery consultants private practice.



Results: Three patients were identified (two female; mean age 64.7 years). Two patients had a known history of RP. All patients presented with periorbital swelling, erythema and pain, two patients with diplopia. One patient had reported fatigue and night sweats. On examination, all patients had restriction of eye movements, two patients had proptosis and one patient was febrile with auricular swelling of the cartilage. Antinuclear antibody was positive in all patients, antineutrophil cytoplasmic antibodies was positive in one patient. Abnormal serum immunoglobulin (IgM) kappa free light chains were identified in two patients, and lambda free light chains in one patient. Radiological findings included post-septal inflammation and extraocular muscle enlargement. Two patients received systemic corticosteroids and one patient resolved without immunosuppression. During follow-up (4 months to 15 years) orbital inflammation recurred on average 3–4 times. One patient developed bilateral orbital extranodal marginal zone lymphoma and one patient was diagnosed with monoclonal gammopathy of undetermined significance. At final review only one patient was on systemic immunosuppression.

Conclusions: RP is a chronic and serious multisystemic inflammatory disorder, in which orbital inflammatory disease can be the primary manifestation. It is important to exclude systemic autoimmune disease and haematological malignancy, which are known associations.

Characteristics of peri-optic nerve orbital lymphoma

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Background: Orbital lymphoma is the commonest primary orbital malignancy. A small proportion are primarily intraconal; this subset is not well described. Those adjacent to the optic nerve may mimic other pathology, such as optic nerve sheath meningioma. The aim of this study is to describe the clinical and radiological features of peri-optic nerve lymphoma.

Methods: This retrospective case series includes 7 patients with histologically proven lymphoma adjacent to the orbital nerve. Patient demographics, presentation, imaging, management and outcomes are described.

Results: The mean age was 57 years with 5 females. Unilateral disease was present in 3 patients and asymmetrical, bilateral disease in 4. All patients presented with

conjunctival chemosis, unilateral axial proptosis and good visual function. There was no previous history of lymphoma in any case. Initial imaging suggested an optic nerve meningioma in unilateral cases. Biopsy was obtained via upper lid skin crease, medial or lateral conjunctival orbitotomy approaches, with no complications. Extra-nodal marginal zone lymphoma was diagnosed in all patients, which responded well to radiotherapy initially. One patient developed recurrence at the same site and a second had recurrence within the lateral rectus and a cervical lymph node.

Conclusion: Lymphoma is an important differential diagnosis to consider in infiltrative intraconal pathology. Conjunctival chemosis with normal visual function may be useful in differentiating these cases from optic nerve meningiomas. Lymphoma surrounding the optic nerve carries a good prognosis and biopsy is safe and necessary.

Surgical outcomes of a new lower eyelid reconstruction: Minimal marginal approach for releasing the lid with closure handling technique (Minimal MARCH technique)

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Purpose: Discuss surgical details in the Minimal MARCH technique for full-thickness lower eyelid defects.

Methods: Interventional study including patients that had a full-thickness lower eyelid defect and underwent the MARCH technique surgery.

Results: Six-male patients were recruited. Full-thickness lower eyelid defects involving up to around 60% of the lower eyelid were conservatively restored using the Minimal MARCH technique. The size of the defect, as well as the length of the remnant temporal and medial lower eyelid, had an effect on the reconstruction.

Conclusions: Recurrences in eyelid skin cancers and surgical iatrogenic morbidity incentivize the design of new techniques to save healthy tissue as much as possible. The Minimal MARCH technique offers a safe alternative, minimally aggressive, with excellent surgical outcomes in some cases.

Diagnostic dilemma in a rare case of extranodal natural killer T-Cell lymphoma

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Purpose: To describe a rare case of natural killer T-Cell lymphoma complicated by secondary haemophagocytic lymphohistiocytosis (HLH) presenting with unilateral orbital inflammation and undifferentiated systemic inflammatory disease.

Method: A review of medical records, imaging and histopathology.

Result: A 61-year-old male was referred with a ten-day history of right periorbital swelling. He had a history of lower respiratory tract infection prior with ongoing symptoms of breathlessness and dry cough. Imaging demonstrated fusiform enlargement of the medial and inferior rectus muscles and moderate proptosis. Mildly elevated inflammatory markers and deranged liver function tests were also noted on admission. After being initially treated for presumed orbital inflammatory syndrome, he subsequently developed an orbital compartment syndrome requiring a canthotomy and cantholysis and two endonasal decompressions. He developed acute respiratory distress syndrome on day 7 requiring intubation and management by intensive care. The presence of lymphohistiocytic infiltrates in an orbital fat biopsy, fever, progressive pulmonary infiltrates, worsening liver function tests, pancytopenia and elevated ferritin confirmed the diagnosis of HLH (Modified 2009 HLH Criteria). A definitive pathologic diagnosis was made of an extranodal NK/T-Cell lymphoma (Nasal Type, EBV positive). The patient died on day 26 of admission secondary to multiple complications of HLH and chemotherapy-induced ileitis.

Conclusion: Natural Killer T-Cell lymphoma is a rare but aggressive and devastating lymphoma comprising only 1–3% of all orbital Non-Hodgkin Lymphomas. HLH is an uncommon multi-system inflammatory complication which can be triggered by lymphoid malignancies. This is the first reported case of an orbital NK/T-Cell Lymphoma presenting with HLH.

Comparison of specialist and trainee accuracy in assessing thyroid eye disease using VISA grading

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Purpose: To determine the interrater reliability (IRR) of thyroid eye disease (TED) photographic assessment using the VISA system. To assess whether a VISA grading atlas improves registrar performance in assessing photographs of TED.

Method: Participants were emailed an online survey and asked to score 10 photographs of TED using the inflammation and motility restriction parameters of the VISA system. Local and international ophthalmologists and ophthalmology registrars were included. A modified version of The Graves' Orbitopathy Clinical Evaluation Atlas was provided to 50% of the ophthalmology registrars participating in the study. Interrater reliability was analysed with intraclass correlation coefficients (ICC) and percentage agreement. Interrater reliability was compared between groups of practitioners by their level of experience. Additionally, the effect of a training atlas on registrar performance was measured.

Results: Fifty-four survey raters were included (oculoplastic surgeons n = 18, subspecialist – other n = 9, comprehensive ophthalmologist = 9, ophthalmology registrar = 18). The mean overall rater score was 4.63/10 for inflammation and 3.55/12 for motility restriction. Overall interrater reliability ICC was 0.96 for inflammation and 0.99 for motility restriction. There was no statistically significant difference in IRR between rater groups. Registrars with a grading atlas had the highest IRR for inflammation (ICC 0.95). There was no significant difference in motility restriction IRR with an atlas (with atlas ICC 0.969; without atlas ICC 0.938).

Conclusion: Interrater reliability using the inflammation and motility restriction components of the VISA system was excellent. A VISA grading atlas improved registrar performance in grading inflammation.

Retrobulbar haemorrhage following orbital surgery: A case report and development of a postoperative orbital pro forma

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Background: Visual loss following orbital surgery is rare (0.44–1.2%). Of these cases, retrobulbar haemorrhage (RBH) as a cause of visual loss is even more rare (0.1%). We present a case of RBH following orbital surgery with subsequent poor visual outcome. This prompted a review

of postoperative management and clinical pathways, resulting in the development of a pro forma.

Methods: Case report and review of the literature. Survey of Australian and New Zealand Society of Ophthalmic Plastic Surgeons members. Development of a postoperative orbital surgery pro forma.

Results: A pro forma was developed under the following domains: patient specific risk factors for postoperative RBH; postoperative instructions; postoperative medication regimens; drain output measurement; eye observations (visual acuity, pain, intraocular pressure); criteria for escalation based on observations; post-orbital surgery RBH pathway.

Conclusion: Close postoperative observation of patients undergoing orbital surgery is critical to avoid blindness. A pro forma is proposed to identify early signs and symptoms of RBH, and prompt appropriate escalation and timely management.

Asymptomatic post-traumatic bilateral ophthalmic vein and cavernous sinus thrombosis

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Purpose: To highlight the considerations in clinical diagnosis and management of ophthalmic vein thrombosis through a challenging case of asymptomatic post-traumatic bilateral superior ophthalmic and cavernous sinus thrombosis.

Methods: A review of electronic medical records.

Results: A 54-year-old female with no significant past medical history presented to a tertiary trauma and referral hospital two hours after falling from a ladder and sustaining significant head and torso polytrauma. She had a second dose of BNT162b2 COVID-19 mRNA vaccination two weeks earlier. Contrast computed tomography imaging confirmed the presence of bilateral superior and inferior ophthalmic vein thrombi, and suspected cavernous sinus thrombi without carotid-cavernous fistula. The patient's presentation occurred in the absence of any neurological or ophthalmic signs or symptoms, and her visual acuity remained normal throughout follow-up. A serological inflammatory, infectious, and thrombotic screen was negative. Repeat computed tomography imaging demonstrated successful resolution of all thrombi following treatment with systemic anticoagulation.

Conclusions: This unusual case of bilateral ophthalmic vein thrombi highlights a challenging diagnosis that should not be overlooked despite a normal neurological and ophthalmic examination. Although the cause of SOVT was likely post-traumatic, contribution from recent nVoC-19 vaccination was investigated.

Soft stop on syringing and probing may have a high false-positive rate in diagnosing pre sac obstruction

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Background: To determine the diagnostic value of 'soft stops' encountered during lacrimal syringing and probing.

Methods: Single-centre retrospective review. Adult patients with epiphora attending a tertiary lacrimal clinic from May 2010 to April 2021 were reviewed. Cases with evidence of soft stop encountered during lacrimal syringing/probing were included, and patients with a history of lacrimal surgery were excluded. Findings of syringing/probing consistent with pre sac obstruction were correlated to dacryocystography and surgical findings.

Results: Fifty-three (10.2%) canalicular systems had soft stops on syringing/probing. The mean age of the patients was 63.8 ± 15.6 (range 28–87) years, and 27 (65.9%) were females. Intraoperative examination findings were available for 27 of 30 cases that underwent lacrimal surgery and dacryocystography was available for 40 systems. Pre-sac obstruction found on syringing/probing was confirmed in 40% and 37% of cases on DCG and surgery, respectively. The correlation between syringing/probing and DCG was stronger for canalicular than for common canalicular location ($p = 0.016$). Canalicular stenosis on syringing/probing manifested as pre-sac abnormality on DCG in 5/7 (71.4%) compared to 0/6 common canalicular stenosis cases ($p = 0.021$). Based on the surgical findings, the false-positive rate of a soft stop on syringing/probing was highest for common canalicular 'stenosis' (100%) and lowest for canalicular 'block' (45.5%; $p = 0.093$). Findings of pre sac obstructions on DCG were confirmed in 85.7% of the cases intraoperatively ($p = 0.035$ compared to syringing/probing alone).

Conclusions: Soft stops on probing showed poor correlation with DCG and surgical findings, particularly in common canalicular location.



Late spontaneous orbital subperiosteal hematoma after endoscopic sinonasal tumor resection

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Purpose: We report a case of spontaneous subperiosteal orbital hematoma many years after endoscopic sinonasal resection of malignancy

Methods: A 50-year-old female with a six-year history of endoscopic sinonasal resection of a poorly differentiated neuroendocrine tumour presented with two days of worsening frontal headache and left periocular swelling.

Results: A subperiosteal abscess was initially suspected on CT; however, MRI sequences revealed changes consistent with the diagnosis of hematoma. A conservative approach was justified based on the clinico-radiologic features. Progressive clinical resolution was noted over three weeks. Two monthly follow-up MRI revealed resolution of the orbital findings with no features to indicate recurrence of malignancy.

Conclusion: Spontaneous orbital hematomas are self-resolving, and surgical exploration may be avoided in the absence of complications. Therefore, it is beneficial to recognize it as a potential late complication of extensive endoscopic endonasal surgery. Characteristic features on MRI can aid diagnosis.

Idiopathic apical orbital inflammation

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Purpose: Patients with idiopathic apical orbital inflammation are a rare subset of patients for which there is limited literature. This condition can result in severe morbidity for the patient due to the potential involvement of multiple cranial nerves. We aim to describe the clinical features, management and outcomes of patients with apical orbital inflammation.

Method: Retrospective case series involving five patients with idiopathic apical orbital inflammation.

Results: Five patients were included. Their ages ranged from 35 to 84 (mean 52.6 years) with a male predominance (4, 80%). The most common symptoms seen were pain (5, 100%), retrobulbar pressure (4, 80%), blurry vision (4, 80%) and diplopia (3, 60%). Extraocular movement restriction was seen in all cases and optic nerve involvement in two cases (40%). All patients had magnetic resonance imaging orbits performed however only one underwent orbital biopsy (20%). Corticosteroid treatment was initiated in all patients except for one patient who opted for no further treatment. Maintenance azathioprine to prevent flare up of symptoms was required in one patient (20%). At last follow up, one patient had complete resolution (20%), two had significant improvement with mild residual disease (40%) and two had stable disease without further progression (40%).

Conclusion: Idiopathic apical orbital inflammation can have a wide variety of presentations with varying outcomes. Due to its rare occurrence and the difficult position for biopsy, it can often be difficult to diagnose. Prompt diagnosis and adequate treatment is vital to prevent progression of disease and hopefully allows complete recovery to be achieved.

Emerging medical and surgical treatments for neurotrophic keratopathy: Review of human recombinant nerve growth factor and corneal neurotisation techniques

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Purpose: Neurotrophic keratopathy (NK) is characterised by damage to the trigeminal corneal innervation leading to corneal hypoesthesia and anaesthesia. This results in loss of corneal protective reflexes and neurotrophic factors, which ultimately causes progressive epithelial breakdown, poor healing, and visual decline. This process is refractory to conventional treatment options.

Method: Literature review of emerging medical and surgical treatments in NK.

Results: An update on NK is provided including its aetiology, pathophysiology, staging, and an outline of treatment options. Recombinant human nerve growth factor has facilitated a paradigm shift in the medical

treatment for NK and is discussed. The role of corneal neurotisation is discussed with comparison the outcomes and complications of direct and indirect surgical techniques, use of an autograft or allograft, its timing, and the potential for visual rehabilitation postoperatively.

Conclusion: Traditionally, NK represented a challenging condition to treat. Recent breakthroughs and developments have added exciting medical and surgical treatment options in the armamentarium for NK. Recombinant human nerve growth factor has demonstrated potential to promote corneal healing. Similarly, corneal neurotisation directly addresses the underlying pathophysiology of NK and improves corneal sensation and trophic functions, which sustains corneal clarity and can restore visual function. The cost-effectiveness, position in the treatment algorithm, and long-term safety and efficacy of both treatments need to be examined. Randomised comparative studies may elucidate the answers. Without these emerging treatments, NK and subsequent corneal anaesthesia is a lifelong problem with only symptomatic treatment, with significant implications on quality of life and vision.

An unusual case of proptosis in a child

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Purpose: To describe a case of IgG-4 related dacryoadenitis in a 9-year-old boy who presented with acute onset proptosis.

Method: Case report.

Results: A 9-year-old boy presented with a three-day history of a painful progressive right eye proptosis with associated ophthalmoplegia. At presentation he was systemically well with preserved vision and optic nerve function. He had right eye S-shaped upper lid swelling with associated proptosis and chemosis, and painful ophthalmoplegia. Magnetic resonance imaging/venography revealed extensive inflammatory changes involving the right orbit and periorbital tissues. There was associated areas of restricted diffusion within the intraconal and extraconal compartments, concerning initially for abscess or malignancy. The patient was commenced on intravenous antibiotics to cover possible infection and transferred to a tertiary paediatric facility for further investigation including biopsy. Subsequent PET revealed intense FDG-avid uptake in the superolateral right orbital without associated local or metastatic nodal involvement. Lacrimal gland biopsy was performed

which revealed dense mixed inflammatory infiltrate with mixed neutrophils, eosinophils, lymphocytes and abundant plasma cells with associated dense fibrosis surrounding gland lobules. There was no evidence of malignancy. Microbiology revealed scant multi-resistant staph aureus; fungal cultures were negative. Immunoperoxidase staining for IgG4 showed scattered positive cells (average 4-5/HPF) which was not considered conclusive, though serum IgG4 levels were raised (1.26). The patient responded to steroids and continues to be monitored via a multidisciplinary approach.

Conclusion: IgG 4 related disease is an uncommon presentation of proptosis in children and can mimic other causes of orbital inflammation, such as infection or malignancy.

Systemic inflammatory markers differentiate between orbital cellulitis and non-specific orbital inflammation

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Purpose: Bacterial orbital cellulitis (OC) and diffuse non-specific orbital inflammation (DNSOI) may be challenging to differentiate clinically. This study investigates the utility of systemic inflammatory markers, namely white cell count (WCC) and C-reactive protein (CRP), in differentiating between OC and DNSOI.

Methods: A single-centre retrospective study of patients diagnosed with OC or DNSOI, between 2003 to 2021, who had WCC and/or CRP obtained at presentation. The mean levels of these factors and the proportion of positivity were compared between OC and DNSOI. A receiver operating characteristic analysis was conducted to calculate the specificity and sensitivity of WCC or CRP in each group.

Results: Forty-nine patients were included in this study. The mean age was 56 ± 20 years, and 21 patients were females. Twenty-six (53.1%) patients had OC, and 23 (46.9%) patients had DNSOI. Mean WCC for OC and DNSOI were $14.5 \times 10^3/\mu\text{l}$ and $9.27 \times 10^3/\mu\text{l}$, respectively ($p = 0.001$). Mean CRP for OC and DNSOI were 104.4 mg/L and 10.0 mg/L, respectively ($p < 0.001$). The optimal CRP cut-off value of 20.2 mg/L demonstrated 90.9% sensitivity and 90.5% specificity (area under the curve 0.946, $p < 0.001$) for differentiating between OC and DNSOI. CRP was more predictive of OC than WCC ($p = 0.017$). 7/26 (26.9%) OC patients with fever also had



an elevated CRP, while 1/23 (4.3%) of DNSOI with fever had a normal CRP.

Conclusions: An elevated WCC is suggestive of OC. However, a normal WCC can neither exclude nor differentiate between OC and DNSOI. CRP may be a more accurate predictor of OC compared to WCC.

MHC-1 and -2 immunohistochemistry in idiopathic orbital myositis

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Purpose: Major histocompatibility complexes (MHC)-1 and -2 are not detected in normal skeletal muscle but upregulated in systemic idiopathic inflammatory myopathies. This study investigates the utility of MHC-1 and -2 immunohistochemistry (IHC) staining of extraocular muscle (EOM) in idiopathic orbital myositis (IOM).

Methods: This was a multi-centre retrospective study of patients with a clinico-radiological diagnosis of IOM who underwent an EOM biopsy and had MHC-1 and -2 IHC staining.

Results: Six patients with IOM between 2013 and 2021 were included in this study (mean age = 47.5 ± 20.9 years; male:female = 2:4). There was one paediatric case (17-years-old) and one bilateral IOM case. Four patients presented with recurrent disease. The most common clinical features were restricted and painful motility. Duration of symptoms ranged from 5-days to 3-weeks. The lateral rectus (3/6, 50%), inferior oblique (2/6, 33.3%) and medial rectus (1/6, 16.6%) were biopsied. Non-specific inflammatory features were observed in all patients including interstitial and/or perivascular fibrosis, lymphoplasmacytic infiltrate and variation in muscle fibre size. IHC demonstrated presence of CD20+ B-cells, CD3+ T-cells in the lymphoplasmacytic infiltrate, and occasionally, increased expression of CD68+ interstitial macrophages. All cases demonstrated MHC-1 and MHC-2 positivity on myofibres.

Conclusion: IHC staining for MHC-1 and -2 may act as an adjunctive tool in the histopathological analysis of IOM. It may help to confirm and differentiate IOM from other specific causes of myositis.

Methicillin-resistant *Staphylococcus aureus* associated orbital cellulitis

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Purpose: In recent years, methicillin-resistant *Staphylococcus aureus* (MRSA) orbital cellulitis (OC) has drawn increasing clinical and public health concern. We present a case-series of MRSA OC encountered at four Australian tertiary institutions.

Methods: Multi-centre retrospective non-comparative case-series investigating MRSA OC in Australia between 2013 and 2022. Patients of all ages were included.

Results: Ten cases of culture-positive MRSA OC were identified at four tertiary institutions across Australia within a 10-year period from 2013 to 2022 (8 male, 2 female). Mean age was 15.3 ± 16.5 years (range 13-days to 53-years), of which one was 13 days old, and all were immunocompetent. Nine patients (90%) had paranasal sinus disease and eight (80%) cases had a subperiosteal abscess. Three (30%) had intracranial extension, including one (10%) case which was also complicated by a superior sagittal sinus thrombosis. Empirical antibiotics, such as intravenous (IV) cefotaxime alone or IV ceftriaxone and flucloxacillin, were commenced. Following identification of MRSA, targeted therapy consisting of vancomycin and/or clindamycin was added. Nine (90%) patients underwent surgical intervention. Average hospital admission was 12.2 ± 7.2 days (range: 3 to 25 days), with two patients requiring intensive care unit admission due to complications related to their orbital infection. All patients had complete resolution of ocular symptoms following an average follow-up period of 4.1 months (range 2 to 9 months).

Conclusion: MRSA OC can follow a more aggressive clinical course causing severe orbital and intracranial complications across a wide demographic, including immunocompetent individuals. However, early recognition and initiation of IV antibiotics along with surgical intervention may effectively manage these complications and complete resolution of ocular sequelae was achieved in all our patients.

Transorbital apical drillout: An approach to the cavernous sinus

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Purpose: To describe a transorbital apical approach to the cavernous sinus, whereby the greater wing of sphenoid and superior orbital fissure (SOF) are drilled out to access the interdural incision zone and lateral wall of the cavernous sinus.

Method: Retrospective case series of two patients with periocular squamous cell carcinoma and radiological evidence of perineural spread to the anterior cavernous sinus. Following an orbital exenteration, the greater wing of sphenoid was drilled to reach the lateral border of the SOF, which was then partially removed. The meningo-orbital band, a periosteal band of transition between the frontotemporal basal dura and the periosteal layer of the periorbita, was incised to enter the lateral wall of the cavernous sinus. The relevant cranial nerves were biopsied to provide an accurate zonal classification of disease.

Results: This technique was successfully performed on two patients with periocular squamous cell carcinoma. One case had radiological evidence of intracavernous oculomotor nerve involvement, while the other case demonstrated enlargement and enhancement of the nasociliary nerve at the SOF. Cerebrospinal fluid leak occurred in one case, which was addressed with fat packing and fascial closure.

Conclusion: The transorbital apical approach via the SOF provides a corridor of access to the cranial nerves within the lateral wall of the cavernous sinus.

Recurrence following globe sparing excision for basal cell carcinoma with anterior orbital invasion

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Purpose: To present a series of patients with tumour recurrence following globe-sparing excision for periocular basal cell carcinoma (BCC) with anterior orbital invasion.

Method: Multicentre retrospective case series. Analysis of medical records, neuroimaging and histopathology.

Results: Eight patients were identified for inclusion. Time to recurrence following globe sparing excision ranged from 3–12 years. Seven patients (87.5%) presented with recurrent disease originating from the medial canthus. Clinical features at presentation included contracture (n = 4, 50.0%), upper lid ptosis (n = 3, 37.5%), a palpable mass (n = 2, 50.0%) and hypoesthesia (n = 2, 50.0%). Radiologically, tumour recurrence was predominantly characterised by isointense signals on T1 and T2-weighted sequences (n = 5, 62.5%) with moderate contrast enhancement. The most common histologic subtype in recurrent tumours was a mixed nodular and infiltrative growth pattern (n = 5, 62.5%). Perineural invasion was a feature in four (50%) cases. Salvage therapy in the form of exenteration was performed in seven cases. Vismodegib and adjuvant radiotherapy were provided for one case with surgically unresectable tumour recurrence.

Conclusion: Globe sparing excision for invasive periocular basal cell carcinoma can be complicated by late recurrence that develops rapidly despite silent neuroimaging for years. Early clinical signs are subtle. High risk features predictive of recurrence include medial canthus location, mixed histological subtypes and perineural invasion. Patients with such characteristics require a close clinical and imaging surveillance program following globe sparing excision.

Fatty infiltration of extraocular muscles on magnetic resonance imaging

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Purpose: To define and characterise fatty infiltration of the extraocular muscles (EOM) on magnetic resonance imaging (MRI) in normal orbits.

Method: Retrospective review of patients who underwent T1-weighted coronal MRI of the orbits. Patients with bilateral orbital disease were excluded. In patient with unilateral orbital disease, the contralateral normal orbit was used. In patients with both normal orbits, only



the right orbit was used. Fatty infiltration was present if hyperintense signals were seen within the EOMs by two independent reviewers. The degree of fatty infiltration was semi-quantitatively characterised as: (i) fatty streaks; (ii) fatty infiltration less than EOM; (iii) fatty infiltration equal to EOM; (iv) fatty infiltration more than EOM; and (v) diffuse fatty infiltration.

Results: The study population consisted of 79 orbits (55 right, 24 left) from 79 patients (37 male, 42 female) with a mean age of 55 ± 18 years. The frequency of muscle involvement was inferior rectus (75%), medial rectus (12%), superior rectus (10%) and superior oblique (4%) muscles. The pattern of involvement within the inferior rectus muscle was fatty streaks (30%), fatty infiltration less than EOM (27%), fatty infiltration equal to EOM (16%), and fatty infiltration more than EOM (1%).

Conclusion: Some degree of fatty infiltration in the extraocular muscles in a common occurrence in normal orbits. The inferior rectus is the most commonly involved muscle, in line with previous data. This data may serve as a baseline for comparison with other cohorts such as thyroid eye disease patients.

OTHER

Characterising the ocular manifestations of COVID-19

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Purpose: To identify and collate the most common manifestations of a SARS-CoV-2 infection and categorise them based on the affected anatomy of the eye. This included ocular manifestations which were a result of direct infection of the SARS-CoV-2 virus along with diseases which were a result of an inflammatory or ischemic response to the infection.

Method: A comprehensive literature survey was undertaken on the databases Embase and Scopus. The inclusion criteria were clinical studies and discussion articles which discussed patients who had tested positive for COVID-19 and concurrently had ocular signs or symptoms. Studies which mentioned co-infections with other pathogens which had resulted in ocular disease were not included.

Results: The main ocular pathology resulting from a SARS-CoV-2 infection is viral conjunctivitis in both paediatric and adult populations. Results showed that conjunctivitis most commonly occurs in the middle phase of

the disease and hand-eye contact is independently correlated with conjunctival symptoms. The incidence of conjunctivitis is not correlated with the severity of the infection. Several neuro-ophthalmic conditions were also seen in a significant number of COVID-19 patients.

Conclusion: Given the longevity and increasingly accepted notion that the disease will become endemic, knowledge of the ocular manifestations of COVID-19 may lead to faster diagnosis and by extension better management of the disease. Both primary care physicians and eye care providers should be made aware of this as acute conjunctivitis may be the presenting complaint or the sole manifestation an active COVID-19 infection.

Automated disease registry using low-code natural language processing

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Background: Electronic health records contain clinical data in an unstructured, often abbreviated, free-text narrative format that presents a barrier to the efficient detection of diagnoses. Machine learning natural language processing techniques such as named entity recognition (NER) can be applied to extract this data. However, low-code approaches to implementation are needed to encourage widespread use among clinicians unfamiliar with these techniques.

Methods: We extracted deidentified electronic clinical records from a single centre adult outpatient ophthalmology clinic from November 2019 to May 2022. A low code annotation software tool (Prodigy) was used to annotate diagnoses and train a bespoke NER model to extract diagnoses and create an ophthalmic disease registry.

Results: A total of 123,194 diagnostic entities were extracted from 33,455 clinical records. After decapitalisation and removal of non-alphanumeric characters, there were 5070 distinct extracted diagnostic entities. The NER model achieved a precision of 0.819, recall of 0.823 and F score of 0.821.

Conclusion: We demonstrated a workflow using low-code NLP tools to produce an ophthalmic disease registry. Low-code tools increase the accessibility of improved machine learning named entity recognition techniques to clinicians without this expertise. Low-code solutions are needed to encourage widespread adoption, which could have a beneficial impact on patient cohort identification strategies and dynamic monitoring of electronic health records.

Multimodal imaging in ophthalmology: A review and proposed definition

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Background: Medical images are valuable sources of data that can be used to inform clinical care. Beyond visual representations, medical images provide a treasure-trove of data that can be interrogated in different ways to derive new and richer insights into health and disease. In addition, combining data from different imaging modalities may offer new disease insights. How best to combine these different data sources is the outstanding challenge of multimodal imaging (MMI) in ophthalmology.

Purpose: To explore the methodology and nomenclature of MMI in ophthalmology.

Methods: A literature review was performed to explore current concepts and definitions relating to MMI in medicine. These findings were then used to propose a definition of MMI in ophthalmology. The definition then served as the basis for a comprehensive literature review of MMI in ophthalmology.

Results: MMI is increasingly utilised in ophthalmology. Two main technical approaches to the implementation of MMI analysis were identified: the combination of different imaging modalities in a single device ('intramodal MMI') and the combination of independent image data sets following image acquisition ('intermodal MMI'). A summary of these approaches and their clinical application in ophthalmology is addressed and a revised definition of MMI in ophthalmology is proposed.

Conclusion: Intermodal MMI promises greater accessibility and scalability than integrated hardware solutions, with wide scope for improved detection of disease features and biomarker discovery.

A multi-centre retrospective review of bird related penetrating eye injuries

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Purpose: To investigate the nature and complications of bird-related penetrating eye injuries (PEI) in an Australian setting.

Method: A multi-centre retrospective chart review of bird related PEIs from tertiary centres in Sydney and Melbourne. A medical record search of PEIs from bird attacks was conducted from year 2000 to September 2021.

Results: Twenty-three patients (10 females) were included, 57% of injuries occurred during the spring, followed by 17% during the winter season. 87% of injuries involved the cornea, 4% the sclera and 9% did not specify. Complications included traumatic cataract in 43% of patients, retinal tear and retinal detachment in 4%. Endophthalmitis was suspected in 4% of cases. Seventy-eight percent of eyes underwent primary repair, of these 94% required corneal repair, 28% lensectomy, 22% vitrectomy and 33% of cases had a secondary repair. Antibiotic regimens were both systemic and ocular in 44% of cases, ocular only in 17%, systemic only in 4%, not used in 4% and not specified in 31%. The median follow up time was 7.5 months, ranging from 1 day to 3 years. The mean (SD) uncorrected distance visual acuity at presentation was 1.1 (0.9) logMAR and at last follow-up was 0.8 (0.9) logMAR.

Conclusion: Bird-related PEIs are more common in the spring months and often involve a corneal laceration requiring closure. Common complications include traumatic cataract and less commonly involve the posterior chamber and retina. A small number of patients require secondary procedures and experience ongoing morbidity.

Efficacy of patient-sided breath shields for slit-lamp examination

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Purpose: To evaluate the efficacy of patient-sided breath shields in preventing oronasal droplet transmission during slit-lamp examination

Methods: Two commercially available patient-sided breath shields and a 3-dimensional (3D)-printed shield designed by the authors were attached to a slit-lamp chin rest for testing. Each shield was exposed to 3 standardised sprays of coloured dye from a spray gun with its nozzle adjusted to simulate the angular dispersion of a human sneeze. Any overspray not blocked by the shields was



recorded and compared with spray with no shield (control). Image-processing software was used to ascertain the surface area of overspray not blocked by the tested shield compared with the control of no shield

Results: With typical use, both commercially available patient-sided shields and the 3D-printed shield blocked 100% of forward-travelling measurable droplets from a simulated sneeze spray. Even when set to the furthest distance setting to simulate the worst-case scenario, shield 1 and the 3D-printed shield blocked 99.96% and 99.65% of overspray, respectively. However, slow-motion footage did reveal that a considerable amount of spray rebounded off the shields and extended peripherally past its borders

Conclusion: With typical use, all tested shields prevented 100% of oronasal transmission. To encourage accessibility, the authors offer a free 3D model and instructions for creating the tested patient-sided breath shield. Patient-sided shields should be combined with other infection-control measures to minimise transmission during slit-lamp examination

PAEDIATRIC OPHTHALMOLOGY

Real-world application of home visual acuity testing for paediatric teleophthalmology during the COVID-19 pandemic

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Purpose: To review the ability of home visual acuity testing during teleophthalmology consultations to accurately assess visual acuity in paediatric patients in a real-world setting.

Methods: This was a retrospective study of paediatric patients who were seen via teleophthalmology consultation due to COVID-19 related community restrictions between May and June 2020 at a single private ophthalmology practice. Home visual acuity findings were compared with the subsequent in-person assessment to determine agreement between measures.

Results: Forty-three patients (86 eyes) were included in the study. The mean patient age at time of teleophthalmology assessment was 75.9 months (range: 29 to 173 months). Correlation between home visual acuity findings and subsequent in-person assessment across all participants was 0.56 ($p \leq 0.001$). The upper and lower limits of agreement were 0.38 LogMAR units and -0.33 LogMAR units. Correlation reduced

to 0.46 ($p = 0.013$) in the below 5 year old group, and increased to 0.70 ($p \leq 0.001$) for the 8 years and older group.

Conclusion: Home visual acuity assessment for teleophthalmology is of increased clinical value in older paediatric patients. In-person assessment by a trained clinician remains the optimal method for determining visual acuity. As home visual acuity assessment may be necessitated by local and global factors, further research is required regarding the optimal methods for assessment, particularly in younger patients.

Outcomes of trans-scleral sutured intraocular lens in children with ectopia lentis

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Purpose: To report the outcomes of trans-scleral sutured intraocular lens (TSS-IOL) for the management of paediatric ectopia lentis.

Methods: A retrospective chart review of children who underwent TSS-IOL for ectopia lentis at the Department of Ophthalmology, Queensland Children's Hospital from June 2019 to December 2021 was undertaken. Demographic information, presence of underlying systemic conditions, laterality, preoperative and postoperative visual acuity and refraction up to 12-month follow up, and complications were recorded. T-test was used to compare visual outcomes.

Results: Thirty-four eyes of 21 patients (52.4% male, average age 7.19 ± 3.27 years) with ectopia lentis underwent TSS-IOL (Akreos AO60, Bausch&Lomb) for the correction of aphakia. 13 patients (61.9%) were bilateral, and eight patients (38.1%) were unilateral. 29 eyes (85.3%) had Marfan's syndrome (22 confirmed, 7 presumed), one eye (2.9%) had fibrillin-1 mutation, one eye (2.9%) had autosomal dominant ectopia lentis, two eyes (5.9%) were congenital cataract, and one eye (2.9%) was idiopathic. Preoperative best-corrected visual acuity was $0.54 \pm 0.33 \log \text{MAR}$. Postoperatively, best-corrected visual acuity was $0.32 \pm 0.24 \log \text{MAR}$ at 3-months ($p = 0.03$) and $0.26 \pm 0.11 \log \text{MAR}$ at 12-months ($p < 0.01$). At 12-months postoperatively, final refraction was -0.03 ± 0.90 . One eye (2.9%) had postoperative panuveitis and one eye (2.9%) had exposed sutures. There were no cases of hypotony or retinal detachment.

Conclusions: TSS-IOL was a safe and effective method for the correction of aphakia in children with ectopia lentis, due to the presence of weakened zonules in these patients. There was a significant improvement in visual acuity with minimal complications and refractive error.

Using the axial length to corneal radius ratio to determine myopia progression

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Purpose: To examine the relationship between axial length to corneal radius ratio (AL/CR), spherical equivalent refraction (SER) and myopia progression.

Methods: Ocular biometry and cycloplegic autorefractometry was measured in 845 six year old and 1115 12 year old schoolchildren, with 5–6 year follow-up. Crystalline lens power (LP) was calculated using Bennet and Rabbett's formula. AL/CR and SER relationships were modelled using linear and piecewise regression analysis.

Results: AL/CR changes strongly correlated with SER changes ($r = -0.875$ and -0.815 , younger and older cohort respectively) and were best described by a tri-phasic linear model. In low hyperopes ($>0.75D$ to $\leq 2.00D$), a unit increase in AL/CR produced less myopic shift in SER compared to all other refractive groups (all $p < 0.001$). LP changes were negatively correlated with AL/CR changes (all $p < 0.01$), but not in myopes or those with high AL/CR. Myopes displayed the strongest relationships between AL/CR change and SER change ($r^2 = 0.880$ and 0.853 , younger and older cohort respectively). Within baseline myopes of the older cohort, AL/CR changes determined 95% of SER changes within $\pm 0.66D$ of actual SER.

Conclusion: AL/CR correlates highly with cycloplegic refraction, although the relationship is not strictly linear. Reductions in crystalline lens power limit the myopic shifts expected from axial elongation, keeping eyes in a state of low hyperopia. Myopia progression can be indirectly monitored through changes in AL/CR with a reasonable level of accuracy.

Visual failure from hypovitaminosis A in two children with severe autism spectrum disorder; the need for vitamin replacement therapy

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Purpose: Vitamin A deficiency is a cause of malnutrition that can lead to ocular disease. The World Health Organization estimates that 228 million children worldwide are affected. It is known that children with Autism Spectrum Disorder (ASD) can develop dietary restrictions. Here we describe two children with ocular complications of hypovitaminosis A.

Methods: This is a retrospective case report series looking at the presentation, investigations and management of two children with visual failure.

Results: Two unrelated boys of Māori ethnicity had severe non-verbal ASD and diets restricted to potato chips and fries. Both patients presented with a change in visual behaviour. Visual acuity could not be measured. The first patient presented age 11 years and had conjunctival injection and optic disc pallor right $>$ left. The second presented age 9 years and did not have any obvious fundus abnormalities. Magnetic resonance imaging, lumbar puncture and blood tests were conducted under general anaesthesia. Both patients had low vitamin A levels of $0.2 \mu\text{mol}$ (0.9 – 1.7). Magnetic resonance imaging identified calvarial thickening including the skull base in both patients which is a known consequence of low vitamin A. The optic canals were narrowed with no increased signal in the optic nerves. Lumbar puncture demonstrated normal opening pressures. Vitamin replacement therapy has led to a partial improvement in visual function in the second patient only.

Conclusion: Dietary restriction in ASD may lead to vision loss due to Vitamin A deficiency. Unfortunately, presentation can be late in this subgroup of patients. Increased awareness of vitamin replacement is essential to prevent visual loss.

Corneal and macular morphology of the paediatric eye with progressive myopia

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Purpose: To analyse corneal and macular parameters in myopic children and how these change over time in juvenile myopia progression.

Method: A cohort study of myopic children presenting to clinical practice. Baseline assessment included vision, refraction, fundus examination, axial length (AL), central corneal thickness (CCT, Pentacam), anterior chamber depth (ACD, IOLMaster) and central macular thickness (CMT, Cirrus HD-OCT). This was repeated at 6-month intervals over a 12–18 month period.



Result: Twenty-eight myopes, mean age 10.68 (6–15 years) completed baseline assessment: mean SE -3.44 ± 2.22 D OD, -3.56 ± 2.24 D OS, AL 24.71 ± 1.14 mm OD, 24.65 ± 0.94 mm OS, CCT 551 ± 32 μ m OD, 555 ± 35 μ m OS, ACD 3.24 ± 0.33 mm OD, 3.27 ± 0.31 mm OS, astigmatism 1.65 ± 1.25 D OD, 1.52 ± 1.03 D OS and CMT 24.6 ± 19 μ m OD, 245 ± 19 μ m OS. At baseline, eyes displayed a high correlation between SE and AL (OD: $r = -0.67$, $p < 0.0001$, OS: $r = -0.55$, $p = 0.0035$), with this correlation maintained over the follow-up period. Apart from AL increasing by 0.16 OD ($p = 0.01$), and 0.18 mm OS ($p = 0.01$), only ACD significantly increased over the follow-up period ($p = 0.05$). There was no correlation between the other parameters: CCT, ACD, astigmatism and CMT with either AL or refraction.

Conclusion: A significant correlation between AL and SE was maintained over the follow-up period. ACD increased significantly but did not correlate with AL or refraction. This implies that although ACD changed over time, it was not a significant component of AL change. Ongoing monitoring will provide further insights into the morphological changes in progressive childhood myopia.

Idiopathic intracranial hypertension in a child with Bardet-Biedl syndrome

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Purpose: Bardet-Biedl syndrome (BBS) is associated with hydrocephalus, but not with idiopathic intracranial hypertension. We describe a rare case and propose the pathogenesis. We also discuss the challenges of diagnosis, treatment and monitoring outcomes in a population that is already at high risk of vision loss from retinal dystrophy.

Method: Single case report.

Results: A female patient with BBS and mild renal dysfunction was suspected to have mild optic nerve head swelling at the age of 7. Over a year, her body mass index increased from 22.9 to 26.5 (99th percentile). The patient was asymptomatic, but had developed Frisen Grade 3 papilledema. Magnetic resonance imaging brain demonstrated prominent optic nerve sheaths and flattened pituitary gland without ventriculomegaly, and lumbar puncture opening pressure was 42 cm H₂O. She was commenced cautiously on acetazolamide 10 mg/kg twice a day and on review her optic nerve swelling improved to Frisen Grade 1. Best corrected vision remained unchanged.

Conclusion: We hypothesize that idiopathic intracranial hypertension can result from a combination of risk factors, such as sudden increase in body mass index or progressive renal failure, in conjunction with the dysfunctional cilia in BBS patients. This represents a separate disease process to the more commonly seen hydrocephalus. Monitoring disease progression is also difficult in this population due to a lack of symptoms, concurrent nerve fibre atrophy from rod-cone dystrophy and the difficult learning curve required for visual field testing in these children. It is important that clinicians be aware of these challenges in this vulnerable population, and regular monitoring should be done to avoid preventable vision loss.

Surgical intervention in patients with orbital cellulitis—A retrospective analysis

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Purpose: Orbital cellulitis is a sight threatening condition. We present the largest review of paediatric orbital cellulitis in Australia—focussing on patients undergoing surgical intervention.

Methods: A retrospective chart review of 276 patients with orbital cellulitis at a quaternary children's hospital in Sydney Australia over a 17 year period. Outcome measures included case numbers, cultures isolated and case characteristics seen in patients undergoing surgical intervention.

Results: Of 276 patients analysed, 220 patients had orbital cellulitis, with others being deemed non orbital. There were greater case numbers in males and a greater prevalence of admissions in winter months. Common pathogens on cultures were *staphylococcus*, *streptococcus* and methicillin-resistant *Staphylococcus aureus*. There was no difference between cultures in groups proceeding to surgical intervention compared to those undergoing medical treatment. Surgical drainage was more common in children greater than age 9. Of 134 patients proceeding to surgery 38.8% had a subperiosteal abscess measuring over 1.5 cm in size, as compared to 18.6% of patients managed without surgical intervention. Surgical intervention was undertaken by ENT surgeons alone in 40.2% of cases and ophthalmologists alone in 34.3% of cases. Combined cases with ENT and ophthalmology occurred in 22.3% of cases. From the 9 patients that had secondary surgical drainage after recollection, 8 patients had

pansinusitis, 6 presented with an acuity poorer than 6/12, and 6 also had a white cell count greater than 16.

Conclusion: This is the largest series of paediatric orbital cellulitis in Australia. We highlight the demographics of patients requiring surgical intervention for this condition.

REFRACTIVE SURGERY

Corneal allogenic intrastromal ring segment implantation for the treatment of post-LASIK keratectasia

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Purpose: We present the first case report of corneal allogenic intrastromal ring segment (CAIRS) surgery combined with corneal collagen cross-linking (CXL) for the treatment of post-laser in-situ keratomileusis (LASIK) keratectasia.

Method: A 52 year old male presented with gradual blurring of vision following previous myopic LASIK. He was diagnosed with post-LASIK ectasia and subsequently underwent CAIRS surgery followed by oxygen-enriched transepithelial topography-guided CXL.

Results: At 3 month review, the patient reported subjective vision improvement, his uncorrected distance visual acuity had improved from 20/200 to 20/30 and corrected distance visual acuity improved from 20/30 to 20/20. Subjective refraction was improved from +3.25/−12.00 × 66 to +4.25/−5.25 × 47. No complications were noted.

Conclusion: This case shows early successful treatment of post-LASIK ectasia with CAIRS combined with CXL.

Clinical, corneal densitometric and dry eye outcomes of small incision lenticule extraction for high myopia

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Purpose: To report the clinical, corneal densitometric and dry eye outcomes of small incision lenticule extraction (SMILE) for high myopia.

Methods: Prospective study on eyes that underwent SMILE for high myopia (>6 dioptres) and myopic astigmatism. Main outcome measures at 1 month included uncorrected visual acuity in logMAR, spherical equivalent (SE) in dioptres (D), wavefront higher order aberrations, corneal densitometry values and tear film osmolality.

Results: This study included 22 eyes of 12 patients, the mean patient age was 34.4 ± 7.1 years. Post SMILE, 90.9% of treated eyes had a postoperative logMAR uncorrected visual acuity of 0.0 (Snellen 6/6) or better. Mean preoperative SE was -8.2 ± 1.6 D compared to mean postoperative SE of -0.5 ± 0.7 D ($p < 0.0001$). The mean preoperative refractive cylinder of 1.0 ± 0.8 D preoperatively was reduced to 0.42 ± 0.38 D ($p = 0.004$). Post SMILE SE within ± 0.5 D and within ± 1.0 D of intended refraction was noted in 77.3% and 100% of eyes respectively. A significant increase in higher order aberrations was noted from 0.4 ± 0.1 mm to 1.3 ± 1.3 mm ($p = 0.006$). No significant changes in corneal densitometry were noted in the anterior, mid stromal, posterior and total zones. No statistically significant difference was observed in tear film osmolality from 298.3 ± 11.7 mOsm/L preoperatively to 293.5 ± 19.5 mOsm/L postoperatively ($p = 0.30$).

Conclusions: Initial postoperative results indicate that SMILE is effective in correcting high myopia and myopic astigmatism with favourable visual outcomes and a complimentary dry eye profile.

Corneal densitometric outcomes of small incision lenticule extraction

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Purpose: To compare pre- and postoperative corneal densitometry values in patients who have undergone SMILE refractive surgery.

Methods: Prospective study of 170 eyes of 86 patients with myopia or myopic astigmatism. Preoperative corneal densitometry values and 1 month postoperative corneal densitometry values were measured with a Pentacam Scheimpflug device (Oculus Wetzlar, Germany). Total corneal densitometry was measured and divided into 3 sections—anterior cornea, mid-cornea and posterior cornea. Anterior and mid-cornea sections were subdivided into 0–2 mm and 2–6 mm zones.

Results: Mean age of patients included in this study was 32.4 ± 6.0 years. The mean spherical equivalent of 170 eyes preoperatively was -4.8 ± 2.1 dioptres. Postoperative



uncorrected visual acuity was -0.02 ± 0.10 (LogMAR). Postoperative spherical equivalent for all patients was -0.1 ± 0.4 dioptres. An overall increase in corneal densitometry values was observed with the most significant differences found between pre- and postoperative values for total corneal densitometry ($+1.85\%$, $p = 0.021$) and total posterior corneal densitometry ($+2.12\%$, $p = 0.033$), as well as the following cornea zones: Anterior 0–2 mm ($+3.24\%$, $p = 0.013$), Anterior 2–6 mm ($+5.10\%$, $p < 0.001$), Mid-cornea 0–2 mm ($+1.73\%$, $p = 0.040$). Total corneal densitometry values were not correlated with the postoperative refraction/visual acuity.

Conclusions: Corneal densitometry at the Anterior corneal 2–6 mm zone showed the greatest increase postoperatively and is consistent with the area at which SMILE surgery is performed and is therefore expected. An overall increase in corneal densitometry was found, with excellent acuity and refractive outcomes.

RETINA

An analysis of evidence-based vitamin supplements for age-related macular degeneration

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Purpose: To review the available products for age-related macular degeneration (ARMD) and identify products that mirror the recipe outlined by the Age-Related Eye Disease Studies (AREDS 2). Specifically, products containing vitamin C, vitamin E, zinc, copper, lutein and zeaxanthin.

Method: An electronic review of commercially available supplements for ARMD in pharmacies and websites in Australasia, United States, United Kingdom and Canada. The dose, formulation and cost of the supplements were reviewed. Supplements that contain all of the ingredients in the AREDS 2 formulation were included.

Results: Out of the 66 products reviewed, 43 products that contained all the AREDS 2 ingredients were included. Twenty products contained all ingredients at 100% or more of the recommended dose and 23 products contained one or more ingredients at a lower dose. Seven (35%) products were available online only and 13 (65%) products were available both online and in pharmacies. Daily consumption costs ranged between \$0.12 and \$6.72 Australian dollars per day. The formulation of the

products was variable, including 23 in capsule form, seven in tablet form, nine in soft-gel form, one in powder form, two in capsule or powder form, and one requiring both a tablet and soft-gel.

Conclusion: Commercially available products for ARMD are variable in price and resemblance to the evidence-based AREDS 2 formula. Clinicians should be aware of this information to assist in counselling patients with ARMD.

Axial length analysis in patients with retinal detachment in New Zealand

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Purpose: The aim of the study is to analyse the axial length (AL) in patients with rhegmatogenous retinal detachment (in Dunedin Public Hospital (New Zealand)).

Method: Retrospective analysis is performed on the record from 105 patients undergoing retina surgery with PPV in Dunedin Public Hospital between 1 January 2019 and 1 January 2021. AL was collected with Zeiss IOL Master500 (Carl-Zeiss AG Germany). Data was then compared to previous Dunedin healthy individuals (AL of normal population) and 2 samples of Auckland's cataract studies (control groups).

Results: Total data of 108 eyes from 105 patients of which 42 are female and 63 are male with an average age of 63.25 years. The mean AL of the patients was 24.30 ± 0.33 mm compared to the control group of 23.48 ± 0.06 mm. The differences in AL between RRD patients and the control group was 0.82 ± 0.23 mm, $p < 0.0001$. Patient with RRD also has greater AL when comparing to Dunedin's study which has a mean AL of 23.55 ± 0.11 mm. Male patients had a greater AL of 24.60 ± 0.41 mm compared to females, which was 23.84 ± 0.53 mm. This result is similar to that of the control groups where males have a greater mean AL compared to females.

Conclusion: Patients with an RRD have shown to have a greater AL when compared to those without. Males' patient has a greater mean AL when compared to females.

Retinal pigment epithelium tears after anti-vascular endothelial growth factor therapy for neovascular age-related macular degeneration

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Purpose: To assess the visual prognostic factors of retinal pigment epithelium (RPE) tears and describe their clinical features.

Methods: The medical records of treatment-naïve neovascular age-related macular degeneration patients who received intravitreal anti-vascular endothelial growth factor (VEGF) injections were retrospectively reviewed.

Results: The incidence of RPE tears was 1.36% (10 out of 733 eyes). The type of anti-VEGF agent administered did not affect the incidence ($p = 0.985$). The median best-corrected visual acuity (BCVA) of 10 patients decreased after an RPE tear (0.4 to 0.6 logMAR); however, subsequent injections restored the BCVA to a level similar to that before the RPE tear (0.4 logMAR, $p = 0.436$). Central macular thickness improved significantly during the study (794.4 to 491.9 μm , $p = 0.013$). The final BCVA was positively correlated with the BCVA before and immediately after the RPE tear ($p = 0.025$ and 0.002 , respectively) and was weakly correlated with foveal involvement of the RPE tear ($p = 0.061$).

Conclusion: The incidence of RPE tears did not differ according to the type of anti-VEGF agent. The final BCVA was proportional to the BCVA before and after RPE tears. Continuous treatment with anti-VEGF after the occurrence of RPE tears can benefit the final visual acuity and macular anatomy.

The carbon footprint of intravitreal injections

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Purpose: To estimate the carbon footprint of an intravitreal injection (IVI) in Wellington.

Method: Across four public injection-only clinics for a total of 226 IVIs, we measured: (i) travel for patients and staff; (ii) building energy use; (iii) waste disposal; and (iv) procurement (consumption of both pharmaceuticals and disposable materials). We used emissions coefficients from New Zealand and the United Kingdom to calculate a total emission per injection in kgCO_2e .

Results: Most of the emissions came from the injected pharmaceutical as this was the major cost, and emissions from procured materials are based on cost. From the disposable materials, travel, building energy and waste disposal, we estimated an emissions footprint of 14.1

kgCO_2e per IVI, equivalent to a 6 L petrol burn, or approximately 75 km drive. An average of 23 km was travelled by staff and patients per IVI which represented 40% of the footprint. The emissions from non-injected medications and disposable supplies were 45% of the footprint, representing \$20 NZD of materials. Emissions from building energy use (predominantly gas heating) comprised 14% of the footprint, and emissions from disposal of 170 g waste per IVI were negligible.

Conclusion: The optimisation of travel and procurement present the most compelling opportunities to reduce the carbon footprint of IVIs. To minimise the footprint from travel, injection clinics should be located at regional population centres and public transport hubs. Standardising the use of disposables and maximising the use of reusable items can reduce the footprint from procurement and waste disposal.

The effect of real-world follow up delay between planned intravitreal anti-vascular endothelial growth factor treatments for neovascular age-related macular degeneration on retinal thickness

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Purpose: To study the impact of real-world follow-up delay on the anatomical outcomes for age-related macular degeneration (AMD) treated with intravitreal injection at Whangārei Hospital.

Method: A prospective, sequential, observational cohort analysis of the Whangārei Hospital intravitreal injection clinic was conducted between August 2021 and December 2021. Planned follow-up time on an as-required or treat and extend protocol was compared with actual follow-up injection time. Optical coherence tomography central macular thickness (CMT) measurements were collated for each patient with a treatment review.

Results: The mean delay from planned injection for patients receiving intravitreal injection ($n = 709$) was 7.50 days [SD = 21.48]. Eyes that received an intravitreal injection within 7 days of their planned treatment date prior to clinical review ($n = 210$) had a mean reduction of their CMT [$-5.76 \text{ mm} \pm 2.84 \text{ mm}$]. Eyes that received treatment later than 7 days from their planned treatment date prior to clinical review ($n = 154$) had a mean increase in the CMT [$8.99 \text{ mm} \pm 4.28 \text{ mm}$]. We also found a time-dependent correlation between increased delay (in weeks) and CMT.

Conclusion: Delay greater than 7 days from planned injection was associated with a statistically significant increase in the CMT in patients with AMD. This suggests



clinician-led assessment of treatment interval is accurate with regards to outcomes as measured by retinal thickness. It also suggests the importance of adherence to recommended follow-up timeframes regardless of the AMD treatment protocol used.

Health economic implications of artificial intelligence implementation for ophthalmology in Australia: A systematic review

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Purpose: The healthcare industry is an inherently resource-intense sector. Emerging technologies such as artificial intelligence (AI) are at the forefront of advancements in healthcare. Despite significant research and investments into AI in the field of ophthalmology, the health economic implications of this technology have not been clearly established and represent a substantial barrier to adoption both in Australia and globally. This review aims to determine the health economic impact of implementing AI to ophthalmology in Australia.

Method: A systematic search of the databases Pubmed/MEDLINE, EMBASE and CENTRAL was conducted to March 2022, prior to data collection and risk of bias analysis in accordance with PRISMA 2020 guidelines.

Results: Seven articles were identified that fulfilled inclusion criteria. Economic viability was defined as direct cost to the patient that is equal to or less than costs incurred with human clinician assessment. Despite the lack of Australia-specific data, foreign analyses overwhelmingly showed that AI is just as economically viable, if not more so, than traditional human screening programs while maintaining comparable clinical effectiveness. This evidence was largely in the setting of diabetic retinopathy screening.

Conclusions: Primary Australian research is needed to accurately analyse the health economic implications of implementing AI on a large scale. Further research is also required to analyse the economic feasibility of adoption of AI technology in other areas of ophthalmology, such as glaucoma and cataract screening.

Delayed presentation of fungal endophthalmitis after penetrating eye injury in a patient on biologics for multiple sclerosis

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Purpose: Discuss the role of biologics as immunosuppressants in delayed presentation of fungal endophthalmitis after penetrating eye injury.

Method: Case presentation and literature review.

Results: N/A.

Conclusion: Biologics may modify the presentation of fungal endophthalmitis after penetrating eye injury.

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 vitreoretinopathy at presentation. This was followed by diabetic vitrectomy $n = 20$ (19%) and non-diabetic vitreous haemorrhage $n = 12$ (12%). 8 patients had dropped nuclei (5 referred from peripheral hospitals) and 3 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 postoperatively, 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 postoperative period, with limitations identified as PVR 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.

Acute macular neuroretinopathy following COVID-19 infection

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Purpose: We aim to highlight a case of COVID-19 associated acute macular neuroretinopathy (AMN), an outer retinopathy known to occur following febrile and flu-like illnesses.

Method: Case report.

Results: A 23-year-old Caucasian female presented with a 10-day history of sudden onset bilateral paracentral scotomata which developed following confirmed SARS-CoV-2 infection. The patient's medical history was significant for polycystic ovary syndrome and use of the combined oral contraceptive pill (OCP). Fundoscopic examination revealed multiple reddish-brown, wedge shaped lesions in both eyes perifoveally. Optical coherence tomography of these lesions demonstrated areas of ellipsoid zone disruption associated with overlying hyper-reflectivity of outer retinal layers. The lesions were hyporeflective on infrared imaging. The location of lesions at the macula correlated nearly identically with Amsler grid recordings as illustrated by the patient. As a result, the patient was diagnosed with AMN. Other inflammatory, infective and hypercoagulable causes of outer retinopathy were excluded. While OCP use is a risk factor for AMN, the aetiology was determined to be associated with COVID-19, given the onset of visual symptoms closely following the onset of acute febrile illness.

Conclusion: We report a rare case of AMN occurring in the context of recently diagnosed COVID-19, on the background of OCP use. More broadly, this case report aims to contribute to the broader literature regarding COVID-19 associated ocular sequelae. Clinicians should consider asking about recent COVID-19 infection when encountering patients presenting with symptoms of AMN.

Comparison of outcomes of the dexamethasone implant (Ozurdex) for diabetic macular oedema, retinal vein occlusion, and non-infectious posterior uveitis

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Purpose: To report the visual and anatomical outcomes of the dexamethasone implant for diabetic macular oedema (DMO), retinal vein occlusion (RVO), and non-infectious uveitis (NIU).

Method: A retrospective review of patients who received the dexamethasone implant (Ozurdex, Allergan, Irvine, USA) at the Princess Alexandra Hospital, Australia between June 2018 to January 2021. Demographics, indication, number of injections, visual acuity, intraocular pressure, and central macular thickness before and after the first intravitreal dexamethasone were recorded.

Results: Eighty-nine eyes of 77 patients were included. The mean age was 66.28 ± 12.64 years and 33 (42.9%) were males. 43 eyes of 38 patients had DMO, 16 eyes of 16 patients had RVO, and 30 eyes of 25 patients had NIU. At the most recent follow-up visit, all groups had a significant reduction in CMT (DMO -69.29 ± 28.34 mm, $p = 0.01$; RVO -80.81 ± 47.72 mm, $p = 0.05$; NIU -98.27 ± 34.07 mm, $p < 0.01$). Patients with NIU had a significant improvement in visual acuity (logMAR -0.26 ± 0.11 , $p = 0.02$), while patients with DMO had a non-significant improvement (-0.02 ± 0.02 logMAR, $p = 0.37$). On average, patients with RVO had stable visual acuity. All groups had a significant reduction in injection frequency (DMO $+ 8.55 \pm 1.16$ weeks, RVO $+ 10.00 \pm 2.33$ weeks, NIU $+ 20.09 \pm 5.97$ weeks) ($p < 0.01$).

Conclusion: The dexamethasone implant was used for various indications at our institution. There was stability in visual acuity, improvement in anatomical outcomes, and a reduction in injection burden across all indications. The dexamethasone implant should be considered for patients with resistant macular oedema with an ongoing significant injection frequency on anti-vascular endothelial growth factor.

Results of a Delphi consensus study of current diagnosis and management of geographic atrophy due to age-related macular degeneration

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Purpose: With emerging therapies for geographic atrophy (GA), there is an unmet need to establish status quo in its management.

Methods: Eight retina specialists (RS) developed a consensus sent to 175 randomly selected RS. After round 1, 125 RS (selected from the same respondents) were probed further on topics not achieving consensus. Questions were open-ended, multiple-choice, rank-order and level of agreement (Likert scale). Consensus was defined as $\geq 75\%$ agreement.

Results: The most elicited symptoms during an initial clinical visit include reading difficulties (93%) and impaired ability to recognise faces (84%). The most used functional measures for GA are best-corrected visual acuity (94%) and Amsler grid (86%). Optical coherence tomography (98%) and fundus autofluorescence (81%) are the most used imaging modalities. Optical coherence tomography was ranked first or second most important imaging modality for GA diagnosis (85%) and monitoring (82%). Foveal involvement is the most important variable for GA prognosis (76%). Impact on daily living (89%) and visual-aid options (75%) are important topics to discuss with newly diagnosed patients. A GA treatment option would have a significant positive effect on quality-of-life (90%). Low-vision aids (90%), smoking cessation (86%), and vitamin supplementation (75%) are considered beneficial for GA. Active neovascular age-related macular degeneration was the most common circumstance requiring close follow-up (76%). Patients with choroidal neovascularisation controlled by anti-vascular endothelial growth factor therapy can continue to experience vision loss due to atrophy (82%).

Conclusions: RS agreed GA is a significant burden. In lieu of treatment options, RS also agreed on general clinical management approaches.

A phase 1B study of the safety and tolerability of the mineralocorticoid fludrocortisone acetate in patients with geographic atrophy

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Purpose: To evaluate the safety and tolerability of a mineralocorticoid, in a single-dose intravitreal injection of

1 mg/0.1 ml and 2 mg/0.1 ml fludrocortisone acetate (FCA) in subjects with geographic atrophy (GA) secondary to age-related macular degeneration.

Methods: This phase 1b study was a two-part dose-escalation prospective study. Part-1 involved a single participant treated with 1 mg/0.1 ml and monitored up to 28-days before being reviewed by a safety review committee. Two subsequent participants were then dosed with the same dose. Part-2 involved a single participant dosed with 2 mg/0.1 ml and monitored up to 28-days when a further 5 participants were dosed. All participants were followed up for 6-months after baseline. A full ophthalmic assessment was performed at study visits which included GA area, best-corrected visual acuity (BCVA), low-luminance BCVA and intraocular pressure (IOP). Adverse events were reported from the first dose of FCA until the end-of-study visit.

Results: There were no serious AEs (ocular or systemic) observed with intravitreal FCA at either 1 mg/0.1 ml or 2 mg/0.1 ml among the 9 participants. There was no evidence of increased IOP or cataract development. Neither BCVA or LL-BCVA changed significantly in the study-eye over the follow-up period ($p = 0.28$ and 0.38 respectively). Mean GA area increased in the study (0.5 mm^2 $p = 0.003$) and fellow-eyes (0.62 mm^2 $p = 0.02$) over 6-months. Differences between eyes were not significant ($p = 0.64$), and at the lower end of population norms.

Conclusion: Intravitreal FCA is clinically safe and well-tolerated and did not increase IOP.

Full thickness macular hole closure following a single intravitreal injection of aflibercept in an eye with diabetic macular oedema

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Purpose: To report on a case of full thickness macular hole (FTMH) closure following a single dose of aflibercept in a patient with diabetic macular oedema (DMO).

Methods: A case report of a FTMH secondary to DMO is presented.

Results: A 32-year-old male presented with reduced vision in the right eye. Fundus examination revealed moderate non-proliferative diabetic retinopathy with clinically significant macular oedema and absence of fibrous vitreous bands. Spectral-domain optical coherence tomography revealed intraretinal DMO and a FTMH. The patient received a single intravitreal injection of 20 mg aflibercept and was booked for pars plana vitrectomy. Four weeks post injection, the patient's vision had improved and

repeat Spectral-domain optical coherence tomography revealed closure of the FTMH with significantly reduced intraretinal fluid. Surgery was cancelled and the patient underwent a further three intravitreal injections of aflibercept spaced four weeks apart to treat the residual DMO.

Conclusion: FTMH is a rare complication of DMO that typically requires surgical management with pars plana vitrectomy and internal limiting membrane peel to reduce traction on the retina. The use of anti-vascular endothelial growth factor to treat a FTMH is uncommon. We present a case of FTMH closure after a single dose of intravitreal aflibercept, which to our knowledge, is the first of its kind. In the absence of vitreomacular traction, there may be scope to trial intravitreal anti-vascular endothelial growth factor to treat a FTMH associated with DMO to avoid surgery and its associated risks.

Detection of faces with a second-generation suprachoroidal retinal prosthesis

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Purpose: Bionic vision with a retinal prosthesis allows object localisation, but face detection is not provided in current device software. The aim was to compare accuracy in face detection using a face-specific vision processing method (FaD) to the current comprehensive vision processing method (Lanczos2; L2) in recipients of the second-generation (44-channel) suprachoroidal retinal prosthesis.

Method: Four implant recipients (#NCT05158049) with profound vision loss due to retinitis pigmentosa were acclimatised to both vision processing methods. One or two mannequins (dressed in white or black) were positioned forward (face visible) or backward (face not visible) in the right, middle, and/or left position(s) in a square room

(4 × 4m) with a white curtain backdrop. Participants (40 trials each, randomised) were asked to detect the number of mannequins and the (forward) faces present.

Results: For the detection of mannequins, performance accuracy was equivalent between FaD (47.2 ± 5.5% correct) and L2 (56.2 ± 10.5%) with one mannequin present ($p = 0.234$, Kruskal-Wallis). However, FaD (20.3 ± 7.7%) performed better than L2 (5.6 ± 6.4%) with two mannequins present ($p = 0.036$). For the detection of faces, FaD (total 80.0 ± 8.9% correct) performed significantly better than L2 (total 34.1 ± 4.2%) regardless of whether zero ($p = 0.019$), one ($p = 0.021$) or two ($p = 0.013$) faces were presented.

Conclusion: The FaD processing method performs better than the L2 processing method for the purpose of specifically detecting faces. Hence, there is potential for FaD to be incorporated into the bionic eye vision processing system to aid social interaction.

Detection of available chairs with a second-generation suprachoroidal retinal prosthesis

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Purpose: Retinal prosthesis recipients have indicated that identification of chairs is a useful tool in the real-world environment. Current device software allows object localisation but does not specifically identify chairs. The aim was to compare accuracy in chair detection using a novel chair-specific vision processing method (ChD) to the current comprehensive vision processing method (Lanczos2; L2) in recipients of the second-generation (44-channel) suprachoroidal retinal prosthesis.

Method: Four implant recipients (#NCT05158049) with profound vision loss due to retinitis pigmentosa were acclimatised to both vision processing methods. Two mannequins (dressed in white or black) were seated face forward in two of three chairs (right, middle, left) in a



square room ($4 \times 4\text{m}$) with a white curtain backdrop. Participants (36 trials each, randomised) were asked to detect and navigate to the available chair (white or black) and navigation time was recorded.

Results: The ChD vision processing method ($87.5 \pm 14.6\%$ correct) performed significantly better than L2 vision processing method ($19.4 \pm 13.2\%$) for detecting available chairs ($p = 0.020$, Kruskal-Wallis). Furthermore, ChD performed better than L2 regardless of whether black ($p = 0.019$) or white ($p = 0.015$) chairs were used against the white backdrop. There was no difference in time taken to navigate to the available chair (L2 51.6 ± 25.1 s, ChD 48.4 ± 28.7 s; $p = 0.564$).

Conclusion: The ChD processing method performs better than the L2 processing method for the purpose of specifically detecting chairs. Hence, there is potential for ChD to be incorporated into the bionic eye vision processing system to aid real-world navigation.

Establishment of a new retinal service in remote Western Australia: Kimberley hub—A comparative audit 2019–2022

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Purpose: The Lions Outback Vision provides access to specialist eye care in rural and remote Western Australia. In 2021, the Kimberley Hub was established and included the appointment of a permanent vitreoretinal surgeon. This is a retrospective audit of retinal services provided by Lions Outback Vision within the North Western Australian region, in the year prior to, and following, establishment of the Kimberley Hub.

Methods: All ophthalmology occasions of service in the Kimberley in 2019 (1/1/19–31/12/19) were compared with those from April 2021 to March 2022.

Data are presented as number (percentage) and mean $\pm$ SD as continuous data was normally distributed. Two-way comparisons for categorical data were by chi-square test.

Results: Appointments increased by 75% from 3307 to 5793 between the 2019 and 2021/22 periods respectively. There were significantly more people who attended the service (1711 in 2019 and 2405 in 2021/22, $p < 0.001$). Non-attendance significantly reduced from 28.5% to 18.7% ($p < 0.001$). In the 12 months following introduction of vitreoretinal capabilities, 42 surgeries were performed on 35 people (mean $\pm$ SD age of 56.1 ± 13.1 years at first surgery), 17 (48.6%) were male, 29 (82.9%)

identified as Aboriginal or Torres Strait Islander and 19 (54.3%) had diabetes. Nine (21.4%) of these cases were emergency procedures. The number of people receiving intravitreal injections significantly increased between the two periods (78 and 122 respectively, $p = 0.002$). There were significantly more laser photocoagulation procedures ($p = 0.028$).

Conclusion: Establishment of the Kimberley Hub saw increased appointments, reduced non-attendance and establishment of the first vitreoretinal service in remote Western Australia.

Colour vision testing in cone and cone-rod dystrophies: A role in monitoring disease

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Purpose: To determine whether Hardy-Rand-Rittler (HRR), Ishihara and Farnsworth-Munsell Saturated Panel D-15 (FD15) bedside colour vision tests can be used to monitor disease progression in Cone and Cone-Rod Dystrophy.

Methods: One hundred and fourteen patients with progressive Cone or Cone-Rod Dystrophy diagnosed by electroretinography (ERG) at the Save Sight Institute in Sydney from 2003 to 2022 were included in a retrospective analysis. Each patient's HRR, Ishihara and FD15 colour vision test scores were compared with markers of cone and rod system function including visual acuity (VA), ERG responses and changes on spectral domain optical coherence tomography (OCT) and fundus autofluorescence.

Results: A negative correlation was found between the number of plates identified on HRR and Ishihara testing and logMAR best corrected distance VA; $r(101) = -0.49$, $p < 0.001$ and $r(59) = -0.56$, $p < 0.001$ respectively. The Total Error Score and number of diametric crossings on FD15 also correlated with VA; $r(19) = 0.60$, $p = 0.0041$ and $r(24) = 0.57$, $p = 0.0026$ respectively. Significant correlations were found between HRR, Ishihara and FD15 scores and optical coherence tomography central macular thickness, cone-specific Full Field ERG 30-Hz flicker amplitudes and light adapted 3 B-wave amplitudes. There was no correlation between colour vision testing scores and changes on Fundus Autofluorescence. Sub-analysis of cone dystrophy patients showed no correlation between Ishihara scores and near VA, central macular thickness and cone ERG responses in this group.

Conclusion: Colour vision testing with HRR and FD15 can be used to monitor disease progression in Cone and Cone-Rod Dystrophies.

Central serous chorioretinopathy treated with focal subthreshold 3 ns laser: A retrospective case series review of 84 eyes of 80 patients

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Purpose: To evaluate the efficacy of focal subthreshold 3 nanosecond (3 ns) laser (2RT[®] AlphaRet) treatment of retinal pigment epithelial dysfunction in central serous chorioretinopathy: a consecutive case series.

Methods: All patients fulfilled the major diagnostic criteria of current symptomatic serous retinal detachment of ≥ 3 months duration. Eyes with cystoid changes or choroidal neovascularisation were excluded. After threshold determination (2–4 spots) the site of increasing fluorescence was treated directly with subthreshold applications by WJH. Patients were reviewed after 6 weeks and retreated if still active. Data analysis was with IBM SPSS Version 28 software.

Results: Of the 84 eyes, 70 had resolved at a mean of 42.23 days, 14 were retreated: 11 with repeat focal alone, 3 with supplemental grid in the inferior serous retinal detachment. VA improved: 72 to 74.88 letters (z -4.1, $p < 0.001$), central macular thickness improved: from 341.9 to 234.3 ($p < 0.001$), mean number of spots was 7.1 (median 4.5; SD 7.5; range 2–43), mean power 2.07 mJ (SD 1.5; range 1–9) and no complications occurred.

Conclusions: These results support the hypothesis that subthreshold 3 ns laser limited to the area of fluorescein leakage or staining can induce sustained SRF resolution in central serous chorioretinopathy. In this series 83.3% of eyes resolved within 6 weeks. And, of the 14 cases that did not settle, 11 were successfully retreated focally at a higher power while in 3 cases, scatter treatment in the dependent residual fluid. There were no cases of choroidal neovascularisation which is consistent with other case series of 3 ns laser. Further studies are warranted.

Environmental impact of fluorinated gas use in vitreoretinal surgery at the Royal Victorian Eye and Ear Hospital

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Background: Fluorinated gases are widely used in ophthalmic surgeries. Their medical applications include usage in vitreoretinal surgery to tamponade the retina in retinal detachment repair or full-thickness macular hole repair, and to secure corneal lamellar grafts. Fluorinated gases are eventually expelled from the body or disposed of as medical waste into the atmosphere. They are powerful greenhouse gases with a lasting global-warming potential 23,500 times greater than CO₂.

Methods: This retrospective audit outlines the usage of fluorinated gas in the vitreoretinal unit at Royal Victorian Eye and Ear Hospital, Victoria. Anonymised data were extracted from the Australian and New Zealand Society of Retinal Surgeons registry (on Redcap).

Results: From 2017 to 2020 inclusive, 1503 retinal detachment and full-thickness macular holes cases were recorded on the registry. SF₆ was the most common tamponade used for both full thickness macular hole (77%) and retinal detachment repair (84%). If we assume 30 ml of gas were emitted for each operation, the total emission over the 4-year period equates to 242 g of SF₆, 13.0 g of C₂F₆, and 48.1 g of C₃F₈, equivalent to 6.26 tonnes of CO₂, which is the emission of an average car travelling for 9684 km. We then collected data on gas purchased over the 4-year period. Assuming all gases purchased were eventually emitted into the atmosphere, the CO₂ mass equivalent emitted over the 4-year period equates to 63.4 tonnes, implying huge amount of waste.

Conclusion: There are opportunities to significantly reduce greenhouse gas emissions through more efficient gas preparation and dilution in theatre.

A 10-year review of endophthalmitis rates and organisms at a regional tertiary centre in Australia

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Purpose: Analyse the rates, causative microorganisms, and surgical management of patients presenting with



endogenous or acute exogenous endophthalmitis to a regional tertiary centre in Australia over a 10-year period. **Methods:** Single centre 10-year retrospective review of patients admitted to the John Hunter Hospital, New South Wales with endophthalmitis, from 31 December 2009 to 31 December 2019. Cases were categorised as: (i) post-cataract surgery; (ii) post-intravitreal injection; (iii) trauma; (iv) post-glaucoma surgery; (v) post-vitreous surgery; (vi) endogenous; (vii) other. Surgical intervention with pars plana vitrectomy was assessed as early (<48 h) or late (>48 h).

Results: A total of 137 patients with a mean age of 72.34 years (74 F:63 M) met eligibility. Exogenous cases made up 88.3% (n = 121) and endogenous 11.7% (n = 16). Sources of exogenous endophthalmitis were post-cataract (38%; n = 52), post-intravitreal injection (21.9%; n = 30), post-trauma (2.9%; n = 4), post-glaucoma surgery (5.1%; n = 7), post-vitreous surgery (9.5%; n = 13), and undefined/other (10.9%; n = 15). Organisms were isolated on culture in 56% (n = 77). Gram-positive organisms predominated (79.2%; n = 61), with *Staphylococcus epidermidis* most common, isolated in 29.5% (n = 18). Gram-negative organisms were isolated in 15.6% (n = 12) with *Pseudomonas aeruginosa* in 46.7% (n = 5). Fungal species were isolated in 5.2% (n = 4). A total of 35% (n = 48) underwent vitrectomy, with 20.8% (n = 10) occurring early (<48 h), and 79.2% (n = 38) late (>48 h). Enucleation was required in 7.3% (n = 10).

Conclusion: Endophthalmitis remains a significant complication, particularly following cataract surgery and intraocular injections in a regional setting, with *Staphylococcus epidermidis* as the most common causative organism.

Outcomes of switching from proactive to reactive treatment after developing advanced central neovascular age-related macular degeneration

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Purpose: We assessed outcomes of eyes with neovascular age-related macular degeneration that switched from a proactive (treat-and-extend) to a reactive (pro re nata) treatment regimen after developing center-affecting macular atrophy (MA) or submacular fibrosis (SMFi).

Methods: Data were collected from a retrospective analysis of a prospectively designed, multinational registry of "real-world" neovascular age-related macular degeneration treatment outcomes. Eyes without MA or SMFi when starting treatment with a vascular endothelial growth factor inhibitor regimen that subsequently developed MA or SMFi were included.

Results: Center-affecting MA developed in 821 eyes while 1166 eyes developed SMFi. Seven percent of eyes that developed MA, and 9% of those that developed SMFi, were switched to reactive treatment. Mean (95% confidence interval) visual acuity change 12 months later, was generally stable for all eyes with MA (0 [−3, 3] and −1.4 [−3, 0.2] letters for active and inactive, respectively) and eyes with SMFi and inactive lesions (−0.8 [−2, 0.4] letters). Active eyes that switched to reactive treatment after developing SMFi had significant loss of vision (−3.6 [−6, −1.2]; p = 0.004). No eyes that continued proactive treatment developed a ≥15 letter loss, but 8% of all eyes that switched to a reactive regimen, and 15% of those with active lesions that switched after developing central SMFi did.

Conclusion: Eyes that switch from proactive to reactive treatment after developing MA and inactive SMFi, can have stable visual outcomes. Physicians should be aware of the risk of a significant loss of vision in eyes with active SMFi that switch to reactive treatment.

Genetic testing of inherited retinal disease in Australian tertiary private ophthalmology practice

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Purpose: To assess the prevalence of genetic testing for inherited retinal diseases (IRD) in a tertiary practice setting.

Methods: Single-centre retrospective analysis of patients with diagnosed or suspected IRD.

Results: Four hundred and sixty-four patient records were analysed. The patients had received care for different IRDs grouped as follows: panretinal pigmentary retinopathies (283, 61%), macular dystrophies (136, 29.3%), stationary diseases (23, 5%), hereditary vitreoretinopathies (14, 3%), and other IRDs (8, 1.7%). The suspected pattern of inheritance of patients' IRD was predominantly autosomal recessive (205, 44.2%). Genetic testing was performed with the corresponding results available for 44 patients (9.5%). Diagnostic yield was 65.9% for the results received. For patients without genetic testing results, reasons include awaiting a geneticist consultation (17.9%), awaiting test results (4.5%), or patient refusal (8.4%). Most clinical records (69.2%) did not document genetic testing status.

Conclusion: Genetic testing is increasingly being utilised in the work-up for patients with IRD worldwide. This large Australian private practice IRD cohort shows a low uptake of testing (around 10%), reflecting historical management patterns and accessibility of genetic counselling and testing. The results show that younger patients and those with a longer duration of care were more likely to have received genetic testing. As the importance of IRD genetic testing continues to increase, we expect to see a change in patient management within the Australian private ophthalmology system and testing rates to increase.

The clinical outcomes and cost of pars plana vitrectomy in the surgical rehabilitation of open globe injuries

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Purpose: To report the frequency, outcomes and cost of pars plana vitrectomy (PPV) in the surgical rehabilitation of open globe injuries.

Method: Retrospective, tertiary-centre, observational study of 155 consecutive patients (aged >16) over 10 years. The Ocular Trauma Score (OTS) was calculated.

Outcomes measured included visual acuity, retinal attachment rate, and projected economic costs using official Australian figures.

Results: Of 494 surgical procedures undertaken, 110 PPV and 11 scleral buckles were performed. Presenting visual acuity was 6/120 or worse in 95% of patients and mean OTS was 50 ± 3.3 . Final visual acuity was 6/60 or better in 45% of patients and complete retinal reattachment rate was 85%. Single and multiple PPV were performed in 13 and 27 patients, respectively. Of these, 19 patients (48%) required silicon oil insertion and 8 (20%) had their oil in situ at final follow-up. No significant differences in the age, OTS, or visual outcomes were identified between the single and multiple PPV groups. Although the timing of PPV remains contested, there is increasing evidence that early PPV may provide favourable outcomes. The cost of PPV, based on the number of operating theatre costs was estimated at AUD\$700040, equating to a cost of AUD\$6364 per procedure. Total hospital and direct societal costs of patients requiring PPV were AUD5.4–6.7 million.

Conclusion: A high proportion of open globe injuries required PPV engendering significant hospital and societal cost. Timely referral to a vitreoretinal centre that offers PPV likely provides the best chance of salvaging vision in an otherwise devastating situation.

Retrospective study of eyes with central serous chorioretinopathy treated with 3 ns laser

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Purpose: Central serous chorioretinopathy (CSCR) is characterised by serous detachment of the retinal pigment epithelial from the neurosensory retina. The underlying pathogenesis is not known; however, it is likely linked to RPE dysfunction. Sub-threshold nanosecond laser (3 ns) has been described as a treatment modality whereby it stimulates the RPE to absorb fluid more effectively. The aim of this study was to investigate the effectiveness and safety of 3 ns for CSCR.

Methods: A consecutive retrospective analysis of eyes with serous retinal detachment was conducted. Eyes were treated by one ophthalmologist using the AlphaRET[®] 2RT nanosecond laser after topical anaesthesia. A grid pattern of spots was applied within the area of serous detachment.

Results: Twenty eyes of 16 patients were included for analysis. Mean age was 47.7 (SD = 11.1) and most (85%)



were male with equal proportion of right and left eyes. Fifteen eyes (75%) presented with centrally positioned fluid, 65% were classified with RPE abnormality and 75% had smokestack leakage pattern. Average laser power applied at first treatment was 4.59 mJ (SD = 4.5 mJ) and the average number of treatment spots was 32.32 (SD = 31.3). Six eyes (30%) required re-treatment after first review (mean 86 days). Six different eyes then had a recurrence of CSCR and needed re-treatment between 154 and 280 (mean 226) days later. Mean best-corrected visual acuity at baseline was 71 letters and remained stable but central macular thickness improved after treatment ($p < 0.05$). No adverse events were reported.

Conclusion: 3 ns is a viable and safe treatment for sub-retinal fluid resolution in patients presenting with CSCR.

Brolucizumab treatment for pigment epithelial detachment in treatment-resistant neovascular age related macular degeneration

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Purpose: To assess changes in pigment epithelial detachment (PED) size among patients with neovascular age-related macular degeneration (nAMD) switched to brolucizumab.

Methods: Patients previously treated aflibercept for nAMD with PEDs were switched to brolucizumab and assessed every 4-weeks for 52-weeks. Best-corrected visual acuity (BCVA) and spectral-domain optical coherence tomography (Heidelberg) was performed at each visit to assess PED dimensions and were compared to baseline. A loading dose of brolucizumab was given every 4-weeks for the first 12-weeks. Patients were subsequently treated every 12-weeks (Q12W) unless, BCVA decreased by ≥ 5 letters from baseline. Or BCVA decreased by ≥ 3 letters AND central subretinal thickness increase $\geq 75 \mu\text{m}$, BCVA decrease ≥ 5 letters due to disease activity or new or worse intraretinal fluid compared with Week-12. If any criteria were met, participants were treated every 8-weeks (Q8W).

Results: Ten patients switched from monthly aflibercept to brolucizumab, mean age was 82 ± 8 years, 70% were male and 50% were right eyes. Of 10 eyes, 9 were treated Q12W and 1 received injections Q8W. Mean baseline BCVA, PED height and width was 62 ± 19.6 letters, $401.4 \pm 180 \mu\text{m}$ and $2819 \pm 818 \mu\text{m}$ respectively. At 48-weeks, BCVA, PED height and width changed by

$+3.1 \pm 13.1$ letters ($p = 0.50$) $-22.1 \pm 50.0 \mu\text{m}$ ($p = 0.10$) $+109.8 \pm 218.6 \mu\text{m}$ ($p = 0.27$) at 48-weeks respectively. Change in BCVA, PED height and width were not correlated ($r < 0.6$) at 48-weeks. No ocular or systemic events were reported through the duration of study.

Conclusion: Among this cohort of previously treated nAMD eyes with PEDs switched to brolucizumab, PED dimensions remained stable over the study period.

Long-term morphology of pigment epithelial detachments among patients receiving anti-vascular endothelial growth factor therapy for neovascular age-related macular degeneration

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Purpose: To report changes in pigment epithelial detachments (PED) among patients receiving anti-vascular endothelial growth factor treatment for neovascular age-related macular degeneration (nAMD) over 5 years.

Methods: This study retrospectively collected data on patients with nAMD with associated PED between 2009 to 2016 in a single retinal clinic. Data were collected annually from the baseline visit with up to five years follow-up. Optical coherence tomography was performed (Heidelberg Spectralis) to assess change in PED height and width from baseline. Paired T-tests were used to assess the statistical significance. PED stability was defined as stable if change was within $\pm 25 \mu\text{m}$ and $\pm 200 \mu\text{m}$ for height and width respectively. Subsequent visits were compared to baseline values.

Results: Thirty-four patients had complete 5-year follow-up data with a total of 39 eyes. Of these patients 19 (54%) were female, 17 (44%) were right eyes and the mean patient age was 72.6 ± 8.5 years. Baseline PED height was $213.6 \pm 167.4 \mu\text{m}$ and changed by $-1.0 \pm 21.7 \mu\text{m}$ ($p = 0.04$) after 5 years. Baseline PED width was $1813.7 \pm 819.3 \mu\text{m}$ and changed by $-16.25 \pm 234.4 \mu\text{m}$ after 5 years ($p = 0.05$). Nine eyes (23%) remained stable, 18 (46%) eyes decreased in PED height and 7 (18%) increased in size after 5 years. Conversely, PED width was stable in 14 eyes (36%), 17 (44%) increased in and 8 (20%) decreased in width after 5 years.

Conclusion: Pigment epithelial detachment parameters remained relatively stable among this cohort of patients with nAMD treated with anti-vascular endothelial growth factor over the 5-year period.

Influence of the APOE ϵ 4 allele on retinal nerve fibre layer thickness and optical coherence tomography angiography parameters in healthy aging: Optic nerve decline and cognitive change

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Purpose: To investigate the relationship between the APOE (Apolipoprotein E) ϵ 4 allele and retinal structural and vascular characteristics in healthy ageing subjects.

Methods: 109 healthy participants with a mean (SD) age of 67.1 ($\pm$ 9.0) years were recruited. Participants were classified as either APOE carriers or non-carriers based on the presence or absence of the ϵ 4 allele. Baseline assessment included best-corrected visual acuity, ocular history, intraocular pressure, colour vision, peripapillary retinal nerve fibre layer (RNFL) optical coherence tomography (OCT) and OCT angiography. OCT angiography images were analysed in ImageJ to quantify vessel density in the superficial and deep vascular plexus and the size of the Foveal Avascular Zone (FAZ). The relationship between carriers of APOE ϵ 4 allele and these ocular parameters was analysed using the generalised estimating equation models and data adjusted for age, sex as well as inter-eye differences as within-subject variables ($p < 0.05$).

Results: Twenty participants were identified as APOE ϵ 4 carriers (22% of the cohort). Temporal RNFL thickness was decreased in APOE ϵ 4 carriers ($p < 0.01$). Vessel density between carriers and non-carriers was not significantly different at either the superficial or deep level, however, the FAZ area was found to be smaller in ϵ 4 carriers in both superficial ($p < 0.01$) and deep layers ($p < 0.003$).

Conclusions: Our results indicate associations between reduced FAZ area and decreased temporal RNFL thickness with the APOE ϵ 4 allele. Further studies are warranted to fully characterise this association.

Galileo and the eye—Implantable telescope technology

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Purpose: This project describes the benefits and rehabilitation techniques of intraocular low vision aids, specifically the Implantable Miniature telescope (IMT) in bilateral advanced age-related macular degeneration.

Method: The patient was evaluated for both ophthalmic and emotional eligibility. Eligibility was determined by multiple factors including: visual acuity (VA), anatomical eye structure, VA improvement utilising the external telescope simulator, loss of peripheral vision tolerance, and patient expectations and motivation. Once all criteria were tested and met, the ophthalmologist performed surgery in theatre. The patient returned at different intervals post-operatively for the rehabilitation process.

Results: LogMAR VA in the left eye (eye undergoing surgery) was 1/60, and with the telescope simulator, 1/38. Surgery was completed, uncomplicated under general anaesthetic. One day post-op LE intraocular pressure was 13 mmHg and post-op drops were instilled. LVA at one week post-op was 2/60 on LogMAR, patient was not using magnified telescope image yet. Two weeks post-op, tracking and eye movement exercises were implemented in clinic and the patient executed them at home. At the next appointment, the patient was able to hold fixation with the magnified IMT image for longer than 30 seconds, the exercises were reinforced and LVA improved to 3/60 on LogMAR. Alternate eye viewing exercises were introduced as well as reading exercises. The patient accomplished some tasks that they were unable to previously do, such as doing crochet.

Conclusion: The quality of life and daily functionality have definitely improved post implantation of the IMT.

Retrieving retinal autofluorescence from retinal hyperspectral images using deep neural network analysis

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Background: Hyperspectral imaging (HSI) of the retina has been used to detect novel disease biomarkers. It is not known if hyperspectral imaging can serve as a surrogate of fundus autofluorescence (FAF) imaging. Conventional FAF imaging requires prolonged exposure to intense short wavelength light which limits patient acceptability and clinical utility. We hypothesize that the retinal spectral reflectance measured with HSI can be used to construct an accurate simulation of FAF.

Aim: To devise a method for estimating retinal autofluorescence using HSI.

Methods: Hyperspectral and FAF images of 64 patients with age-related macular degeneration were co-registered



using a machine learning software tool such that corresponding areas could be viewed and annotated simultaneously. FAF images were manually annotated to mark areas of hyperfluorescence, hypofluorescence and normal fluorescence. A multiclass 1-dimensional convolutional neural network was then trained using hyperspectral images of 54 participants, using the FAF annotations as the ground truth for fluorescence. Images of 10 participants were kept aside for testing. The trained deep learning network was then used to construct maps of retinal autofluorescence from the retinal hyperspectral images.

Results: The analysis is in progress and will be complete in the coming weeks. Pilot studies indicate close correspondence between FAF and hyperspectral fluorescence maps.

Conclusion: This project sets the foundation for further research into retinal fluorescence analysis with HSI, potentially enabling quantitative measurement of fluorescence and in vivo sub-typing of retinal fluorophores.

Cloud-based ocular imaging on Topcon Harmony for Maestro 2 optical coherence tomography assessments in five remote and Indigenous healthcare settings in Western Australia

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Purpose: To evaluate the service of cloud-based ocular imaging systems for optical coherence tomography (OCT) images for patients living in remote or Indigenous healthcare settings.

Methods: Five Topcon Maestro 2 OCT were deployed in different settings across Western Australia; two Aboriginal Medical Services, one rural optometry service, one remote district hospital, and the Lions Outback Vision Van serving 25 regional communities. Data were collated over one year period (01/05/2021 to 30/04/2022) in a retrospective, de-identified audit.

Results: Of the total 4531 patients with OCT scans across the five machines, 2869 (63%) were performed on the roving ophthalmology service (Vision Van) and 505 (11.2%) for specialist outreach at a remote district hospital. Of the 534 (11.78%) patients with OCT scans in Aboriginal Medical Services clinics, 148 were conducted by visiting optometry, 256 were for visiting ophthalmology, and 130 (2.86%) for primary diabetic screening. A regional optometry practice conducted teleophthalmology using OCT for remote viewing for 182 (4.01%) patients.

Conclusion: This audit assesses the utility of the role of the OCT with remote viewing capability via a cloud-based Harmony system in a wide variety of clinical settings. It may be of most benefit during visiting specialist clinics as well as for telehealth consultations in conjunction with visiting optometry. A limitation of Harmony requiring further work relates to internet firewalls and prohibition of cloud-based image service in the state remote district hospital.

Real world evaluation of Thirona RetCAD artificial intelligence tool for detection of referable diabetic retinopathy and age-related macular degeneration

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Purpose: Artificial intelligence (AI) tools such as Thirona RetCAD have an emerging role in the timely detection of retinal disease. We aim to evaluate the real-world performance of RetCAD for detection of referable diabetic retinopathy (DR) and age-related macular degeneration (AMD) in rural Western Australia.

Method: Forty-eight patients (86 eyes) with known DR or AMD were randomly selected from ophthalmology clinics in four rural centres. Clinical diagnosis was confirmed retrospectively on fundus photography by a retinal specialist. RetCAD was run on each image. The software produced a quantitative measure (scored 0–100) for the following outcomes: DR and AMD likelihood and image quality.

Results: Of 86 eyes reviewed, 47 had evidence of DR and 39 had evidence of AMD. After applying the AI tool, 68 eyes (79.1%) were diagnosed with the 'correct' diagnosis, where the likelihood score of DR or AMD in an eye with confirmed DR or AMD respectively was >50. Two eyes had an 'incorrect' diagnosis (likelihood score <20 in a confirmed case). In terms of image quality, 41 eyes (47.7%) were considered 'good' with a quality score >50, and 4 eyes were 'poor' (quality score <20). Three of these 4 'poor' quality images were given the correct diagnosis.

Conclusion: The majority of eyes screened by the Thirona RetCAD tool were correctly identified as having referable DR or AMD. Image quality and presence of artefact did not seem to influence diagnosis. Further studies are required to define the ideal threshold score for 'correct diagnosis' to better inform referral decisions.

Silicone oil removal. A review of 215 consecutive cases over 15 years from Waikato Hospital, New Zealand

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Purpose: To determine the pre- and postoperative characteristics of patients having removal of silicone oil (ROSO).

Method: Retrospective chart review of 215 consecutive ROSO cases performed over 15 years at a tertiary referral vitreoretinal centre in the North Island of New Zealand.

Results: The main reasons for silicone oil insertion were proliferative vitreoretinopathy (58%), trauma (13%), diabetes (12%) and giant retinal tear (8%). 360-degree laser and encircling band was performed in 41%, 360-degree laser alone in 28%, and 360-degree encircling band alone in 17%. Oil was left in the eye for a mean duration of 10 months before removal. Mean visual acuity gain from pre-silicone oil insertion to post silicone oil removal was 0.6 log mar units (hand movement vision to 6/120). Detachment rates post ROSO was 18%, which occurred over a mean of one month. Other complications included cystoid macular oedema (11%), glaucoma (5%), ischaemic optic neuropathy (4%), macular hole (3%) and haemorrhage (3%).

Conclusion: This is the first large study to review consecutive cases of ROSO from a single regional vitreoretinal centre in New Zealand. Results were consistent with international standards.

Post vitrectomy endophthalmitis: Incidence and risk factors

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Purpose: While endophthalmitis is a recognised uncommon complication of vitrectomy, remarkably little research exists on risk factors for post-vitrectomy endophthalmitis (PVE). Furthermore, its local incidence is unknown. This retrospective study of PVE

cases at the Royal Victorian Eye and Ear Hospital seeks to determine the rate of PVE and identify potential risk factors.

Method: A retrospective case study of post-vitrectomy endophthalmitis cases at the Royal Victorian Eye and Ear Hospital over 24 years, using data from the Victorian Endophthalmitis Registry (a REDcap database).

Results: Fifteen post-vitrectomy endophthalmitis cases were identified in 34 405 vitrectomies between 1998 and 2021, indicating a local incidence of 0.04% and a mean annual rate of 0.65 cases over the period of interest. A temporary peak in cases was observed concurrent to the introduction of small-gauge vitrectomy. 53% of cases (8/15) used 25-gauge ports, 27% (4/15) used 23-gauge and 20% (3/15) used 20-gauge. 53% of cases (8/15) did not use sutures, while most cases that were (33%, 5/15) used 8-0 or 7-0 vicryl sutures and the remainder (13%, 2/15) used 10-0 nylon sutures. We have collected further surgical and patient variables such as indication for vitrectomy, tamponade, prior eye trauma, diabetes and myopia. Potential risk factors will be compared to aggregate data from vitrectomies conducted at the center over the period of interest to calculate their relative risk.

Conclusion: This study has determined the scale of the issue and aims to provide further insights regarding potential risk factors for this devastating and sight threatening complication.

Intravitreal injections in the era of COVID-19—The Metro South Health Queensland experience

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Background: Intravitreal anti-vascular endothelial growth factor therapy currently represents the treatment standard for vision-threatening macular conditions, while treatment delays cause precipitous vision loss. The COVID-19 pandemic prompted unprecedented delays for patients receiving intravitreal injections (IVI). We aim to provide real-world data on the effects of delayed IVI treatment due to COVID-19 at our center and its associated visual consequences.

Methods: In this retrospective cohort study based at a tertiary hospital in metropolitan Brisbane, medical records were reviewed for consecutive IVI patients within a 6-week interval between March–May 2020. Patients

were divided into two groups based on whether they maintained or delayed their follow-up visit. Main outcome measures included best-corrected visual acuity (BCVA), central macular thickness as well as structural findings on OCT suggestive of disease activity.

Results: A total of 682 patients were scheduled to receive IVI-based care, with treatment delay observed in 123 patients (18.5%) for an average period of 64 days. BCVA worsened in the delayed group by an average of 0.136 letters compared to 0.008 in the control group ($p = 0.02$), with the most significant change seen in neovascular age-related macular degeneration patients ($p = 0.001$). Patients on Aflibercept and Ranibizumab were more likely to maintain vision compared to those on Bevacizumab ($p = 0.02$ and $p = 0.07$). Retinal vein occlusion patients were most likely to suffer from long-term visual consequences from delayed follow-up. In multivariate linear regression model for risk factor analysis; BCVA, distance from hospital and patient age were all correlated with treatment delays.

Conclusion: Patients who experienced treatment delays suffered short-term visual decline. However, visual losses were not sustained in majority of patients.

The use of macular integrity assessment microperimetry and optical coherence tomography in patients undergoing epiretinal membrane peeling surgery

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Purpose: Patients with epiretinal membrane (ERM) often describe symptoms such as metamorphopsia, loss of binocularity and inability to distinguish fine details. Microperimetry provides objective assessment of functional vision by measuring retinal sensitivity. This study aims to evaluate changes in macular function and retinal morphology in patients following membrane peeling surgery.

Method: Thirty-eight patients who underwent Pars Plana Vitrectomy ERM peeling surgeries between January 2019 to June 2020 were included in this study. Assessments included best-corrected visual acuity, microperimetry using macular integrity assessment measuring (CentreVue) assessing threshold sensitivity (dB) at central 4° and 10° and spectral-domain optical coherence tomography (Heidelberg Spectralis) in each topographic section. Patients were followed at 1, 3, 6 and 12 months.

Results: Mean age of the patients was 69 ± 8 years. Mean best-corrected visual acuity was 68 ± 9 and 74 ± 7 letters pre-operatively and 12 months respectively. Mean baseline macular thickness at central, inner nasal, inner temporal, outer nasal and outer temporal macula was 464 ± 85 , 447 ± 60 μm , 437 ± 63 μm , 374 ± 43 μm and 434 ± 46 μm , respectively. At twelve-months postoperatively, the mean macular thickness at central, inner nasal, inner temporal, outer nasal and outer temporal macula sections were reduced by 85 μm , 47 μm , 97 μm , 45 μm and 46 μm respectively. Mean baseline retinal sensitivity at central 10° and 4° area were 21.0 ± 3.4 dB and 19.2 ± 4.3 dB, and increased by $1.3 \pm \text{dB}$ and $2.3 \pm \text{dB}$ at central 10° and 4° area after 12 months.

Conclusion: Macular integrity assessment microperimetry and optical coherence tomography are useful clinical measures of function and structure in patients undergoing ERM surgery.

Macular function characterisation using macular integrity assessment-microperimetry in macular disorders

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Purpose: Microperimetry (MP) provides an objective assessment of functional vision by testing retinal sensitivity. In clinical setting, available MP instruments are NIDEK-MP and macular integrity assessment (MAIA)-MP. This study aims to show the clinical utility of MAIA-MP findings in a range of maculopathies. Macular pathology affecting different anatomic levels of: neurosensory retina, retinal pigment epithelium and choroidal layers were investigated.

Method: Patients were assessed using MAIA-MP for functional threshold sensitivity (dB) at central 10° using 37 measurement points. Fixation plot was also measured. Spectral-domain optical coherence tomography (OCT) (Heidelberg Spectralis) was used to assess macular structural morphology. Retinal threshold sensitivity was divided into 25-36 dB, 23-25 dB and 0-23 dB and each range was defined as “normal”, “suspect” and “abnormal” respectively. MAIA-MP further classified fixation stability into “stable”, “relatively unstable” and “unstable”.

Results: MAIA-MP demonstrated characteristic patterns of altered retinal sensitivity in of macular pathologies. The changes in MAIA-MP were correlated with findings in OCT. For example, in vitelliform macular dystrophy,



mean central macular sensitivity was reduced at 20 dB (abnormal) in discrete areas with vitelliform lesion confirmed by spectral-domain OCT, compared to higher average macular sensitivity of 26 dB (normal) in surrounding areas unaffected by vitelliform lesions. Fixation was affected in maculopathies affected by age-related and dystrophic causes.

Conclusion: In clinical practice, MAIA-MP provides characteristic functional and fixation patterns in patients with macular disorders.

Rate of anatomical closure in primary idiopathic macular hole repair and secondary repair techniques

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Purpose: To evaluate the rate of anatomical closure in primary idiopathic macular hole repair in a single public metropolitan hospital and assess techniques for secondary repair. Secondary outcomes of whether pandemic restrictions affected wait times for surgery and outcomes.

Methods: Retrospective case series involving 70 eyes from 63 adult patients. Analysis of preoperative and postoperative characteristics and intraoperative surgical techniques.

Results: 81.4% of patients had a preoperative visual acuity $\leq 6/36$ and 82.6% presented with a macular hole stage 3 or 4, with an average width of 445 microns. Patients had an average of 105 days waiting for surgery pre-pandemic (range 6–369) and 127 days during the pandemic (range 17–444). 79.4% of primary repairs and 66.7% of secondary repairs achieved anatomical closure. Earlier stage, shorter symptoms, better preoperative visual acuity, and hole width <400 microns were associated with higher rates of closure. Of the nine eyes that underwent secondary repair, the most used techniques were to extend the ILM peel (66.6%) and inject a longer acting tamponade (55.5%).

Conclusions: Well established preoperative traits are associated with better rates of closure and were replicated in this case series. Despite most patients presenting with poor preoperative characteristics, the primary closure rate was 79.4% compared to 76.5–78.2% in the literature. Average wait times increased by 22 days and average operations per year decreased by 3 during pandemic restrictions but did not affect rate of closure. Overall, public ophthalmology services are able to achieve comparable outcomes in a timely manner despite advanced macular hole disease.

Hydroxyurea enhances virus-mediated gene therapy in cell models and retinal explant

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Purpose: To investigate the effect of hydroxyurea (HU) pre-treatment on adeno-associated virus serotype 2 (AAV2)-mediated gene therapy in cultured cells and human retinal explant.

Method: An optimised dose of HU was added to Müller and ARPE-19 cells for 1, 8 or 24 hours prior to transduction with AAV2.EGFP viral particles. One week after transduction, expression of EGFP DNA and RNA was analysed by qPCR. Protein expression was analysed by fluorescence microscopy, Western blot and flow cytometry. Human retinal explant was treated with HU prior to transduction with AAV2.EGFP, then processed after one week for confocal microscopy. Cell cycle analysis was performed using flow cytometry on untransduced Müller and ARPE-19 cells after exposure to HU for 1, 8 or 24 hours.

Results: EGFP DNA, RNA and protein expression was significantly increased in Müller and ARPE-19 cells after pre-treatment with HU for 24 hours. Additionally, flow cytometry demonstrated increased EGFP expression and intensity of fluorescence per cell compared to non-HU treated cells. Increased EGFP expression was also observed in retinal explant after HU pre-treatment. Cell cycle analysis suggested a correlation between the proportion of cells in S phase at the time of transduction and protein expression after one week.

Conclusion: HU increased the efficacy of AAV2-mediated gene therapy in vitro and ex vivo, warranting further investigation as a potential clinical adjuvant.

Diagnostic and treatment preferences for central serous chorioretinopathy

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Purpose: There is a dearth of well-defined guidelines for the management of central serous chorioretinopathy (CSC) given the wide variability in disease progression and scarcity of high-powered studies. We conducted an online survey to assess the diagnostic and treatment preferences for CSC amongst Australian ophthalmologists.



Method: We designed and distributed a 33-item online questionnaire through the RANZCO affiliated emailing system. Participants were masked to the responses from other participants.

Results: There were a total of 61 respondents, of which 65.6% were retinal specialists. 88.5% and 86.9% of respondents treated between 1–5 cases of acute CSC and chronic CSC per month respectively. Fundus autofluorescence imaging was the most preferred diagnostic modality (80.3%) ahead of EDI optical coherence tomography (55%), indocyanine green angiography (9.8%) and fluorescein angiography (7%). 90.2% of respondents preferred to observe cases of acute CSC. For chronic cases, 42.6% preferred photodynamic therapy as first-line treatment, 9.8% preferred micropulse laser, 9.8% preferred anti-vascular endothelial growth factor (VEGF) and 8.2% preferred observation. 63.9% of respondents reported anti-VEGF as ineffective in the treatment of CSC without choroidal neovascularisation. Of the respondents who have used anti-VEGF for CSC without choroidal neovascularisation, aflibercept (21.3%) and ranibizumab (18%) appeared to be preferred agents.

Conclusion: While there is a common trend for the management of acute CSC, there are still variations in the management of chronic CSC, which can often be complex, thereby indicating the need for more definitive treatment guidelines. This survey data could be useful to plan a well-powered prospective study to address the treatment dilemmas in CSC.

HONU: A multicentre, prospective, observational study of the progression of intermediate age-related macular degeneration

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Purpose: To gain an understanding of the natural history/clinical progression of intermediate age-related macular degeneration (AMD) to inform the design of feasible interventional trials.

Methods: HONU is a prospective, multicentre, observational study across ~90 sites globally. It will enrol 400 individuals with large drusen and pigmentary abnormalities, without nascent geographic atrophy (GA) or greater atrophy in ≥ 1 eye (study eye). In the

fellow eye, nGA or greater atrophy without exudative macular neovascularisation is permitted. HONU will have a 3-year observation period after initial screening, where participants will be assessed every 12 weeks. Assessments include standard ophthalmologic examinations (slit-lamp, dilated fundus), intraocular pressure measurement, visual functional testing (best-corrected visual acuity, low-luminance visual acuity, quick contrast sensitivity function), multimodal retinal imaging (spectral-domain optical coherence tomography, colour fundus photography, fundus autofluorescence, near-infrared reflectance, flavoprotein fluorescence, swept-source optical coherence tomography angiography), Vision Impairment in Low Luminance questionnaire and ocular/serological fluid collections.

Results: The primary objective is to assess disease progression by conversion rates from drusen at baseline to atrophy, such as nascent GA, and subsequently to complete retinal pigment epithelium and outer retinal atrophy or GA. Anatomic changes on imaging will be evaluated longitudinally and their relationship with visual function parameters will be used to identify imaging biomarkers and develop diagnostic/prognostic models.

Conclusions: HONU will provide foundational natural history data on intermediate AMD progression and identify early structural imaging endpoints needed to inform the design and improve the feasibility of future early interventional studies aimed at preventing or slowing progression to vision-threatening advanced AMD.

STRABISMUS

To evaluate the types and frequency of strabismus that occur in children post cataract surgery

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Purpose: To evaluate the types and frequency of strabismus that occur in children post cataract surgery.

Method: A single centre retrospective chart review of all children aged less than 12 months who underwent lens-sectomy from 1 January 2014 to 1 January 2021. Cases were identified from theatre coding and electronic medical records. Cases with strabismus prior to cataract surgery were exempted.

Results: Seventy-five children (114 aphakic eyes) were included, 36 (48%) had unilateral cataract surgery while

39 (52%) were bilateral. The mean age at time of cataract surgery was 3.0 ± 2.5 months (range 1–10 months). The mean follow-up period was 41.2 ± 22.8 (range 2–72 months). Nineteen out of 75 patients developed strabismus, 18 (95%) had unilateral cataract, 1 (5%) had bilateral cataract. Out of the 19 strabismus cases recorded, esotropia was reported in 74% of the cases, follow by exotropia –16% while esotropia combined with dissociated vertical deviation and esotropia combined with inferior oblique each made up 5% of the population. More children who developed strabismus [17 patients (89.5%)] had cataract surgery prior to 6 months of age. Strabismus developed less frequently in those who had cataract surgery after 6 months of age [2 patients (10.5%)].

Conclusion: Strabismus, most commonly esotropia, is common after congenital cataract surgery and it occurs more often in those children who underwent unilateral cataract surgery, and in those less than 6 months of age. Further research is needed to better understand the mechanism of strabismus in this population.

TRAINING AND EDUCATION

Eye trauma and the use of artificial intelligence for improved workplace safety with compliance improvement

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Purpose: To provide a potential application of artificial intelligence (AI) to detect personal protective eye-equipment, to reduce ocular injuries.

Methods: Case presentation and discussion of an AI application with discrete classifiers for personal protective wear to improve personal protective eyewear compliance.

Results: This study demonstrates the feasibility of using an AI enabled systems to detect, remediate and train individuals. It also demonstrates utility for recordable compliance and audit tracking.

Conclusion: Ocular trauma is a major workplace and community safety issue across multiple industries with potential for long term loss of vision and as well as economic sequelae. This study demonstrates the feasibility of using an AI enabled system to detect personal protective eyewear, remediate if necessary and improve safety risks that exists in the workplace.

Ophthalmology trainee perceptions of incorporating artificial intelligence into the curriculum: A focus group study

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Purpose: The degree to which artificial intelligence (AI) programs are successfully implemented in ophthalmology practice will be contingent upon the opinions and knowledge of ophthalmologists. We sought to explore trainee perceptions of how best to prepare for the use of AI for diagnosis, prognosis, and patient management, to inform the development of a novel curriculum framework.

Method: Trainees of RANZCO participated in four online focus groups that were held over Zoom between October–November 2021. Questions explored AI educational priorities in the areas of AI fundamentals, clinical translation, and governance. Transcription and thematic analysis was performed using NVivo software according to the constant comparison method.

Results: Twelve ophthalmology trainees (64% male, 50% first year trainees) participated. Overall, trainees held positive views of the use of AI in ophthalmology ($n = 12$, 100%) and thought instruction on its use should be included in the curriculum ($n = 7$, 58%). Trainees indicated that it would be sufficient to have a basic understanding of AI provided there was an evidence-based expert-led approach to implementation of the technology. More importance was given to learning about the translational and clinical implementation aspects than the computer programming or governance aspects of the technology ($n = 10$, 83%). There was no consensus on the model of educational delivery.

Conclusion: Ophthalmology trainees were interested in gaining a basic understanding of AI and its potential implications for clinical practice, provided they were supported by domain experts. More work is needed with key stakeholders to develop the new curriculum framework.

Citation count for ophthalmology articles can be successfully predicted with machine learning

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Purpose: To determine the ability of machine learning natural language processing strategies to predict citation counts for peer-reviewed ophthalmology publications.

Method: Data were collected from PubMed between 2000 and 2021, including titles, abstracts, journals, medical subject headings and authors. Following pre-processing bidirectional encoder representations from transformers (BERT), logistic regression and XGBoost models were applied to these data to predict citation counts. 96 212 articles were included in the study.

Main Outcomes: The primary outcome was the area under the receiver operator curve (AUC) for the best-performing model when applied to the task of predicting journal articles that would have a citation count in the highest quartile, relative to other articles published in the same year, across all articles included in the study.

Results: When the BERT model was applied to the prediction of citation count in the highest quartile, with all of the available input data across the entire dataset, it achieved an AUC of 0.86 (accuracy 0.81). An AUC of 0.891 (accuracy 0.853) was returned in predicting lowest quartile citation counts. The BERT, XGBoost and logistic regression models all performed best in the prediction of articles that would receive ≥ 5 citations within 5 years of publication, when provided with all of the available input data (including titles, abstracts, journals, MeSH, and authors), with AUC of 0.802 (accuracy 0.72), 0.768 (accuracy 0.69), and 0.788 (accuracy 0.71) respectively.

Conclusion: This study has shown that natural language processing, in particular BERT, may successfully predict ophthalmology article citation counts.

Prediction of accepting journal impact with open-source artificial intelligence

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Introduction: Strategies to improve the selection of appropriate target journals may reduce delays in the dissemination of research results. Open-source artificial intelligence may be able to assist with this process.

Materials and Methods: PubMed was searched for articles published between 2016 and 2021 using the medical subject headings 'radiology', 'ophthalmology' and 'neurology'. Article titles, abstracts, authors and MeSH terms were extracted. These data were used to develop a series of models that predict the impact factor or Eigenfactor score of the accepting journal.

Results: There were 10 813 articles included in the study. The bidirectional encoder representations from transformers model achieved the highest classification accuracy in the prediction of accepting journal impact factor and Eigenfactor score tertile (75.0% and 73.6% respectively).

Conclusions: Open-source artificial intelligence can predict the impact factor of accepting peer-reviewed journals. Studies examining the use of this technology, and other possible recommender systems is warranted.

Useful field of view: A possible addition into the standard ophthalmic exam

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Purpose: The "Useful Field of View" (UFOV) is the area surrounding a current point of fixation that is visually processed by the reader. Ophthalmic diseases with only subtle pathology may be missed by the standard ophthalmic exam. We investigated the UFOV in readers with a high expertise in search strategies.

Method: Twenty-three radiologists were asked to read mammograms which were either normal or contained a cancerous lesion. Their eye movements were recorded data such as fixations (maintenance of visual gaze without moving eyes) and saccades (movements of eyes between fixations) were analysed.

Results: Readers looked at an average of 86% of the breast before declaring that no cancer was present. UFOV can be used to classify whether a target was missed due to a search error (target was never fixated—19%), recognition error (fixated but not recognised—26%) or decision error (fixated >600 msec, but misclassified—55%). These results suggest that most misses occurred not because radiologists failed to guide attention to the lesion but because they made the wrong decision about the lesion. Heatmaps of fixations show that readers search strategically (as opposed to systematically, as in reading), devoting most of their time to locations likely to hide cancer. 80% of these targeting saccades are shorter than 5 deg of visual angle and the average targeting saccade measured was 4.3 degrees (3.4–5.7).

Conclusion: Eye tracking provides a rich window into visual attention mechanisms and search strategies. Further studies could identify effective ways to incorporate UFOV into the traditional ophthalmological examination.

A marathon more than a sprint: Determinants of trainee success in race

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Purpose: To explore recent trainee experiences of the RANZCO Advanced Clinical Examination (RACE) and identify what preparation pathways promoted examination success.

Methods: Semi-structured interviews with ophthalmology trainees and Fellows (n = 19) who had sat RACE in the past five years and supervisors (n = 10) of trainees preparing to sit RACE across Australia and New Zealand.

Results: Recent trainee and supervisor experiences of RACE highlight variation in the perceived appropriateness of examination design and difficulty across semesters, with examination failure notably more common on the written component. Reasons for RACE failure included: trainee factors such as misguided preparation and examination (performance) anxiety; and examination factors including subspecialist focus, ambiguous questions and lack of transparent marking criteria. RACE success was more likely for trainees who: studied for twelve months or more; had access to a study group; attended Dunedin, other courses and mock examinations; developed written examination technique through practising past examination papers; and received feedback from supervisors and/or current RACE examiners regarding their written answer attempts. Supervisors described recognising candidates at risk of RACE failure based on the quality of their written answer attempts and confidence presenting in clinics.

Conclusion: RACE success can be promoted by ensuring trainees engage in key preparation strategies and have equitable access to quality education, training and feedback from supervisors and examiners with recent RACE knowledge. College investment is needed in improving examination design and delivery, together with educating trainees and supervisors on RACE, effective preparation strategies and examination technique.

The global state of ophthalmology education in medical schools: A systematic review

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Purpose: There is increasing evidence suggesting a decline in ophthalmology teaching in medical schools. A systematic review was conducted to evaluate ophthalmological education in medical schools worldwide, in terms of course delivery and outcomes.

Method: Systematic review of Embase and SCOPUS to February 2021 with inclusion of studies on medical school ophthalmological course length, and/or one or more outcome measures on student ophthalmology knowledge, skills, self-appraisal of knowledge or skills, or student course appraisal. Results were aggregated with outcome sub-group analysis and description in relation to geographical and temporal trends. Descriptive statistics, including nonparametric correlations, were utilised to analyse data and trends.

Results: Systematic review yielded 3249 publication titles, of which 48 were included in the analysis, with data from 18 countries. Average course length ranged from 12.5–160 hours, with worldwide mean course length 61.9 hours. Africa reported the longest course at 103.3 hours, North America the shortest at 35.3 hours, and Australasia the second shortest at 59 hours. On average course lengths have been declining over the last two decades. Mean student self-evaluation of skills was 42.8%, and student self-evaluation of knowledge was 60.1%. Objective mean assessment mark of skills was 57.5%, and of knowledge was 69.9%, compared to an average pass mark of 66.7%. On average 26.4% of students felt confident in their ophthalmology knowledge, and 42.8% in their skills.

Conclusion: Overall the evidence describes declining length of Ophthalmology courses over the last 20 years, student dissatisfaction with courses and content, and sub-optimal student knowledge and confidence.

Improving ophthalmic education for general practitioners: A mixed methods feasibility study of a general practice ophthalmic education workshop

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Purpose: Ophthalmic-related pathologies represent 2.2% of general practice presentations. However, general practitioners (GP) have low levels of confidence in important ophthalmological examination skills and management. Accordingly, we aimed to investigate the efficacy of a novel educational intervention for increasing GP confidence in key ophthalmic skills and concepts.

Methods: GPs from Sydney and the surrounding regions were invited to an intensive half-day ophthalmic skills workshop at the Prince of Wales Eye Clinic involving two 45-minute information sessions, and hands-on examination and clinical skills sessions. Participants responded to pre-workshop surveys utilising 5-point likert scales and qualitative-style questions assessing their confidence across each educational outcome. Post-workshop surveys measuring confidence in the same outcomes will be supplied to participants at 1 day, 1-week, 6- and 12-months post-workshop to longitudinally assess efficacy for improving participant confidence in key ophthalmic skills and knowledge.

Results: Fourteen GPs from the Sydney local health district were enrolled in the study. Interim pre-workshop survey data demonstrates GPs have low levels of self-reported confidence in fundoscopy, eyelid inversion, relative afferent pupillary defect detection. Qualitative responses indicate that GPs are most interested in developing basic eye examination techniques including direct ophthalmoscopy, and appropriate dispositioning of ophthalmic presentations to general practice. Post-workshop data is yet to be completely assessed.

Conclusions: Our early pre-workshop confirms the low-levels of GP confidence across a range of key ophthalmic examination skills and concepts. Our study hopes to demonstrate significant increases in GP confidence post-workshop, validating our educational intervention format as effective and feasible for wider utilisation.

Medical analogies for clinician-patient communication: Innovative strategies for improving the clinical encounter

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Purpose: Patient-clinician communication is the cornerstone of an informed and patient-centred approach to healthcare. It is continually stressed throughout all

aspects of medical training and practice, but this can be impaired by the myriad of medical jargon and complex pathophysiology required in explaining a patient's condition. There is need for an efficient way to translate years of study and experiential learning from the doctor and healthcare professional to the patient, especially for medical students and junior doctors early in their medical careers. This book aims to provide a comprehensive reference of analogies which simplify and make the most common medical conditions that patients may question about or be afflicted with comprehensible.

Method: The authors researched, identified and created analogies relating to the most common medical conditions faced by patients, in a manner which is easily interpretable to patients. The manuscript underwent multiple internal and external reviews and was published by Springer Nature.

Results: The book contains over 200 analogies that span across 19 chapters covering a wide variety of medical specialties. Specifically, the ophthalmology chapter contains over a dozen analogies discussing common conditions, including astigmatism, cataract surgery, diabetic retinopathy, glaucoma and strabismus.

Conclusion: This book serves as a fruitful reference for anyone, particularly medical students and junior doctors, wanting to communicate profoundly with their patients without forfeiting brevity. It is hoped it will be a useful tool for ophthalmology trainees in explaining common ophthalmological conditions to their patients.

Building surgical skills for the ophthalmology trainee in times of a global pandemic

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Purpose: The eye surgeon's unique microsurgical skillset is developed over time from repeated and meticulous training on delicate ophthalmic tissue. The impact of COVID-19 on the delivery of regular ophthalmology services has impacted the exposure and available opportunities for skills development in the trainee. Adopting ophthalmic surgery teaching models and simulators as training resources provides solutions to enhance microsurgical skills of the trainee operating in a pandemic.

Method: A literature search was performed to identify ophthalmic surgery skills training resources. We included prosthetic, harvested produce, non-live animal, and virtual reality and simulation devices. Human cadaveric models were excluded.

Results: Several established and novel ophthalmic surgery training resources were identified. Low-cost prosthetic models and tissue substitutes are available to develop basic microsurgical and tissue handling skills. Harvested produce, non-live egg, porcine products, and sophisticated virtual reality devices imitate various aspects of ophthalmic tissue to allow simulation of ophthalmic surgery of varying complexity including cataract, corneal, glaucoma, vitreoretinal and strabismus surgeries. The use of ophthalmic skills training devices improved skills of trainee eye surgeons.

Conclusion: A wide range of ophthalmic surgery training resources are available to both the individual trainee and the training organisation, and provide a wide range of accessible, evidenced solutions to augment surgical skill development not only during the pandemic but also beyond.

Enhancing patient and colleague experience through multisource feedback process enriched by facilitated reflective performance feedback

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Purpose: Evidence shows healthcare improvements and overall patient experience are supported by advanced interpersonal skills by healthcare professionals. Multisource feedback (MSF) is a validated and robust workplace-based assessment tool that offers 360-degree evaluation of a doctor's interpersonal relations and communication skills, professional behaviours, and some aspects of patient care and system-based practice. Obtaining structured feedback about how a doctor is performing (with the ability to compare their performance in relation to benchmark datasets of similar doctors, fields, specialism), doctors have an opportunity to improve their performance. The facilitated reflective performance feedback (debriefing) is a fundamental part of the process and enhances the acceptance and use of the feedback.

Method: MSF demonstrates strong alignment with the Medical Board of Australia's Professional Performance Framework two key domains; measuring outcomes (patient feedback) and reviewing performance (colleague feedback). Case studies will be shared to illustrate the MSF process including the debriefing and reflective exercise involved.

Results: Benchmark data on MSF specialists from 2650 questionnaires (2017–2022) will be shared highlighting key trends and areas for improvement. MSF tools and resources will be used to illustrate how doctors can

maximise the benefits by undertaking the MSF learning and development process.

Conclusion: MSF including self-reflection, patient feedback and colleague feedback is gaining recognition in the medical profession as a tool to support doctors to reflect on how they work and identify ways for self-improvement. Using evidence-based facilitated feedback is helpful for doctors in facilitating their reflection on and use of the MSF feedback.

UVEITIS

Ocular Autoimmune Systemic Inflammatory Infectious study (OASIS)—Report 7: Herpetic Anterior Uveitis at a Tertiary Referral Centre in Singapore

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Purpose: To investigate the epidemiology, clinical features, and treatment outcomes for herpetic anterior uveitis in an Asian population.

Method: Clinical records of 80 patients with clinically diagnosed herpes simplex (HSV) and varicella-zoster virus (VZV) anterior uveitis were reviewed.

Results: Thirty cases were HSV-related, and 50 were VZV-related. The mean age was 56.8 ± 16.3 (11–93) years. There was no predilection for gender. Most patients affected were Chinese (73.7%) with unilateral disease (97.5%). The median follow-up period was 156 weeks. Most common presenting symptoms were eye redness, pain, and blurring of vision. Mean presenting VA (Snellen logMAR) was 0.39 and improved by the last follow-up to 0.21 ($p < 0.001$). Most common presenting signs were anterior chamber inflammation (100%), keratic precipitates (82.5%) and stromal edema (33.8%). Complications included raised intraocular pressures (31.3%) and corneal scarring (26.3%). There was significant heterogeneity in the duration and mode of treatment. Between the HSV and VZV group, more in the HSV group needed oral acyclovir and longer treatment duration compared to HSV ($p = 0.01$). 60% of patients had complete resolution, while 40% had at least one recurrence. Patients treated with a longer course of oral acyclovir (>4 weeks) had a lower recurrence rate ($p < 0.001$).

Conclusion: Herpetic anterior uveitis patients commonly present with unilateral eye redness and anterior chamber inflammation. We found significant heterogeneity in the treatment regimen. Though there was a significant recovery in vision, almost half the patients had



recurrences warranting prolonged therapy with oral acyclovir.

Is there a difference in drug persistence between immunosuppressants used in Behçet's disease?

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Purpose: Behçet's disease (BD), a systemic vasculitis, can result in blinding uveitis. Although TNF- α inhibitors are used widely in BD management, there are few comparative studies between these agents and conventional disease-modifying antirheumatic drugs (DMARD). As an indicator of tolerability and efficacy, we used drug persistence to examine for differences between these systemic treatments in BD.

Method: Retrospective case analysis of Royal Victorian Eye and Ear Hospital patients who met the revised International Criteria for BD and presented between 1985–2021. Drug persistence was calculated as median months on drug per-person.

Results: Median age was 28.6 years at initial presentation for 48 patients (37 males). Median follow-up was 7.8 years. Exactly half had bilateral disease ($N = 24$); of the 62 affected eyes, 16 had anterior uveitis, 11 intermediate, 2 posterior, and 33 had panuveitis. Median visual acuity was 6/9 at presentation. Prescribed DMARDs were Cyclosporin ($N = 24$), Mycophenolate ($N = 22$), Azathioprine ($N = 21$), Methotrexate ($N = 15$), Adalimumab ($N = 15$). Median months on drug per-person was 35, 23, 8, 20, 30, respectively. Drug persistence of Adalimumab was significantly longer than Azathioprine ($p < 0.05$). Reasons for DMARD cessation were adverse reaction ($N = 36$), treatment failure ($N = 29$), adherence issues ($N = 26$), quiescent disease ($N = 15$), lost to follow-up ($N = 12$), and unclear documentation ($N = 4$).

Conclusion: Drug persistence of Adalimumab appears comparable to, and potentially superior to conventional DMARDs in young men with BD, who frequently suffer from sight-threatening disease at first presentation. Due to Adalimumab's relatively short market availability, differences between it and other DMARDs may become more apparent in the future.

Posterior uveitis as a COVID-19 vaccination related adverse effect: A case series

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Purpose: We describe three separate cases of HLA-A29 chorioretinopathy, ampiginous choroiditis, and a flare-up of quiescent ampiginous choroiditis, all following COVID-19 vaccination. To our knowledge, there are no such cases described in literature.

Method: Retrospective case series of three patients with post-COVID-19 vaccine posterior uveitis reported with multimodal imaging.

Results: Three patients between ages 34–65 years presented 8–11 days post-COVID-19 vaccination. Case 1 developed de-novo acute HLA-A29 chorioretinopathy following ChAdOx1 nCov-19 (AstraZeneca) vaccine which resulted in significant vision loss despite immunosuppressive medical treatment, including oral prednisolone, mycophenolate and bilateral Ozurdex implants. Cases 2 and 3 developed posterior uveitis after receiving the Pfizer–BioNTech COVID-19 vaccination. Case 2 developed bilateral ampiginous choroiditis. This patient had a history of photopsias and floaters 12 months prior, following quadrivalent influenza vaccination, possibly indicating a previous inflammatory episode. Case 3 developed a third episode of unilateral activation of ampiginous chorioretinal lesions on a background of quiescent sequential bilateral tubercular ampiginous choroiditis which had most recently reactivated 11 months prior. Extensive investigations in all patients were unremarkable for other masquerading aetiologies. Cases 2 and 3 responded to oral prednisolone and mycophenolate with good visual outcome.

Conclusion: We present 3 unique cases of posterior uveitis post-COVID-19 vaccination. The low prevalence of posterior uveitis makes establishing a causal relationship with COVID-19 vaccines challenging. Ophthalmologists should understand the potential for common vaccines to activate posterior uveitis with rapid onset severe vision loss and long-term visual consequences. They may then forewarn high-risk patients and expedite management of sight-threatening inflammatory episodes.

Herpes zoster ophthalmicus uveitis: Onset and associated factors

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Purpose: To describe the features and time to diagnosis of uveitis in individuals with herpes zoster ophthalmicus (HZO).

Methods: This was a retrospective cohort study. Individuals with acute HZO seen at the Department of Ophthalmology, Auckland District Health Board, from 2006 to 2016 were included in the study. The primary outcome measures were the proportion of individuals who developed uveitis and the time to diagnosis of uveitis following the onset of HZO. Secondary outcome measures included factors and other manifestations associated with uveitis.

Results: A total of 869 patients with HZO were included for analysis, of whom 413 (47.6%) developed uveitis. Median time from onset of rash to diagnosis of uveitis was 10 days (interquartile range 6–14). Among those examined during the first week of rash onset (day 0 to 6), 14.6% (79/540) were diagnosed with uveitis at that visit while 26.9% (145/540) were diagnosed at a subsequent visit. Individuals with uveitis were more likely to be older (median 66.9 vs 63.8 years $p = 0.026$), had poorer vision at presentation (median 20/30 vs 20/25 $p < 0.001$), higher presenting pressure (median 17 vs 14 mmHg $p < 0.001$) and were more likely to have conjunctivitis ($p < 0.001$), corneal involvement ($p < 0.001$) or cranial nerve palsy ($p < 0.001$).

Conclusions: Uveitis is a common complication of HZO, occurring in approximately half of individuals with acute HZO in this study. The diagnosis of uveitis was most frequently made during the second week following the onset of rash. Individuals examined during the first week after onset of HZO rash may still develop uveitis after that visit.

Manifestation of anterior necrotising scleritis and reactive infectious mucocutaneous eruption after COVID-19 2022: A case report

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Purpose: To report a case of reactive infectious mucosal eruption and anterior scleritis in a vaccinated patient following recent recovery from COVID-19. Reactive infectious mucosal eruption (RIME) is a newly recognised complication of SARS COVID-19. Scleritis has also been reported in COVID-19 infections; however, these cases were from early in pandemic prior to vaccine development and were not reported to occur concurrently with RIME.

Method: This case report illustrates a 25-year old male fully vaccinated against COVID-19 (Comirnaty™) who presented 2 weeks after recovering from COVID-19 infection with RIME involving the oral mucosal and larynx, and concurrent bilateral anterior necrotising scleritis.

Results: Consultation was sought from ophthalmology, otolaryngology and dermatology and dental regarding diagnoses and management. The patient's condition rapidly improved following treatment with IV methyprednisolone and oral prednisone taper.

Conclusion: In cases of diagnostic uncertainty, multidisciplinary collaboration is critical to achieve a timely diagnosis and prevent serious complications.

Depot steroid injections for the treatment of cystoid macular oedema associated with acute retinal necrosis

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Purpose: To report outcomes from depot corticosteroid injections for cystoid macular oedema (CME) associated with acute retinal necrosis (ARN).

Method: Retrospective case series.

Results: Eleven eyes of 11 patients with ARN from the Royal Victorian Eye and Ear Hospital from 2007 through to 2020 were reviewed: 3 eyes with herpes simplex and 8 with varicella zoster (VZV). Median follow-up was 30 months (range 9–58). Of the 8 eyes with VZV, 6 developed CME 15 months (range 4–28) after initial ARN presentation. None of the herpes simplex ARN eyes developed CME. A total of 16 corticosteroid injections were given to the 6 eyes with ARN related CME, with each eye receiving at least 1 orbital floor injection (range 1–2). Three eyes received intravitreal triamcinolone injections (range 1–4), which included intraoperative intravitreal triamcinolone injections given at the time of cataract surgery. One eye received a subconjunctival triamcinolone injection. Eleven of these injections

were performed with concurrent oral valaciclovir. One eye developed an ARN reactivation one month after an orbital floor injection but had also self-ceased their antiviral. Median follow-up from the first corticosteroid injection was 13 months (range 4–19). At 1 month post injection, mean visual acuity gain was 0.12 LogMAR (range – 0.1 to 0.3) and mean central macular thickness

reduction was 86.5 μm (range 56 μm gain - 358 μm reduction).

Conclusion: Late CME is a common complication of VZV ARN that may be treated with local depot corticosteroid injections. However, these are best combined with concurrent systemic antiviral to reduce the risk of ARN reactivation.

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