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Optometry Australia ABN 17 004 622 431
Suite 101, 68-72 York Street
South Melbourne VIC 3205
Ph 03 9668 8500
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NOVARTIS

A changed publication for a changing profession

A note from Lyn Brodie,
National Chief Executive Officer, Optometry Australia

'It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change.' — Charles Darwin

Charles Darwin's words are equally applicable to businesses and professions. They also apply to publications and education. In this inaugural edition of *Optometry Connection*, I am privileged to contribute, and share the column with eye health leaders Darrell Baker, Optometry Australia President and Professor Nitin Verma, The Royal Australian and New Zealand College of Ophthalmologists (RANZCO) President.

In 2018 when we worked with members and a broad range of stakeholders, on 'Optometry 2040: taking control of your future,' it was clear to everyone that our sector's ability and willingness to adapt to the changing environment would be paramount to survival. Importantly, to truly thrive, we actually need to anticipate change; be continually alert to patterns; to constantly innovate and do more than adapt as change happens – we need to drive change. As we have learned more recently from our program 'Optometry 2040: Leading you to leverage disruption,' we need to value risk and consider it as the path to opportunity.

Adherence to this philosophy has resulted in Optometry Australia grasping every appropriate opportunity that emerged from COVID-19. The caveat on our actions was that every opportunity must benefit our members, the profession and enhance the eye health of all Australians. COVID-19 accelerated progression in regard to collaborative eye healthcare.

A long-time advocate of this model of care is ophthalmologist, Professor Nitin Verma. Professor Verma voiced this philosophy when he attended an 'Optometry 2040' workshop in 2018. As the new President of RANZCO, we are delighted that he accepted our invitation to contribute a few words in this inaugural publication of *Optometry Connection*:

'RANZCO will continue to develop collaborative care models wherein patients, and the community at large, receive the best care from all members of the eye care profession. The COVID-19 pandemic has changed the health landscape significantly for the government, healthcare professionals and patients. We must continue to work together to ensure that the highest standards of patient care are maintained. I look forward to continued engagement with Optometry Australia and the whole eyecare profession.' — Prof Nitin Verma, RANZCO President

Optometry Australia President, Darrell Baker, has led the organisation with a clear purpose to ensure a strong and robust profession that similarly is focused on the highest standards of eye health care for Australians.

During his Presidency, he has overseen the launch of the Optometry Australia Institute of Excellence, and now, complementing our commitment to education and knowledge, the launch of *Optometry Connection*.

'We have ensured the profession continues to raise the bar in the provision of quality eye health care through our focus on ensuring members have access to the most relevant and appropriate learning opportunities to support best practice. *Pharma* and *Equipment* have both been a valuable part of the evolution of our sector, over many years. *Optometry Connection* now takes their place in driving us further ahead, as we adapt and continually innovate. Optometry Australia is committed to leading and driving change, not waiting for it to pass us by – and leave us behind.' — Darrell Baker, Optometry Australia President

The optometry profession is built on a solid foundation of knowledge, science, a strong evidence base and a commitment to caring for the community. Optometry's value to society's health and well-being is essential and our capacity to adapt, innovate and drive change will ensure it continues its vital contribution to everyone's quality of life.

Lyn Brodie
National Chief
Executive Officer,
Optometry Australia

Anticancer drugs and the ocular surface

Management strategies for patients with cancer

FEATURE ARTICLE

Ilyanoon Zahari
MOptom (UNSW)
Institute of Health and Biomedical Innovation,
Queensland University of Technology, Brisbane, Australia

Katie Edwards
BAppSc (Optom) PhD
Institute of Health and Biomedical Innovation,
Queensland University of Technology, Brisbane, Australia

Jeremy Chiang
BOptom (Hons) BSc
School of Optometry and Vision Science, UNSW

Associate Professor Maria Markoulli
PhD MOptom GradCertOcTher FBCLA FAAO
School of Optometry and Vision Science, UNSW

It is undeniable that diagnosis and treatment of cancer have improved over the years. However, side effects from anticancer drugs continue to impact the quality of life of affected individuals. Anticancer drugs can be subdivided into three categories: cytotoxic chemotherapy, hormonal agents and the more novel molecularly-targeted therapies.

Conventional cytotoxic chemotherapy usually prevents further multiplication of cancer cells by disabling proper DNA synthesis (alkylating agents and anti-tumor antibiotics), DNA replication (anti-metabolites or cellular division (mitotic inhibitors), leading to cellular arrest and death. Hormonal agents include tamoxifen, which inhibits estrogen binding to its receptor, and aromatase inhibitors, which inhibit the aromatase enzyme required for estrogen synthesis and cancer development in breast and prostate cancer. While cytotoxic chemotherapy and hormonal agents have the potential to act more widely on bodily cells which can lead to more side effects, molecularly-targeted therapies were developed to be more cancer specific.

Side effects

Systemic side effects such as alopecia (hair loss) and nausea or vomiting are widely known to be associated with anticancer drugs, specifically chemotherapy, however, the ocular side effects are less recognised. The skin and hair follicles of the eyelids, conjunctival and corneal epithelial layers, and the lacrimal apparatus involved in tear production and drainage are delicate ocular surface and adnexal structures susceptible to anticancer drug toxicity. While anticancer drugs target abnormally dividing cancerous cells, they may also affect these structures which consist of constantly dividing cells responsible for renewal and normal growth.

We recently published a review article in the *Ocular Surface* that highlights the impact of anticancer drugs on the ocular surface, underlying pathophysiological mechanisms, management strategies and potential interactions between anticancer drugs and ocular medications.[1]

Advancements in diagnosis and treatment of cancer including anticancer drugs have increased the survival rate and the number of patients undertaking this treatment, hence eye-care practitioners are more likely to encounter ocular surface side effects.

As we found in our review, the most common ocular side effects occur on the eyelids and conjunctiva. Symptoms of epiphora, dry eye and ocular discomfort are also common.

Anticancer drugs	Adverse effects						
	Eyelid/eyelash abnormalities	MGD/ blepharitis	Epiphora	Dry eye	Conjunctivitis	Keratitis	Eye pain/discomfort
Cytotoxic chemotherapy							
Carboplatin	✓						✓
Oxaliplatin			✓		✓		✓
Chlorambucil						✓	
Cyclophosphamide			✓	✓	✓		✓
Ifosphamide					✓		
Busulfan				✓			
Cytarabine			✓	✓			✓
5-Fluorouracil (5-FU)			✓				✓
Capecitabine						✓	✓
Methotrexate	✓	✓		✓	✓		✓
Pentostatin					✓		
Docetaxel	✓		✓		✓		
Vincristine, vinblastine, vindesine, vinorelbine	✓						
Doxorubicin			✓		✓		✓
Mithramycin	✓						
CMF	✓		✓		✓	✓	✓
FEC	✓	✓	✓		✓	✓	✓
S-1		✓		✓		✓	✓
Hormonal agents							
Tamoxifen	✓					✓	
Anastrozole				✓			
Targeted therapies							
Panitumumab (Vectibix)	✓			✓	✓		
Cetuximab (Erbitux)	✓	✓			✓	✓	✓
Trastuzumab (Herceptin)			✓	✓	✓	✓	✓
Erlotinib (Tarceva)	✓			✓	✓	✓	✓
Gefitinib (Iressa)	✓	✓		✓	✓	✓	✓
Sunitinib (Sutent)	✓			✓			
Vandetanib (Caprelsa)				✓		✓	
Imatinib (Glivec/Gleevec)	✓		✓	✓			✓
Nilotinib (Tasigna)	✓			✓	✓		✓

Table 1.
Summarised anterior eye adverse events and symptoms with commonly used anticancer drugs.[1] The table was published in The *Ocular Surface Journal*, Vol number 18, JCB Chiang & Zahari et al, The impact of anticancer drugs on the ocular surface, Page No 8, Copyright Elsevier (2020).

Signs and symptoms

Patients treated with anticancer drugs may present with puffiness around the eyes as a result of fluid retention. This is usually associated with the use of molecularly-targeted drugs including sunitinib used for treatment of advanced renal cell carcinoma,[2] and imatinib[3,4] and nilotinib[5] for leukemia. The use of carboplatin[6] and methotrexate[7] in lung, breast, head, neck and renal cancer has also been associated with reports of eyelid oedema.

Practitioners may observe periorbital rashes and ectropion in lung cancer treatment involving erlotinib.[8] Scarring of eyelid margins, meibomian gland dysfunction and blepharitis was reported among individuals receiving combinations of 5-fluororacil (5-FU), epirubicin and cyclophosphamide (FEC) in breast cancer,[9] cetuximab in head, neck and colon cancer[10] and gefitinib in lung cancer.[11] In addition, paediatric patients receiving vincristine for acute leukemia were reported with ptosis and lagophthalmos[12] which are normally the signs of neurological dysfunction.

Consistent with commonly-reported hair loss with the use of chemotherapy, madarosis was also observed in some women receiving FEC for breast cancer treatment.[9] However, other eyelash abnormalities such as trichomegaly[10,13-15] and trichiasis[11,13] were more common in molecularly-targeted therapies which inhibit epidermal growth factor receptors (EGFR).

Drug-induced, non-infectious conjunctivitis has been associated with the use of anticancer drugs including oxaliplatin, 5-FU,[16] cytarabine,[17,18] methotrexate,[19] and pemetrexed[20] used in different cancer treatments. Following intraveneous infusion of docetaxel (to treat metastic breast cancer), low but detectable levels of the drug have been documented in tears and have been reported to cause erosive conjunctivitis.[21] Practitioners may also come across conjunctivitis and mucus discharge with complaints of ocular surface irritation among individuals on cetuximab treatment for colon cancer.[10] It is believed that cetuximab interrupts EGFR signalling in conjunctival goblet cells responsible for mucin production.[22]

Corneal manifestations

Keeping in mind the use of EGFR inhibitors in anticancer treatments, caution needs to be exercised particularly, but not limited to, individuals with pre-existing corneal complications due to susceptibility to poor epithelial healing.[23] Persistent corneal epithelial defects,[24, 25] resembling corneal erosions[11,13] or ulcerations[26,27] were seen among patients on cetuximab, trastuzumab, gefitinib and erlotinib. Consistent with toxicity to the conjunctiva as mentioned above, the toxicity was also reflected on the cornea as superficial punctate keratitis reported with the use of FEC,[9] erlotinib, gefitinib[11,26] and capecitabine.[28] The latter is used in breast cancer treatment where the patients also presented with subepithelial whitish granular deposits that caused discomfort and reduced vision.[28] Practitioners may notice hazy, whorl-like subepithelial corneal deposits with these symptoms, indicating vortex keratopathy as has been reported with the use of a dual anti-EFGR and anti-vascular endothelial growth factor receptor 2 (VEGFR2) like vandetanib[29,30] and osimertinib[31] for solid malignant tumours and non-small cell lung carcinoma, respectively.

Tears and dry eye

The review[1] also found that obstructed puncta,[32,33] canaliculi fibrosis [24,32-34] or lacrimal duct stenosis[35] and subsequent epiphora were common with the use of various anticancer drugs including 5-FU, docetaxel, doxorubicin, combination of clyclophosphamide, methotrexate and 5-FU (CMF), and the combination of tegafur, gimeracil and oteracil (S-1). 5-FU is used in the treatment of various types of cancer including breast, skin, head, neck, renal, cervical, gastrointestinal and lung, and it has been found to be present in tears after oral[36] and intravenous[37] administration. The secretion into the tears is thought to have a pro-inflammatory effect from chronic exposure to the drugs on the mucosal membrane linings of the lacrimal drainage apparatus. Epiphora has also been reported among patients treated with imatinib who had developed periorbital oedema despite unobstructed lacrimal drainage apparatus.[38]

Another side effect of anti-cancer drugs that may be encountered are symptoms of dry eye. One study of a hormonal therapy in breast cancer treatment found that patients undergoing therapy had a higher risk of developing dry eyes (35.5 per cent) compared to the control group (18 per cent),[39] and that the degree of dry eye symptoms (measured with OSDI questionnaire) was correlated to the duration of treatment.

Awareness of these ocular side effects is essential for eye-care practitioners to be able to provide high-level care to patients with cancer undergoing treatment with anticancer drugs.

Reported managements for these side effects and potential interactions between ocular drugs and concurrent anticancer drugs are further described in the review paper. Awareness of these ocular side effects is essential for eye-care practitioners to be able to provide high-level care to patients with cancer undergoing treatment with anticancer drugs. This also requires proper co-management between eye care practitioners, general practitioners, and the treating oncologists.

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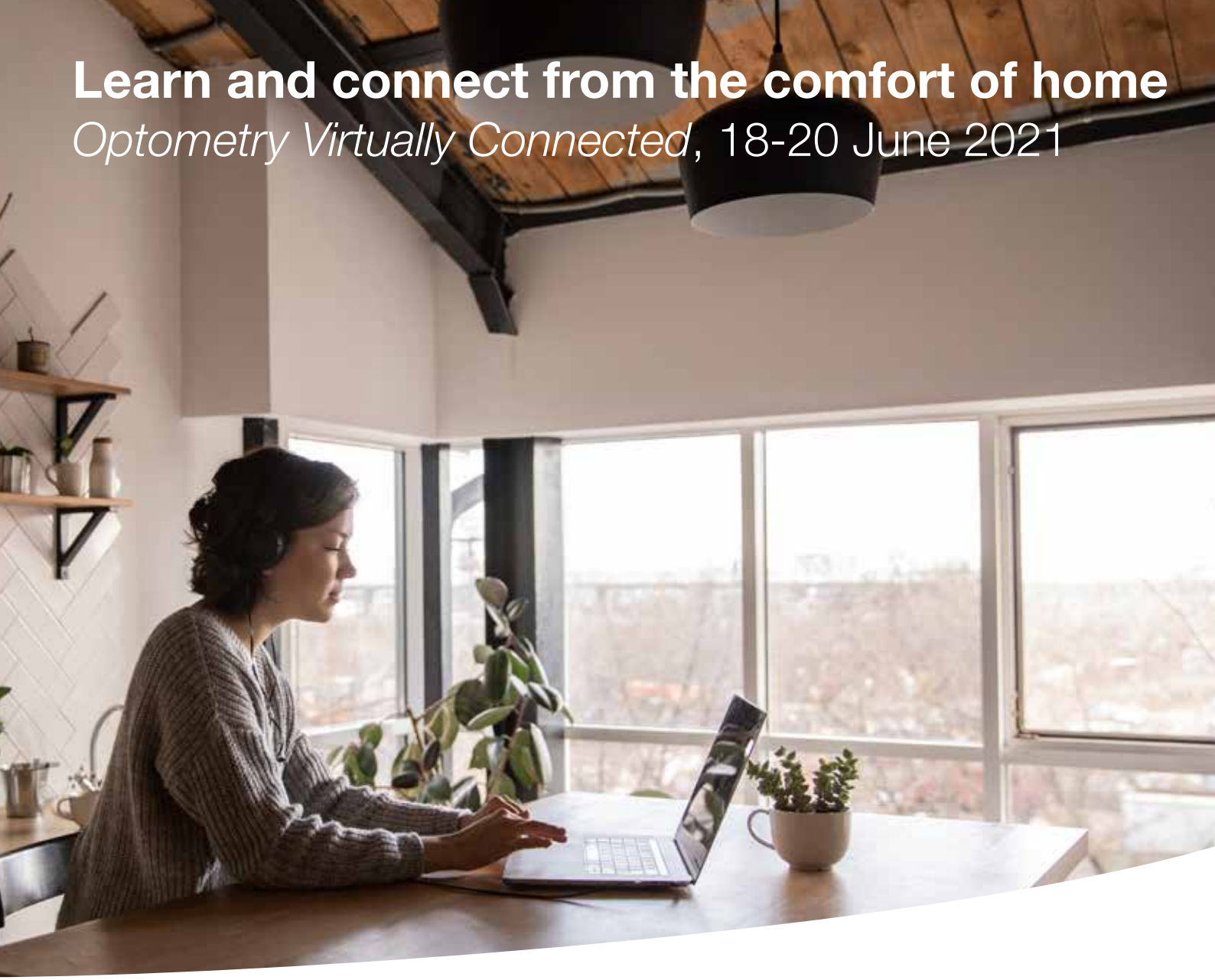

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Optometry AUSTRALIA

MEMBER-SUBMITTED CASE STUDY

This original case report was submitted by Optometry Australia member Amanda Sobbizadeh in response to our call for papers.

Amanda Sobbizadeh
MClinOptom BSc
Centre for Eye Health, NSW

Clinical management of ocular ischaemic syndrome

OIS as a differential diagnosis

A 68-year-old female initially presented to a colleague for a diabetic eye examination. Her medical history included Type 2 diabetes treated with insulin from 35 years of age with HbA1c = 6, cerebrovascular accident at 33 years of age and she was a current smoker.

On examination, best corrected visual acuities were right eye 6/9 and left eye 6/12, with mild nuclear sclerosis noted in both eyes. Dilated fundus examination revealed left eye only scattered mid-peripheral haemorrhages with healthy optic nerve heads and maculae (Figure 1).

The differential diagnoses:

- Diabetic retinopathy
- Branch retinal vein occlusion (BRVO)
- Central retinal vein occlusion (CRVO)
- Ocular ischaemic syndrome (OIS)

At this stage, a colleague diagnosed the patient with 'moderate diabetic retinopathy left eye only, with a one-month review.' At the one-month review, the diagnosis was changed to 'suspected mild BRVO' due to the unilateral appearance of retinopathy. A review was organised for six months, with a suggestion for cataract surgery referral to improve visual acuities.

Approximately six months later, the patient presented to me for review. Her pupil reactions were slower in the left eye and visual acuities were still reduced. Slitlamp examination revealed left eye rubeosis iridis. Dilated fundus examination revealed left eye mid-peripheral haemorrhages, retinal veins were engorged and arteries attenuated, with no tortuosity. Right eye was unremarkable.

On the basis of presented clinical signs, OIS was the most likely diagnosis. The unilateral appearance of retinopathy and pattern of haemorrhaging helped to exclude the other differentials, along with the presentation of iris neovascularisation.

In a similar case, a 52-year-old Aboriginal female presented with left eye discomfort. Her pinholed visual acuities were right eye 6/6 and left eye slightly reduced 6/7.5. Dilated fundus examination revealed left eye dilated veins and attenuated arteries, with mid peripheral haemorrhages and optic nerve head neovascularisation (Figure 2). Again, based on the clinical presentation, OIS was the most likely diagnosis.

Clinical presentation

OIS is an uncommon condition which can lead to sight-threatening complications. OIS occurs secondary to 90 per cent ipsilateral carotid artery atherosclerosis.[1] Of those with OIS, the five year mortality rate was 11-40 per cent with cardiac disease being the leading cause of death.[2]

Symptoms can include decreased vision, ocular pain, prolonged recovery after exposure to bright light and amaurosis fugax.[3] Signs include dilated retinal veins and attenuated retinal arteries with no tortuosity.[3] Other signs include mid-peripheral retinal haemorrhages, iris neovascularisation and posterior segment neovascularisation.[3]

OIS typically occurs between the ages 50 to 80 and is two times more common in men. Ocular complications can include neovascular glaucoma if the angle zippers shut and optic nerve head neovascularisation.[4] The visual prognosis for OIS is poor, with the risk of neovascular glaucoma increasing with the length of time and severity of ipsilateral carotid artery stenosis.[5]

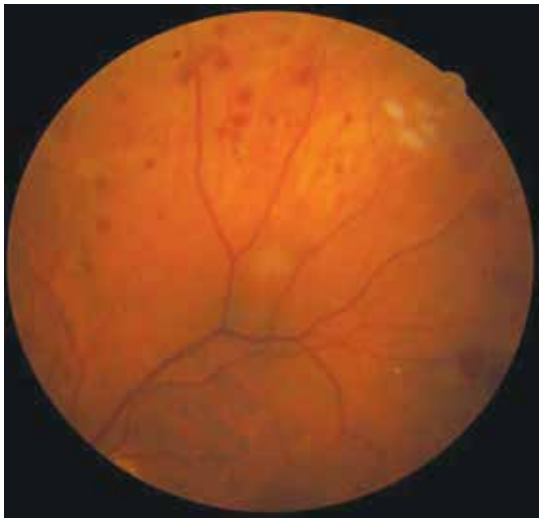

Figure 1.
Initial presentation, case 1. Dilated fundus examination revealed left eye only mid-peripheral haemorrhages.

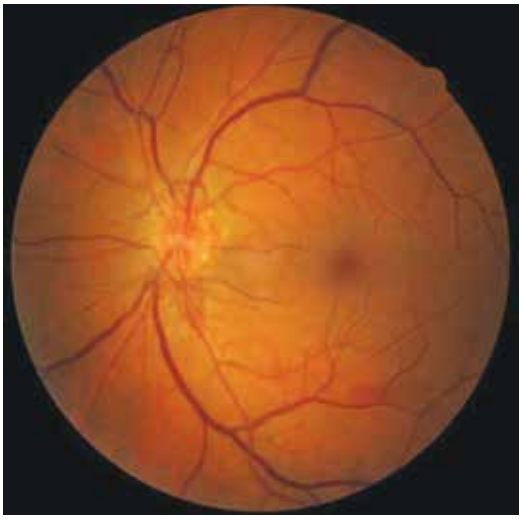

Figure 2.
Initial presentation, case 2. Dilated fundus examination revealed left eye dilated retinal veins and attenuated retinal arteries, with optic nerve head neovascularisation.

Clinical management

To diagnose ocular ischaemic syndrome, a carotid artery evaluation such as carotid doppler or magnetic resonance angiography is necessary. As the underlying cause of OIS is carotid atherosclerosis, this case is co-managed with the GP and hospital.[6] An urgent referral to the GP, for the appropriate scans to be performed is required. From there, the patient would be transferred to a hospital for assessment by a neurovascular surgeon for potential carotid endarterectomy or stenting.[7] In the presence of ocular neovascularisation, a referral to an ophthalmologist for anti-VEGF injections or pan-retinal photocoagulation laser must be organised urgently often in the same hospital.[7] Lifestyle modifications such as smoking cessation and weight loss should be discussed.

Patient outcome

The patient from Case 1 was urgently referred for a carotid doppler through her GP who then had her transported directly to the hospital, where a week later she had bilateral carotid stenting. She was doing well post-surgery and six months later had successfully quit smoking and lost 15kgs in weight. The patient continued to be reviewed at the hospital ophthalmology clinic every three months for her rubeosis iridis. Her husband, children and grandchildren went on to become loyal patients at the clinic.

Conclusion

The morbidity of OIS and its systemic implications require prompt management. When a clinical picture does not match a diagnosis or there is uncertainty, a referral to a fellow optometrist or ophthalmologist would be in the best interests of the patient. While ocular ischaemic syndrome may be uncommon, it should be kept in mind as a differential to ensure patients are diagnosed and treated in a timely manner, to prevent further complications.

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MEMBER-SUBMITTED IMAGE

This original clinical image was submitted by Optometry Australia member Stuart Macfarlane in response to our call for images.

Optometry AUSTRALIA MEMBER

Stuart Macfarlane
Dip App Sc (optom)
Brisbane, QLD

A 74-year-old Caucasian male (AK) presented with symptoms of an acute posterior vitreous detachment. Although in good general health, he was on a self-prescribed regimen that included creatine, promaline and PSK Trammane. He was also consuming 2.5kg of carrots daily.

His skin showed a mild yellow discolouration and the palms of his hands were particularly yellow. AK was unaware of his skin or ocular discolouration.

His best corrected visual acuity was 6/7.5 in each eye. No RAPD was evident. Slitlamp biomicroscopy showed bilateral golden deposits, primarily peripheral, but extending across his entire cornea throughout the stroma. There were low-grade nuclear cataract and no evidence of conjunctival icterus. It was not possible to identify discolouration of the anterior lens capsule due to the corneal discolouration.

Differential diagnosis of corneal deposits can include a Kayser-Fleischer (KF) ring associated with Wilson's disease. However a KF ring is a peripheral annular deposition of copper found at the layer of Descemet's membrane. Paraproteinemia can be associated with corneal deposits and is known as paraproteinemic keratopathy (PPK). Corneal findings in PPK are usually bilateral and can vary in colour and location and can be central or peripheral.

After taking into consideration his enthusiasm for carrots and skin discolouration, the diagnosis of hypercarotenemia was made.

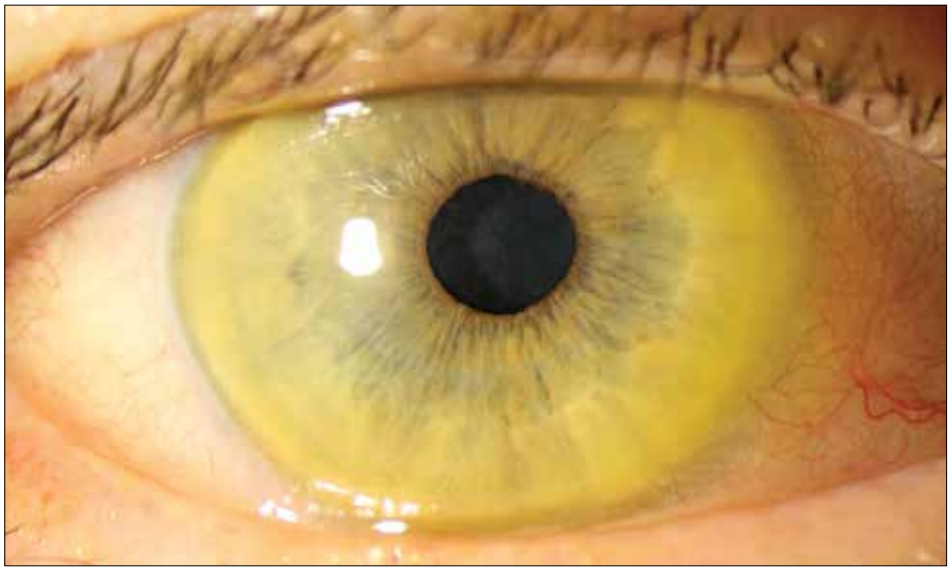

Figure 1.
Diagnosis: hypercarotenemia

Abi Tenen
MBBS (Hons) FRANZCO
Ophthalmologist
Vision Eye Institute

Are we seeing a Digital Eye Strain epidemic within the COVID-19 pandemic?

Dealing, realistically, with the effects of increased screen time

In Australia to date, most of us have avoided infection by COVID-19. But the same may not apply to the health effects of Digital Eye Strain (DES) – a well-recognised syndrome that may have far-reaching consequences if not appropriately addressed.

Our way of living has changed dramatically since the start of the pandemic, admittedly in some states more than others. In Melbourne, residents have endured two lockdowns and various other restrictions since March. At the time of writing, it appears Melbourne is on the road to eased restrictions, but nobody can predict what the future months will look like.

Due to limited movement and minimal access to the world outside, we are increasingly using our digital devices for almost every aspect of daily living – education, work, entertainment, shopping, socialising and even healthcare appointments. The list is extensive.

Increased cases of digital overdose may be part of the 'new normal'

Some six months on from Victoria's first lockdown, there is a daily influx of patients reporting symptoms relating to DES (also known as Computer Vision Syndrome). DES is not a new concept,[1] but I have seen a noticeable increase in the number of people affected. Some of the symptoms are non-specific and can overlap with other concurrent pathologies, so it's important not to overlook DES as a causative or contributing factor.

What do we need to look out for in patients? Dry eyes (we know that the blink rate is reduced), red eyes, blurred and fluctuating vision, photophobia, fatigue, headache, sleep disturbance, mood change and myopic shift.[1–5]

Beware DES-related myopic shift when managing refractive patients

Myopic shift has been known to occur historically among fervent scholars.[6] Exactly why this can happen with excessive screen use is still up for debate, but we know that prolonged focusing on a fixed '2D' screen which emits artificial light is not physiologically optimal.[1–5] As such, excessive muscular contraction with axial length shift and accommodative spasm probably play important roles[7] and studies are currently investigating the apparent link between myopic shift and screen use.[4,5] There is also an inverse relationship between sunlight exposure and the level of myopia in children.[9] Again, the exact explanation remains unclear, but it is reasonable to surmise that our eyes are designed for natural, outdoor settings.

Be flexible and work with each patient's lifestyle and needs – every little bit of change counts.

What's important on a practical level is that DES-related myopic shift is of interest to all optometrists and ophthalmologists.

We all want our patients to remain visually stable following correction with glasses, contact lenses or surgery.

It's accepted that about one-to-two per cent of patients show some progressive refractive shift following laser eye surgery such as LASIK[9,10] and it will be interesting to see if we experience an emerging increase in that global figure during the COVID-19 era.

Another patient cohort that we have to be mindful of is school-aged children. This young group is growing up in a digital world and, despite the enormous benefits that technology brings, we need to remember that they are still in a critical development phase, which includes development of their eyes and visual system.

Aim for moderation—rather than elimination—of screens

Treating and preventing DES hinges on screen-time reduction and returning your patients and their eyes to the real world. Yet, it's not a matter of simply telling patients to reduce their digital activities. They need to be offered direction on how to change their habits, and the suggestions need to be practical.

Be flexible and work with each patient's lifestyle and needs—every little bit of change counts.

Below are some of the tips that my patients have found useful to implement.

TIP 1: Look away from the screen at least once every hour

- ➔ Use this time to consciously blink and apply lubricating drops
- ➔ Setting a timer can be a helpful reminder
- ➔ Make a list of quick, non-digital tasks to do when the timer goes off (for example: fold a load of washing, wash the dishes, do some meal prep, go for a walk around the block, throw the ball to the dog, look outside the window and gaze at the clouds)
- ➔ Eat meals away from digital devices (even if it's just for five to 10 minutes)
- ➔ Switch off screens one hour (or more) before bedtime

TIP 2: Adjust your workstation

- ➔ Increase the font size on your display
- ➔ Reduce the screen brightness
- ➔ Set the blue-light filter (night shift) to turn on each evening (similarly, light your rooms with warm white globes, which disrupt our circadian rhythm less than bluer, cool white globes)
- ➔ Switch your background theme to night or dark mode
- ➔ Push your computer screen back to at least an arm's length away – the further from the screen the better
- ➔ Avoid staring at screens in dark rooms
- ➔ Use the largest screen available (that is: a computer over a tablet and a tablet over a phone)

TIP 3: Swap some digital activities for analogue and/or audio ones

- ➔ Try an audiobook instead of an e-book
- ➔ Give YouTube or Netflix a miss and listen to a podcast
- ➔ Avoid doing all your exercise via online classes in front of your tablet or laptop and get moving outside instead (walking, jogging, bike riding, trampolining, swimming, tennis, skipping with a rope, ball games, gardening)
- ➔ Embrace phone calls over texting and video calls – better yet, walk while you talk
- ➔ Swap electronic games for a board game, puzzle or cards (think 'old-school')

The take-home

While I think that we need to accept increased screen time as a given during the pandemic, it's important to remain realistic in terms of how to deal with it. Eyecare practitioners should recognise the symptoms and signs of DES, which are particularly significant for children or anyone undergoing refractive correction with glasses, contact lenses or surgery. Patients are relieved to find out that DES may be a cause of their presenting problems, as management is generally simple and non-threatening.

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About the author

Dr Abi Tenen is a refractive, corneal and cataract surgeon with expertise in PRK, LASIK, refractive lens exchange, phakic implants, cataracts and corneal collagen cross-linking. By working closely with a broad range of refractive-based procedures, Dr Tenen offers a customised care plan for each patient. She practises at Vision Eye Institute's Blackburn South and Melbourne (St Kilda Rd) clinics.

When a ‘watery eye’ is really ‘dry eye’

Diagnosis and treatment of evaporative dry eye

Jennifer Rayner
BAppSc (Optom) GradCertOcTher
Principal Optometrist
Alleve Dry Eye Clinic
St Peters, SA

We’ve all had those patients who present complaining of persistent symptoms such as grittiness, dryness, stinging or watery eyes. Often, we have seen them for years, tried multiple drops and treatments, yet the issue remains. It’s frustrating – particularly if examination of the ocular surface appears incompatible with their symptoms.

I find watery eyes to be challenging – the lacrimal system is patent yet nothing seems to work. Epiphora/watering can lead to frequent dabbing at the eye affecting the surrounding skin resulting in tender, excoriated skin which can be painful and red. For most people, there is the added embarrassment of having to explain to the people around them that they are not upset or crying.

A good case history and examination of the ocular and palpebral surfaces with staining agents (typically with fluorescein) will help narrow down the cause.

Watering can be caused from a reduction of outflow from lacrimal duct obstruction, or from poor apposition of the punctum on the globe from lid malpositions such as ectropian. More acute or recent onset may be caused by misdirected eyelashes, foreign body, onset of viral or bacterial conjunctivitis or ultraviolet keratitis such as welding flash or swelling of the nasolacrimal passage.

Chronic causes can be reflex tearing from allergic conjunctivitis (seasonal, perennial, vernal or atopic). It may also be the result of contact sensitivity from, for example, preservatives in eyedrops or contact lens wear, or from anterior blepharitis or meibomian gland dysfunction. Rarely, it can be caused by hypersecretion of the lacrimal gland.

Case study

An 85 year-old Caucasian female was referred to our clinic with a 20-year history of a watering left eye that had worsened over the last five-to-six years. Her right eye would occasionally water when she was exposed to air conditioning or wind. Screenwork did not affect her symptoms. She had consulted several ophthalmologists and surgical options were offered to her (she was not specific as to the nature of the surgery suggested) which she did not wish to pursue.

She was using an off-the-shelf artificial tear twice a day with little effect; she found a hot face washer would help on occasion. Her medical history consisted of knee surgery, varicose vein surgery and an appendectomy. She was not on any prescription medication or supplements. She suffered from occasional seasonal hay fever and developed osteoarthritic pains about six months ago. She lived independently with her husband.

On examination, there was an unstable tear film noted in her right eye with a tear break-up time (TBUT) of around two seconds,

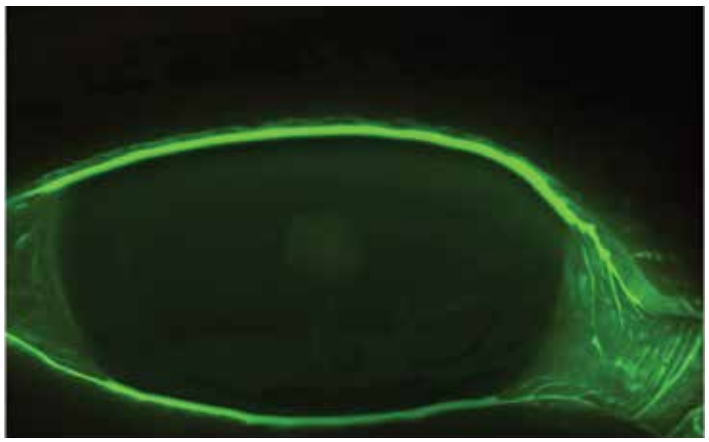

Figure 1.
Right eye with unstable tear film

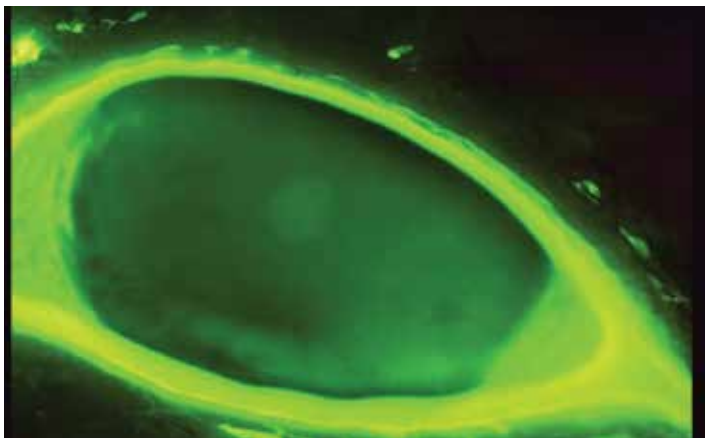

Figure 2.
Left eye with significant reflex tearing and epiphora

particularly inferiorly (Figure 1). Her left eye showed significant reflex tearing (Figure 2) and epiphora which she needed to wipe regularly during the consultation.

Meibography using infrared imaging showed significant meibomian gland loss of the inferior lids (Figure 3) particularly of the left eye. The puncta were all well positioned against the globes.

From her history, I chose not to do lacrimal lavage at this point—assuming this had been done several times before. An in-room lid warming session yielded a small amount of oil expressed from the lids.

In our older population with chronic conditions such as this patient had, protecting the ocular surface is imperative and it is important to come back to basics when looking at the tear film composition.

With few functional meibomian glands, I prescribed her Novatears eyedrops four times a day. On her review, she was very pleased with the outcome—her left eye was hardly watering and her right eye was not watering at all. As she found manual warm compresses to be of value, I encouraged her to continue this at home using a heat bag for 10 minutes on a regular basis. A review in six months' time was recommended, barring any issues.

Discussion

Dry eye is a multifactorial inflammatory disease and while there are many causes of watering, it can occur as a result of meibomian gland dysfunction and subsequent increased tear evaporation.[1] The lacrimal gland receives both autonomic and sensory innervation,[2] and surface irritation from evaporation can result in compensatory watering to protect the ocular surface. A basal tear rate is around 1.2 µl/min and should equal tear drainage and evaporation yet reflex tearing can increase this by 100-fold.[3]

Older patients are more likely to have epiphora due to lid malpositions,[1] however in this case, there was clear reflex tearing in the left eye due to the increased tear evaporation from significant gland loss. There may have been lacrimal duct obstruction as well, but her symptoms reduced to a level that she was happy with after using Novatears.

Novatears (Perfluorohexyloctane, EyeSol, 100% v/v), from AFT Pharmaceuticals is a non-preserved tear film stabiliser for use in evaporative dry eye. It is available in a multi-use bottle that is suitable for use for six months after opening. Its lubricating properties mean that it can provide excellent supplementation and prevent further damage to the ocular surface.

Evaporative dry eye can lead to increased hyperosmolarity of the tears and a chain of inflammatory events that contribute to the vicious circle that perpetuates the dry eye disease state.[4] Aside from creating uncomfortable symptoms, advancing dry eye disease can lead to issues such as loss of corneal sensitivity, or punctate staining that can affect vision and leave the corneal vulnerable to further degradation.[4]

Identifying patients at risk of evaporative dry eye disease can be easily done at the slitlamp by everting the lids and observing for the presence of the white channels (glands), or using a transilluminator against the epidermal side of an everted lid to observe any meibomian gland loss.[5] A gentle push near the gland orifices with a finger or cotton bud can reveal if there is poor meibum quality.

In our older population with chronic conditions such as this patient had, protecting the ocular surface is imperative and it is important to come back to basics when looking at the tear film composition.

An oil-based artificial tear such as Novatears is perfect for stabilising the ocular surface while working on improving natural meibum production, or like in this case, it provides excellent supplementation to prevent further damage to the ocular surface. It is available on the PBS which means it is much more readily accessible for many older patients who are often eligible for the scheme.

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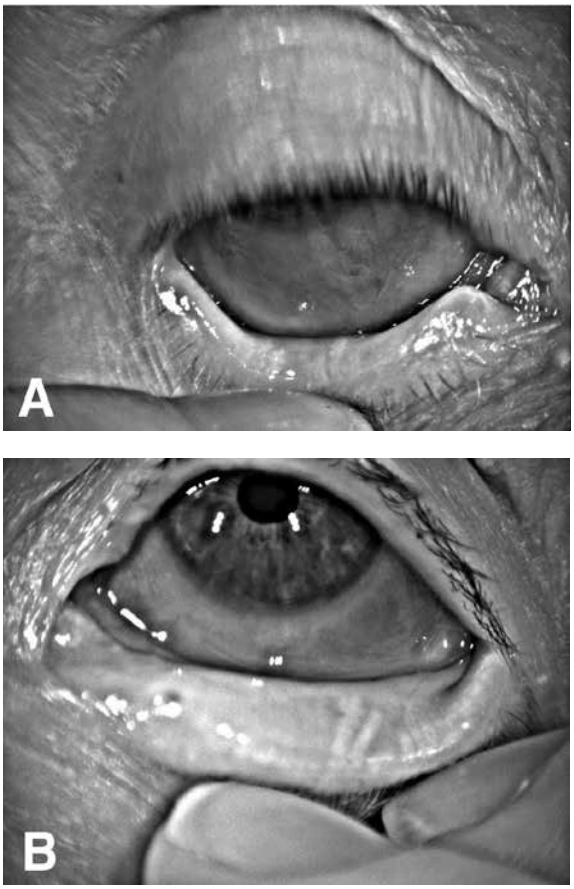

Figure 3.
Inferior meibomian gland loss. A: right lower lid MG drop out. B: left lower lid MG drop out.

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Kerryn Hart
BOptom GCertOcTher MPH PGDipAdvClinOptom GCertHE FACO
Clinical Editor, *Optometry Connection*

José J Estevez
BMedSci MOptom GradCert(Pub Health)
Optometrist, PhD Candidate
Flinders University

Enoch Chan
BOptom(Hons) MGSM
Clinical Director, Optometry
Teachers Health Centre, Surry Hills

Telehealth and optometry

Exploring the risks, benefits and opportunities

While COVID-19 exposed many of the vulnerabilities in our healthcare systems, it also highlighted some new opportunities—chief among them: telehealth. As virtual consultations become more and more mainstream, many practising optometrists and patients have suddenly grown more comfortable with the idea. But even as the transformation of healthcare models is underway, questions remain.

To address some of these questions, *Optometry Connection*'s Clinical Editor Kerryn Hart convened a small panel of two experts. Enoch Chan has been a practising optometrist for 16 years and has been the Clinical Director at Teachers Health Centres for six years. José Estevez works as an optometrist in Flinders University's Ophthalmology Department and is Associate Research Fellow, South Australian Health and Medical Research Institute (SAHMRI), Aboriginal Health Equity Theme. He is also a member of Optometry Australia's Aboriginal and Torres Strait Islander eye health advisory group.

KH **Telehealth came into the spotlight during the initial stages of the COVID-19 pandemic; do you think patients are keen to have the option of tele-optometry consultations (when appropriate)?**

JE Unquestionably the COVID-19 pandemic has made us all take some actions that we would otherwise not do. I think this is true for the way we communicate broadly; we have seen the uptake of virtual meetings and interactions, and a large uptake of telemedicine across the healthcare sector that is now regarded as the 'new normal.'

Luckily, we now also have the advent of technological advancements at our disposal such as 5th generation (5G) telecommunication networks, artificial intelligence (AI), Internet of Things (IoT) and digital security capabilities using blockchain, creating an ecosystem that fosters new ways of delivering care to patients and addressing the challenges brought upon us during the COVID-19 pandemic and beyond.

Although utilising telehealth probably felt forced at first, it has generated a lot of enthusiasm and possibilities for integration into routine service delivery. The uptake of telehealth by patients varied widely, but in some instances it was substantial. For example, in Australia from March through to June 2020 there were 17.2 million telehealth consultations based on MBS data and by June it represented 28.1 per cent of all MBS items claimed. The representation of telehealth consults is largely driven by general physicians whereas allied health only contributes about five per cent of consultations.[1]

EC We found the vast majority of our patients were extremely grateful to have access to an optometrist via telehealth, especially those who were uncertain of the urgency of their concerns or those simply looking for reassurance and advice on how to manage minor issues, such as screen-related dry eye. During our shutdown period, we reached out to all patients we needed to reschedule and found that although patients appreciated having the option of conducting a telehealth appointment over the phone, around 80 per cent of those who called the practice during lockdown preferred to wait until they could be seen for a face-to-face appointment.

KH **Under what circumstances do you think a tele-optometry consultation is best utilised?**

JE This varies widely. It can be a simple phone call to check on your patients to ensure their eye healthcare needs are being met or as complex as sophisticated virtual consultations to diagnose retinal diseases. What is unquestionable is that telemedicine throughout the COVID-19 pandemic has proven not only useful for those living in rural or under-serviced areas, but that it could also be utilised in urban areas and the broader population. Likewise, tele-optometry and the use of video consultation facilitates can be utilised at many stages of the patient journey.

In clinical practice, it allows for forward-triaging, whereby the optometrist can prioritise urgent cases based on the discussions with the patients (onset, severity etc.) and delay those non-urgent cases. There probably exists many models of tele-optometry out there and there isn't a one-size-fits-all approach.

EC Out of 61 telehealth exams conducted, we deferred 36 for face-to-face consultations, treated or continued treatment in 19 cases and referred six for a medical opinion.

Tele-optometry consultations appear to be most suited to circumstances where a face-to-face appointment is overly inconvenient, such as for patients living in remote areas or with limited mobility, or in cases such as the current SARS-CoV-2 pandemic and its associated risks.

Tele-optometry, we found, was most useful as an adjunct to traditional care, and where the patient was known to the practice. Even prior to the pandemic we had been using tele-optometry as a form of follow-up for some time, such as checking in with a patient trying a new contact lens brand or starting dry eye therapies.

While telehealth will not be able to replace a comprehensive in-person examination, we've found it to be very useful in triaging symptoms and organising an appropriate solution tailored to the urgency.

Specific to the COVID-19 pandemic, discussing a patient's history and symptoms ahead of time via telehealth was useful in minimising the amount of contact time when they were later required to attend for an exam.

KH **What does an optometrist need to do to start as a tele-optometry provider?**

JE I would start by doing an audit of what you already have in your clinic, checking and trialing how well your technology works while also considering what you might need to invest in. At minimum you need a working telephone line, but high-speed internet is useful for those wanting to engage in video-consultations.

Read the existing clinical guidelines; it's important to conduct the consult in a professional manner, just as you would a face-to-face interaction. (Optometry Australia has released its own set of updated tele-optometry clinical practice guidelines which is available on the Optometry Australia website.*) There are an array of telehealth guidelines for other professions that are also useful.

There are some important elements you need to take into consideration—things as simple as looking at the camera, adequate lighting and a clear voice can make a difference between a successful or poor consult.

EC We deliberately kept the tele-optometry procedure as simple as possible to make it more accessible to patients who may be less familiar with technology. We put together a PDF file to email to each tele-optometry patient, consisting of a few VA charts, near-reading charts and Amsler grid, with instructions on how to calibrate the size of the screen appropriately.

Other obvious things required would be a working phone and access to the patient's history. We also found a slight mental adjustment on the part of the practitioner was required, from being able to simply physically and objectively examine a patient's vision and eyes to relying more on clear communication and problem solving through verbal reports of symptoms.

KH **What considerations do you need to keep in mind to ensure the patient is the right candidate for tele-optometry (what do they need to know; what equipment do they need)?**

JE The vast majority of your patients would be suitable candidates for tele-optometry, we certainly live in an interconnected society. It would be inappropriate to assume that someone is not suitable for tele-optometry and the option should at least be offered to individuals. However, some consults simply require a face-to-face consultation, like those at risk of sight-threatening disease. There is a suite of online tests such as visual acuity, Amsler grids and visual fields that the patient can download from home, if indicated, and links to these are available through the Optometry Australia website.[2]

It's also important to consider specific populations, as you may alter your consultation to suit them. For example, for our elderly population, we may want to establish what matters most to them and conduct a brief cognitive ability check before the consultation (as simple as asking questions around weather and time of day).

EC By keeping our tele-optometry process simple, we were able to cater to a wider range of patients. Instructions on how to set up the PDF charts, such as how to calibrate their screen and measure the viewing distance, were clearly explained in the document itself but we were also available to talk a patient through the steps if needed. Patients required only access to a mobile or cordless phone, an email address and a computer to be able to participate in the consultation. In regards to being a suitable candidate for tele-optometry, patients simply needed to be able to verbally communicate effectively. We also preferred to use tele-optometry for our existing patients for whom we had an accessible record; for new patients to the practice with no available optometric history we were quite limited in the advice we could offer.

There are several platforms that video tele-consultation could be performed on and we do intend to add that as an optional part of future telehealth services.

KH **Are there any risks involved with tele-optometry?**

JE Sure, there are risks of course, but my personal opinion here is that the benefits far outweigh the potential harm. Not providing tele-optometry when consumers have no other options would lead to delayed access to vital sight-saving treatments. With that said, optometrists must still take reasonable steps to protect personal information from misuse and loss. Ensuring that the services are used through secure and trustworthy platforms mitigates some of the potential risks but even this is imperfect.

Therefore, it is important for clinicians to be familiar with each state's privacy and confidential requirements for health information, invest in information technology security within their practice, have a privacy and consent statement prior to each consult to advise the patient of what the information will and won't be used for, how it will be stored and collected, and ensure the physical privacy of yourself and the patient when undertaking the consult is maintained.

EC One of our main concerns was the possibility of misdiagnosis in the absence of a physical examination. We consulted our optometrists and formed a framework of what conditions we would be comfortable treating and those that where we need to exercise caution to help guide clinical judgement. Mitigating this problem required being mindful of the worst-case differential diagnosis and triaging or advising the patient accordingly, as well as undertaking more frequent reviews and follow-up than we would have otherwise considered.

Our other concern was adequately maintaining patient privacy without using a third party such as another online platform to conduct the consultation. To address this, we ensured the patient was appropriately identified with a three-point identity check at the start of the phone call in addition to providing us with verbal consent for a tele-optometry consultation. All patient data and

notes were stored in our usual practice management system, accessible only through our secured practice network.

It should also be advised that the patient should be in a private place when conducting the consultation. For instance, if the patient is doing the tele-consultation in their living room, other co-habitants could compromise privacy.

KH **How does tele-optometry differ from 'traditional' optometric care?**

JE Tele-optometry consultations will likely result in the clinician receiving less clinical information and more self-reported measures to formulate their management plans. Optometrists would need to consider this change in information gathered, and integrate that into their decision making while understanding its limitations. The use of telehealth would not be a 'plug and play' replacement for traditional optometric care, but a new paradigm with different expectations from the initial and follow-up consultations.

EC As previously mentioned, tele-optometry is more useful in triaging or following-up patients in select cases, recognising that our results through telehealth would not replace an optometric examination performed under traditional face-to-face circumstances. Despite the PDF document we put together, even accurately testing VA can be difficult as there was no way to confirm the patient had set up the test correctly.

From the tele-optometry consultation, we tended to categorise our management into three plans:

- ➔ Treat concerns over the phone; these could be followed up via tele-optometry at an appropriate interval to ensure the concern had been adequately resolved
- ➔ Refer urgent cases for ophthalmologic or medical care
- ➔ Defer non-urgent cases until a face-to-face appointment could be organised.

The majority of our telehealth patients fell under the third scenario.

There are some advantages however by moving the consultation from an optometry clinic to a patient's home or workspace: we could assess their visual requirements more appropriately such as 'the glare in their work environment' or 'the distance to their television' or 'how dimly lit their reading corner is' so I think we should be creative in how we use tele-consultations.

KH **Can you offer an example where you used tele-optometry effectively?**

JE During the peak of the COVID-19 pandemic in Australia I worked closely with a remote Aboriginal Community Controlled Health Service in Central Australia to develop a protocol and model of tele-optometry eyecare delivery as we anticipated not being able to deliver any outreach services for at least one year, maybe more (in fact, the community has only now re-opened for specialist face-to-face visits). In any case, the community already had a pre-existing and well-established teleophthalmology retinal screening service, so we had a good foundation to work from. However, there was a need to provide refractive error correction, cataract referrals and other disease management. We organised a portable auto-refractor and spent time training the local staff and were able to successfully provide spectacles, cataract referrals and solve presenting complaints for many patients using a three-way video consultation between the nurse, patient and me.

The on-the-ground staff were crucial to the success of the project, and they had a strong background in eye health, so this helped. Some issues were as trivial as interpreting spectacle prescriptions when re-ordering glasses or chatting with the patient about their eye condition. But we also made some sight-saving decisions, diagnosing retinal embolis and diabetic macular oedema, and making referrals for cataract based on the clinical information we had at hand.

EC Early in the year, we had seen a patient with a cotton-wool spot at the macula. At the time of her scheduled review the pandemic was in full swing and she was hesitant to attend for the appointment due to being immunocompromised. However, through tele-optometry we were able to monitor her regularly and effectively by emailing her the VA charts and Amsler grid without requiring her to take the risk of coming into the practice.

We also had several cases where continuation of treatment for chronic conditions such as dry eye, myopia control and glaucoma, required therapeutic prescriptions to be re-issued or adjusted and this was very well received by patients.

KH **Do you think there is a future for tele-optometry? How do we move the use of telehealth to an adjunct to face-to-face care?**

JE Well COVID-19 has certainly forced our hand, but now would be a good time to grab this opportunity and engage in telehealth. Potentially, starting simple like picking up the phone and checking in on your patients, especially those most vulnerable is the best way. Our job as optometrists is to play a role in addressing some of the most urgent challenges facing our society, including finding ways to achieve universal and equitable eye health care that is sustainable for what is a growing, diverse and aging population. This means engaging in the latest advancements and taking proactive actions to better meet the needs of our patients, ultimately this might mean stepping out of our comfort zones of traditional optometry. I think our biggest barrier remains how we are compensated for our time, as it stands there is not an MBS telehealth item for tele-optometry, but certainly we should consider private billing and Optometry Australia have offered guidance around this area.[3]

EC The pandemic has really accelerated the Australian public's acceptance of telehealth, however where telehealth is very well-suited in some fields such as the mental health space, it is a bit trickier in optometry with the current technology.

I believe tele-optometry consultations are best used as a form of triaging acute symptoms or as a follow-up consultation once an appropriate diagnosis and management plan has already been established via a face-to-face exam.

For tele-optometry to become truly viable, even as an adjunct to face-to-face consultations, our profession will also need to be able to bill appropriately for the time.

Finally, by reducing the barrier to accessing optometry, I believe that more Australians would seek optometric advice at an appropriate time rather than putting off a visit or waiting until they had time. This would facilitate early intervention which can lead to better outcomes.

1. Snoswell CL, Caffery LJ, Hobson G et al. Telehealth and coronavirus: Medicare Benefits Schedule (MBS) activity in Australia. [Internet]. St Lucia: Centre for Online Health, The University of Queensland, 2020. [cited 2020 Sep 10] Available from: https://coh.centre.uq.edu.au/telehealth-and-coronavirus-medicare-benefits-schedule-mbs-activity-australia

2. Optometry Australia. Telehealth [Internet]. Melbourne: 2020. Available from: https://www.optometry.org.au/practice-professional-support/coronavirus-covid-19-what-optometrists-need-to-know/covid-19-clinical-advice/telehealth/

3. Optometry Australia. Telehealth Fee Guide [Internet]. Melbourne: 2020. Available from:: https://www.optometry.org.au/wp-content/uploads/Professional_support/COVID-19/2020_Telehealth-Fee-Guide.pdf

*Visit the 'Telehealth' section of the Optometry Australia website to read the clinical practice guide 'Telehealth in Optometry.'

(https://www.optometry.org.au/wp-content/uploads/Professional_support/COVID-19/Clinical-Practice-Guide_Telehealth-in-optometry_June-2020-FINAL.pdf)

Contact lens prescribing trends 2020

The 21st annual survey by Efron, Morgan and Woods

Emeritus Professor Nathan Efron
AC PhD DSc

Institute of Health and Biomedical Innovation,
Queensland University of Technology, Brisbane, Australia

Professor Philip B Morgan
BSc PhD MCOptom FAAO FBCLA

Eurolens Research, the University of Manchester
Manchester, UK

Professor Craig A Woods
PhD BSc(Hons) FACO

School of Optometry and Vision Science
University of New South Wales, Sydney, Australia

The 21st annual survey of Australian contact lens prescribing was conducted between February and April this year. The same survey format as in previous years was employed. An email invitation to participate in the survey was sent to all members of Optometry Australia, with a link to a questionnaire, and a request that this be downloaded, printed and completed to provide details of the first ten patients fitted with contact lenses after receipt of the questionnaire. The survey was specifically designed to be straightforward to complete while capturing key information about their patients.

Practitioners were asked general questions about themselves. For each contact lens fitting, they were requested to complete the following details: date of fitting, age and sex of patient, lens material, lens design, frequency of replacement, times per week of wear, modality (daily or extended wear) and care system. Practitioners were asked to return the photographed or scanned copies of the questionnaire by email.

The invitation to participate in the survey was sent on 24 February 2020, which was a month after the first case of coronavirus was reported in Australia. The first wave of the pandemic went on to peak around the beginning of April, by which time the practice of optometry was significantly adversely impacted. The end date for submission of survey forms was 30 April.

2020 survey highlights:

- Low returns due to COVID-19
- Silicone hydrogels dominate the market (87%)
- Daily disposables at record levels (65 %)
- Myopia control lenses gaining traction (4%)

Completed questionnaires relating to 192 contact lens fits were returned, which was, not unexpectedly, about half the number submitted in previous years. However, we determined that there was still sufficient data to provide a sound basis for a meaningful analysis of soft lens prescribing, to which the majority of reported fits pertained.

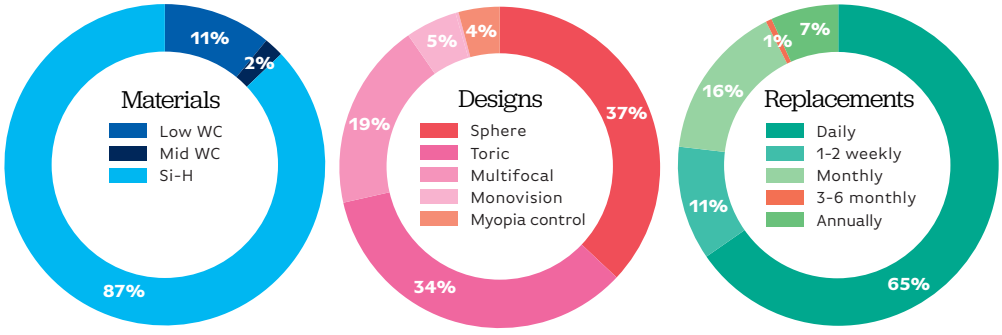


Figure 1.
Detailed results for soft contact lens prescribing in the 2020 Australian survey. Si-H, silicone hydrogel; WC, water content

Demographics

As is the case elsewhere in the world,[1] a majority of lenses (60 per cent) were fitted to females.

The average age of contact lens wearers at the time of fitting has increased over the past two decades, from 32.3 ± 12.9 years in 2000 to 37.5 ± 18.6 years in 2020. The age at fitting this year ranged from 0 to 78 years.

Figure 1 is a composite of pie charts detailing the key findings of the 2020 survey in relation to soft lenses.

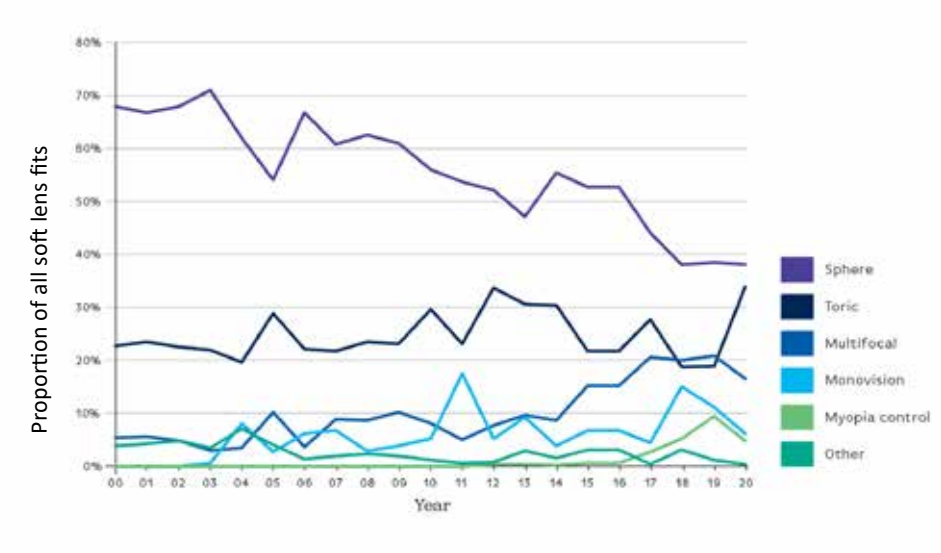


Figure 2.
Proportion of all soft lens fits of various designs in Australia between 2000 and 2020

Soft versus rigid lens fits

Soft lenses remain the main type of contact lens prescribed, accounting for 89 per cent of fits. Soft lenses have represented the vast majority of contact lens fits since our survey began 21 years ago.[2] Because of the overall low return this year, coupled with the low rate of rigid lens fitting, it is not possible to provide a meaningful sub-analysis for rigid lens fits.

Soft lens materials

There has been a further increase this year in the fitting of lenses made from silicone hydrogel materials, which now represent 87 per cent of all soft lens fits, up from 80 per cent in 2019. The balance comprises mainly of low- and mid-water content hydrogel materials, at 11 and two per cent of all soft lenses fitted, respectively.

Soft lens designs

The key categories of soft lens designs are spherical, toric, multifocal, monovision (perhaps a 'fitting approach' rather than lens design), myopia control and coloured (tinted). Figure 2 shows trends in lens designs fitted in Australia between 2000 and 2020.

In 2000, the majority of soft lenses fits (67 per cent) were with spherical lenses. In 2020, spherical soft lens fits were very much in the minority (37 per cent). This statistic alone is testament to the tremendous developments that have taken place in respect of non-spherical designs. Toric lens fitting has remained robust over the past two decades, ranging between about 25 and 40 per cent of soft lens fits.

Options for correcting presbyopia (multifocal or spherical monovision lenses) would have been considered 'specialty designs' 20 years ago but are now mainstream. Between 2000 and 2013, multifocal and monovision lenses were fitted in approximately equal measure; however, since 2013, multifocal fitting has exceeded monovision fitting, which may be attributed to improved multifocal lens designs and a commensurate increase in confidence of practitioners fitting such lenses.

Lenses designed for arresting the progression of myopia – referred to as 'myopia control' – which are mainly fitted to children, have gained traction in Australia over the past four years and now account for four per cent of soft lens fits (this figure does not include additional rigid lens fits for myopia control using orthokeratology). Other lens designs, such as coloured lenses, continue to be prescribed at very low levels.

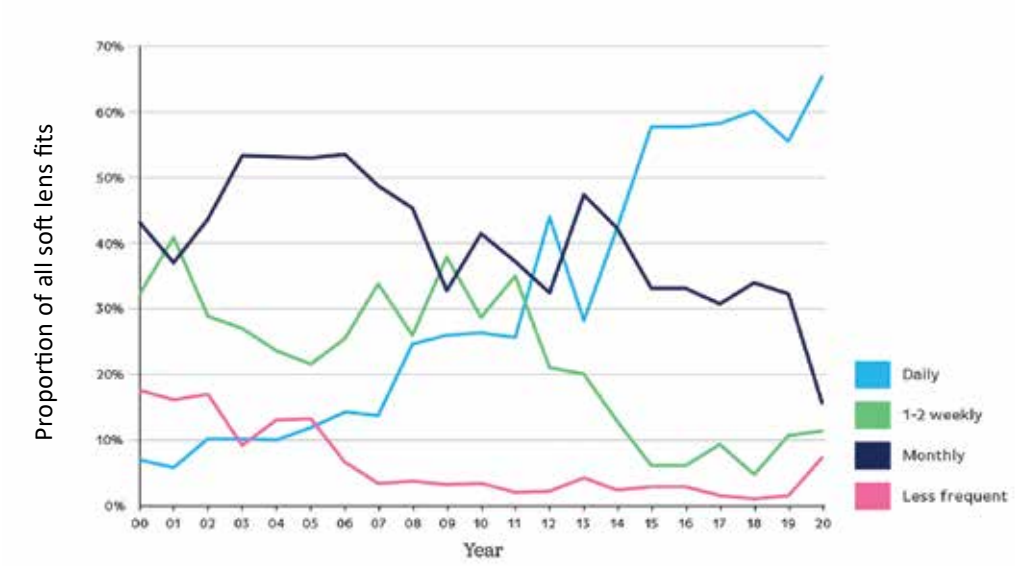


Figure 3.
Proportion of all soft lens fits according to replacement frequency in Australia between 2000 and 2020. ('Less frequent' = replaced less than monthly).

Soft lens replacement frequency

The vast majority soft lenses fitted in 2020 were replaced daily, which at 65 per cent is the highest recorded level of daily disposable fits since the Australian survey commenced in 2000. This has been mainly balanced by a significant drop in monthly lens fits.

Trends since 2000 in soft lens fitting according to replacement frequency are shown in Figure 3. As has been the case over the past five years, daily disposable lenses now dominate the Australian market, with the level of prescribing of this modality at or above 60 per cent of all soft lens fits since 2015.

Soft lens wearing modality and care solutions

Extended wear lens fitting, almost exclusively with silicone hydrogel

materials, has remained constant at under 10 per cent of all lens fits over the past decade, dropping to a low point of four per cent in 2020.

Multi-purpose solutions are used by the vast majority of those wearing reusable lenses, with this solution type representing 92 per cent of prescribed care regimens. The balance is peroxide systems.

Australia versus the world

We conduct annual contact lens fitting surveys in about 40 countries each year.[1] This provides an opportunity to benchmark against international colleagues, and this year we compare contact lens prescribing in Australian against world trends (the latter derived from 2019 data[1]) (Figure 4). Seven key categories of lens type are represented. The outer and inner rings display the Australian and world-wide fitting data,[1] respectively.

The most profound difference revealed in Figure 4 is that daily disposable silicone hydrogel lenses—widely believed to be the most advanced lens type in terms of eye health—are prescribed at more than twice the rate in Australia (52 per cent) compared with the rest of the world (22 per cent). The main rationale for this difference is the much lower rate of fitting of reusable silicone hydrogel and hydrogel lenses in Australia versus world averages. Rigid lens fitting in Australia is similar to world trends.

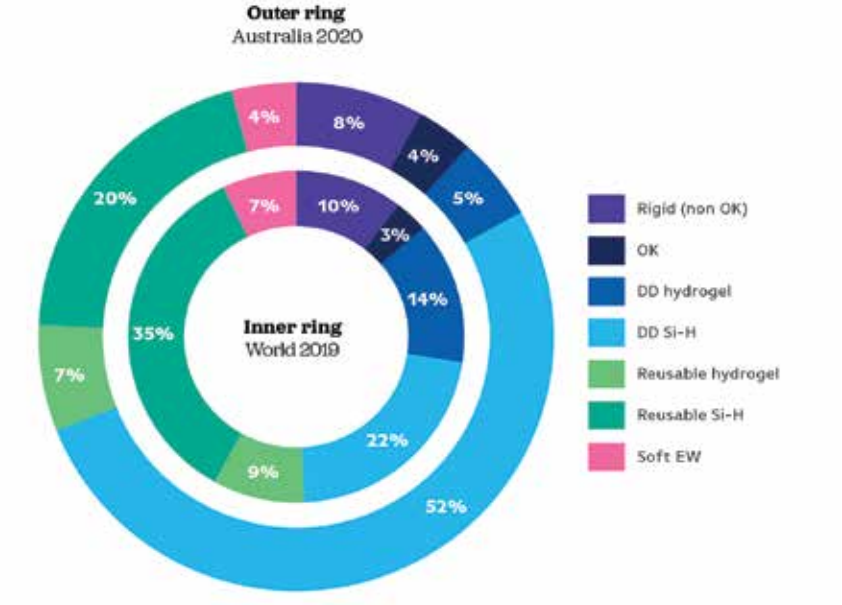


Figure 4.
Percentage of all contact lenses prescribed in Australia (2020, outer ring) compared with the world (2019, inner ring). EW: extended wear; Si-H: silicone hydrogel; DD: daily disposable; OK: orthokeratology

Conclusions

We are fortunate to have received a sufficient number of survey forms to report contact lens prescribing trends in Australia, with a reasonable level of confidence, during this 'COVID-affected' year 2020. The dominance of silicone hydrogel materials and daily lens replacement reflects a continuing trend that is showing no sign of abatement.

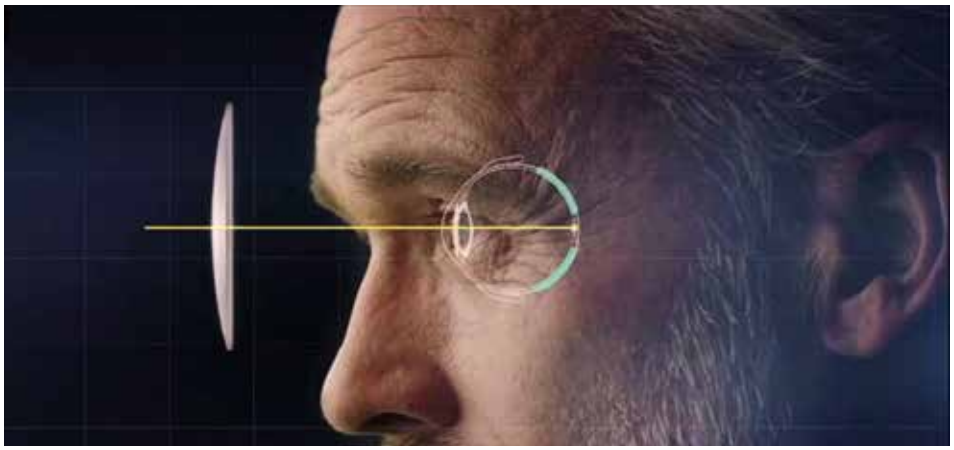
1. Morgan PB, Woods CA, Tranoudis IG et al. International contact lens prescribing in 2019. *Contact Lens Spectrum* 2020; 35: 26-31.
2. Morgan PB, Efron N, Helland M et al. How does the UK market compare with other countries? *Optician* 2001; 221: 26-32

Nicola Peaper
National Sales and Professional Services Manager
Rodenstock Australia

Non-tolerance lens issues

A step-by-step plan to resolve problems

Non-tolerance to a spectacle appliance is only a small part of optometry practice – research shows somewhere between 1.6 per cent and 2.3 per cent[1,2] – but the consequences can be far-reaching in terms of wasted professional time and loss of reputation. It is essential that a resolution is reached quickly to avoid the stress that repeated visits can cause both patient and practitioner.



In order to successfully trouble-shoot an issue it is important to understand the implications of each step in the process of the prescribing and supplying spectacles.

Case study

Here we consider the patient who collected new progressive spectacles one week ago now presenting with a problem. Previously, the patient had successfully worn progressive lenses. The new script is:

R +2.00 / -0.25 x 180 VA 6/6
L +1.25 / -1.00 x 180 VA 6/6
Add +2.25

First, the practitioner needs to ascertain what the problem is: distance- or near-clarity, reduction of areas of clear vision anywhere on the lens, swim etc. The next step is to consider any of the changes that have been made with respect to previous spectacle prescription.

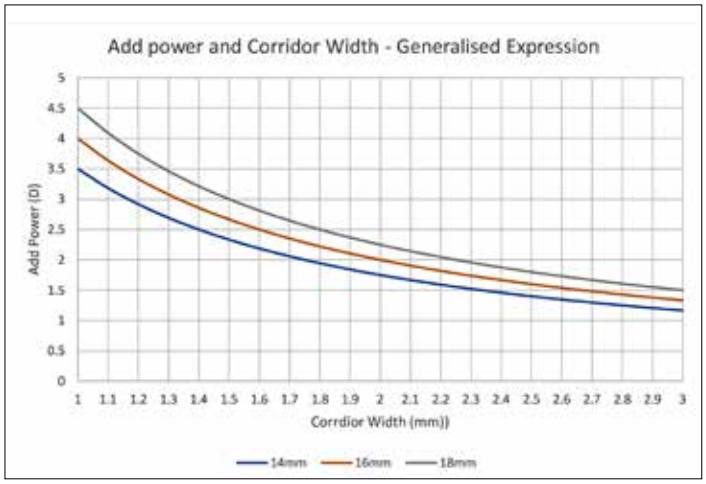


Figure 1.
How add power and corridor length effect corridor width. (Reproduced with permission of Grant Hannaford - Academy of Advanced Ophthalmic Optics).

Studies indicate[1,2] that non-tolerance to a prescription is one of the most common reasons why a patient will return to a practice. Following this, other common issues likely to cause a patient to return typically occur from dispensing, such as frame issues and then lens design. As such, it makes sense to approach the problem in that order.

1. Start with the script

Taken in isolation, the example script probably does not immediately give cause for concern, but if we are told that the previous script was:

R +1.50 / -0.25 x 180 VA 6/6
L +1.25 / -0.50 x 180 VA 6/6
Add +1.50

Several alarm bells ring. Consideration needs to be given to the effect that the increased difference between right and left scripts will likely cause, along with the significant increase in near power, especially in the right eye.

- There is a significant change in the script in both eyes that at the very least will necessitate a change in head position for viewing every distance. It is likely that the patient has been elevating their chin to improve vision in their old spectacles. This is not something they will need to do wearing the new pair.
- There is now a 1.50 D difference between the two eyes in the distance script in the vertical meridian. If the patient had been put into a 16 mm corridor progressive lens then the differential vertical prism at near would be 1.8Δ. This may lead to discomfort on prolonged close work. Shortening the corridor would reduce the prism difference at near. When calculating the differential prism at near the shorter the corridor the better.
- The increase in the add will cause an increase in the amount of Minkwitz astigmatism, which is the aberration caused by the power of the lens changing from distance to near. This will automatically reduce the corridor width significantly (Figure 1).

Lengthening the corridor will reduce the effect of this aberration. As the addition has increased by +0.75D, to endeavor to maintain corridor width, a long corridor would be best.

If the patient is complaining of having to drop their chin, tiredness or loss of clarity at near, a narrow reading area or a combination of these things then a modified script should perhaps be considered. It may be possible to reduce the R distance script by +0.25D and reduce the add by +0.25D. These small differences may resolve the issue.

Interestingly, a study in 2011[3] found that partial prescribing, or modification of refracted prescription, was more likely to occur the longer a practitioner had been qualified. Partial prescribing of a script change is three times more likely at the end of a forty-year career than at the beginning. The study proposes that 'the most likely cause of the strong link between years qualified and the likelihood of partially prescribing is increased experience, as with more exposure to patients who return unsatisfied with their spectacles, a greater appreciation of partial prescribing is achieved.'

2. Frame

The next thing to consider is the frame. Is it deep enough for the patient to have full use of the corridor? How close is it to the standard parameters that your lens manufacturer uses to compensate the lens? For European lens designers, these parameters are approximately 5° face form angle (FFA), 7° pantoscopic tilt (PT) and 13 mm corneal vertex distance. If the frame sits outside these parameters, even by a few degrees, then the performance of the lens drops off quite quickly.

It should be understood that, with FFA, a change from standard of only 3° will cause a drop in lens performance of 25 per cent and a FFA of over 10° will likely make the lens unusable. Likewise, with PT. A PT of 0°, which is not uncommon in small frames, the performance of the lens drops by 50 per cent.

If the patient reports high levels of swim and/or narrow corridor, then consider altering the frame parameters to be closer to standard or change to a lens optimised for the exact parameters of the frame.

3. Lens design

Finally, consider the lens design. It is commonly accepted that, according to the Minkwitz Theorem,[4] astigmatism increases by two dioptres horizontally for every dioptre the lens power increases vertically causing an extra increasing aberration as the add goes up. In this case, the add has increased by +0.75 D causing 1.50 D of unwanted astigmatism. This cannot be reduced and so will need to be dispersed over the lens surface. Several lens manufacturers now have a suite of lens designs for different lifestyles and these designs govern how aberration appears across the lens.

A distance-preferencing lens will have reduced aberration in the distance and intermediate portions as the design starts below pupil height and aberration is pushed down and out of the intermediate areas. Figure 2 shows an Iso VA graph of this type of lens. It can be seen that at the height of the fitting cross, the add still has no influence, giving good vision even in low light levels when the pupil size increases. At the same time the aberration is pushed down, out of the distance zone.

A consequence of this is the add has to come in quickly and this will narrow the corridor. As modern times call for a wider intermediate area the near portion will have increased aberration. This will not necessarily cause problems as 'near' today is considered the central and close viewing of a mobile phone and most other tasks take place at an intermediate distance.

Figure 3 shows the opposite type of design giving preference to intermediate and near. In this case, a longer corridor may be created by sitting the fitting cross 1 mm into the corridor. More width then comes from pushing aberration out and up into the distance portion of the lens. Again, this will probably not cause problems as, according to the iso VA chart in Figure 3, the VA peripherally at pupil height does not drop below 0.8 (6/7.5).

Understanding the patient's lifestyle will enable the lens choice to be made. However, in the example, if driving is a problem with narrow fields of view and blurred night vision then a distance-preferencing lens is indicated. If width of corridor and an elevated head position for intermediate and near is a problem, then an intermediate and near-preferencing lens would be better.

When dealing with a case of non-tolerance to spectacles it is important to understand the implications of every change that has been made in script, frame and lens. Following a logical, step-by-step process of analysis can reduce the time taken in terms of repeated visits, increase positive outcomes and thereby reduce stress.

1. Hrynchak P. Prescribing spectacles: reasons for failure of spectacle lens acceptance. *Opthal Physiol Opt* 2006; 26: 111–115.

2. Freeman CE, Evans BJW. Investigation of the causes of non-tolerance to optometric prescriptions for spectacles. *Opthal Physiol Opt* 2010; 30: 1 – 11.

3. Howell-Duffy C, Scally AJ, Elliott DB. Spectacle Prescribing II: Practitioner experience is linked to the likelihood of suggesting a partial prescription. *Ophthalmic Physiol Opt* 2011; 31: 155–167

4. Sheedy JE et al. Progressive Powered Lenses: the Minkwitz Theorem. *Optometry and Vision Science* 2005; 82: 916-922

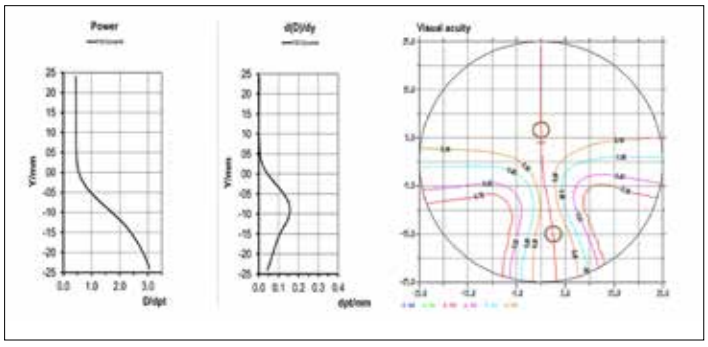


Figure 2.
Distance-preferencing lens

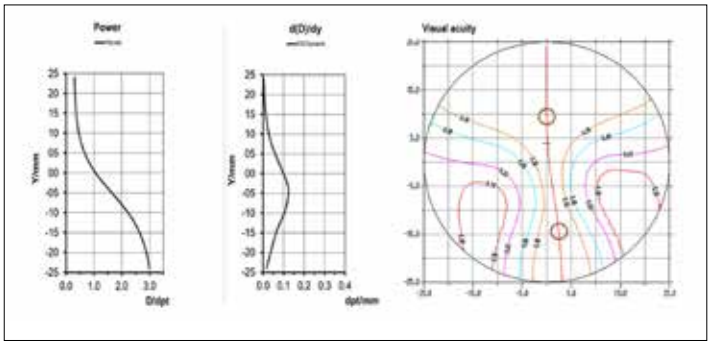


Figure 3.
Intermediate and near-preferencing lens

The diagnosis and management of temporal arteritis

Discussing the critical importance of early detection and management of giant cell arteritis

Melvin LH Ling
BMed MD

Jason Yosar
MBBS

Brendon WH Lee
BMed

Saumil A Shah
BMed MD

Ivy W Jiang
BMed

Anna Finniss
FRACP

Alexandra Allende
FRCPA PhD

Ian C Francis
FRACS FRANZCO PhD

Associate Professor Maria Markoulli
PhD MOptom GradCertOcTher FBCLA FAAO

Deputy Editor, *Clinical and Experimental Optometry*
Senior Lecturer and Postgraduate Research Coordinator
University of New South Wales, Sydney

As undergraduate optometry students, we are taught to be on the lookout for the clinical signs and symptoms of ocular emergencies, as the outcome can depend on timely diagnosis and management. Temporal arteritis, retinal detachment, central retinal artery occlusion, acute angle-closure glaucoma, penetrating globe injury and chemical burns are all among the list of conditions that need urgent referral to an ophthalmology colleague or an emergency department. Our actions as primary care optometrists can be both vision- and life-saving. *Clinical and Experimental Optometry* recently published an invited review from the team of Professor Ian Francis, which focused on temporal arteritis (also known as giant cell arteritis).

Temporal arteritis is a chronic vascular inflammation affecting the medium- and large-sized arteries in patients over the age of 50 years, with over 80 per cent of affected individuals over the age of 70, and a greater disposition for females. The vision loss that can result in one or both eyes can be due to the ocular manifestations of the disease; arteritic anterior ischaemic optic neuropathy (A-AION) is the primary cause of vision loss due to occlusion secondary to inflammation of the ciliary artery, the source of blood supply to the optic nerve. The systemic manifestations include aortic dissection or rupture, stroke, and death. Early diagnosis and management are therefore critical to avoid vision loss, and potentially, death.

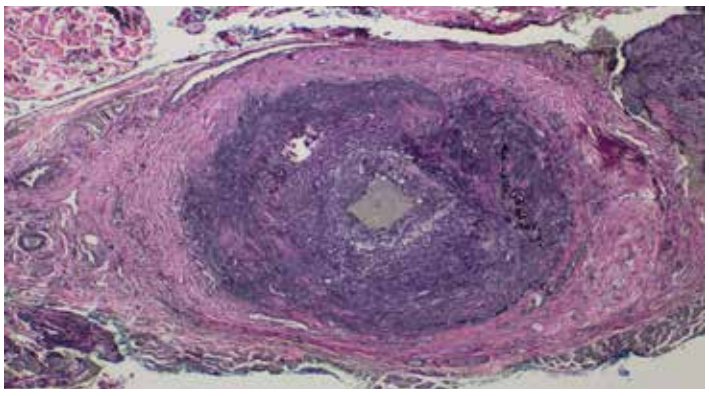


Figure 1.
Temporal artery biopsy

The common triad of clinical symptoms to remember includes:

1. New-onset headaches associated with tenderness of the scalp.
2. Visual disturbances such as diplopia or amaurosis fugax. This may be the sole or first manifestation of temporal arteritis and may be sudden and painless, involving one or both eyes. Without prompt management, up to 50 per cent of people will develop vision impairment in the contralateral eye. Untreated, up to 60 per cent will develop complete vision loss in one or both eyes.
3. Jaw claudication which may be misdiagnosed as temporormandibular joint disorder.

This triad can occur alongside non-specific symptoms such as weight loss, fatigue, loss of appetite, fever and night sweats.

The ophthalmic examination includes best-corrected visual acuity, the presence of a relative afferent pupillary defect, dilated fundus examination and ocular motility in the presence of diplopia. The fundus may be normal, however cotton wool spots may be observed, suggesting focal ischaemia.

The authors advocate urgent, same-day referral to an ophthalmologist if temporal arteritis is suspected. The diagnosis will be confirmed with histopathological analysis of a temporal artery biopsy, although treatment should be commenced prior to confirmation. In addition to this test, blood tests for erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and full blood count should also be ordered.

The first line of therapy is systemic corticosteroids. In the absence of vision loss, patients are treated with oral prednisone 1 mg/kg once daily, to a maximum of 100 mg/kg, with adjustments made based on the blood results. In the presence of amaurosis fugax or diplopia, the most common modality of treatment is pulsed intravenous methylprednisolone, 500-1,000 mg once daily for three days, followed by oral prednisone, 1 mg/kg once per day. This is maintained for up to four weeks, followed by a slow taper.

The full article can be found in the September 2020 issue *Clinical and Experimental Optometry* and is well worth a read for clinical guidance. For additional content on this paper, please visit the Optometry Australia YouTube channel for an interview with author Ian Francis.

Ling ML, Yosar J, Lee BW, et al. The diagnosis and management of temporal arteritis. *Clin Exp Optom* 2020; 103: 572-582. doi:10.1111/cxo.12975

CLINICAL & EXPERIMENTAL OPTOMETRY

Interview with CXO author Angelica Ly

Author of: An evidence-based approach to the routine use of optical coherence tomography Clin Exp Optom 2019; 102: 242–259

Dr Angelica Ly is an Associate Lecturer at the School of Optometry and Vision Science UNSW, Lead Clinician and Integrated care co-coordinator at the Centre for Eye Health. She is a clinician-scientist driven toward applying technology and systems-wide change for better, patient-centred care. Her current research interests include advanced retinal image analysis, patient outcomes, and health care delivery. Associate Professor Maria Markoulli spoke with Dr Ly about her research and recent publication in *Clinical and Experimental Optometry*.

What path of study did you follow to get into academia?

I graduated from my core bachelor studies at UNSW with first class honours and so had a smooth transition enrolling into a PhD at UNSW, six years later. My PhD project was based at the Centre for Eye Health where I was already practising part-time as a clinician.

What piqued your interest about macular degeneration?

Macular disease interests me because of the easy accessibility of the area via imaging, as well as the strong connection with visual outcomes. It is such a small but delicate region and so much can go wrong!

What are the key take-home messages from your recently-published a paper in CXO?

The key message from this paper is to appreciate how quickly the evidence has evolved and above all to recognise that optical coherence tomography, as with all imaging, is an adjunctive test that should complement rather than rule our clinical decision making.

Where do you envisage OCT will be in 10 years?

Optical coherence tomography will follow the trajectory of colour fundus photography and become even more widely available. As we've seen in the evolution from time-domain to spectral-domain, swept-source and now OCT angiography, both hardware and software developments in OCTs will contribute to making the tool ever-more useful and relevant in a clinical setting.

When I'm feeling speculative, I like to imagine that there will one day be an ultra-widefield OCT capable of acquiring an auto-focused, auto-aligned, super-dense, high-definition volume in a matter of seconds. And, of course, the instrument would be portable; wouldn't suffer any signal roll-off; have complementary angiography; a flawless and regularly-updated normative database; a myriad of image analysis features; and built-in machine learning capabilities!

What are you currently working on?

I have a new interest at the moment in health literacy and preventative care, which I see as tools for optometrists to promote better visual outcomes for our patients. Health literacy describes a patient's ability to access, understand and apply health information for their own wellbeing. Preventative optometry describes a practice philosophy aimed at avoiding disease altogether and can be as simple as advising patients not to sleep in their contact lenses.

It is so intriguing to consider on an individual level what we as optometrists might actively do differently to promote both.

Optical coherence tomography, as with all imaging, is an adjunctive test that should complement rather than rule our clinical decision making.

Any advice for young optometrists considering an academic career?

My advice for all career planning is to reflect on what brings you as an individual the most satisfaction and, if the situation allows, to maximise those experiences in day to day life. I think the core attributes for those specifically considering an academic career are that you need to be driven (enough so to work outside of the usual 9-5), passionate about lifelong learning and highly curious. My suggestion would be to chat to academics who have walked the path you might be considering and to seek out opportunities to get a taste for what a career in academia involves.

Associate Professor Katrina Schmid
BAppScOptom (Hons), PhD, Grad Cert Ocular Therapeutics,
Grad Cert Ed Higher Education, SFHEA

School of Optometry and Vision Science,
Queensland University of Technology, Kelvin Grove, Australia

Fluoroquinolones

Highly effective as antibacterial agents, they can also adversely affect human cells.

The fluoroquinolones (modified quinolones) are generally considered the most effective of all the topical ocular antibiotics. They are a group of broad spectrum, bactericidal antibiotics with a similar mode of action that includes inhibiting the replication and transcription of bacterial DNA synthesis by blocking DNA gyrase or topoisomerase-IV.[1]

In Australia, ciprofloxacin, moxifloxacin and norfloxacin are available for systemic use.[2] These can only be prescribed for specific indications and are used to treat respiratory and urinary tract infections for which there is no other effective treatment. In Australia, only two second-generation agents, ofloxacin and ciprofloxacin, are available for ocular use.[2] In America there are more ocular agents available, including ciprofloxacin, gemifloxacin, levofloxacin, moxifloxacin, norfloxacin and ofloxacin.

Are systemic fluoroquinolones safe to use?

Although stated to be rare, there are many potential side-effects from systemic use of fluoroquinolones. This includes a serious and potentially permanent peripheral neuropathy;[3] the onset of symptoms (tingling, numbness or pain of the feet, legs, hands or arms) may be rapid.[4] There are also warnings alerting patients to the risk of tendon damage and rupture, which might be due to the release of tissue-damaging substances or enzymes that degrade collagen, and could be permanent.[5] Fluoroquinolones are stated to weaken the aortic wall, presumably also by damaging collagenous proteins, increasing the risk of its dissection or aneurysm which are life-threatening events.[6] More recent warnings include risks of low blood sugar and mental health problems.[7]

What is fluoroquinolone toxicity?

Fluoroquinolone toxicity and the large collection of irreversible effects that have been described has led to the naming of a potentiality permanent syndrome called fluoroquinolone-associated disability (FQAD)[8] and the situation of having been 'Floxed.' There are FQAD social media support groups for affected individuals. Symptoms can last more than a year and impact quality of life.[9]

What are the ocular effects of systemic fluoroquinolones?

Collagen is also a critical component of the vitreous body and in maintaining retinal attachment, but whether fluoroquinolone use increases the risk of retinal detachment remains controversial. Daneman et al.[10] performed a longitudinal population-based study in Canada. They did not find a significant association between fluoroquinolone use and retinal detachment risk and suggested possible reasons: the type of collagen in retinal tissue may be less affected than other forms, or that the retina is under less tension than the ankle tendons. Etminan et al.[11] had previously reported a link between oral fluoroquinolones and increased risk of retinal detachment. Although the increased risk was small, at only four per 10,000 person-years, this was five times the usual risk.

Are there any side effects of topical ocular agents?

It is generally considered that topical fluoroquinolones do not pose the same risk as systemic use,[2] and are generally considered safe to use.[12] Though there are case reports linking Achilles tendinopathy to moxifloxacin eye[13] and ear drops.[14] Listed precautions include if patients have a history of tendon damage or hypersensitivity to previous quinolone use.

Topical agents may be problematic to the eye itself and particularly the ocular surface. Thompson[12] has provided a comprehensive review of the typical ocular side-effects (see Table 1) which are dose dependent. Frequent instillation of ciprofloxacin eye drops is associated with white precipitates on the ocular surface due to crystallisation of the compound due to its pH solubility profile. Toxic effects on ocular collagen may be the reason for the increased risk of corneal perforation. Although the systematic review by McDonald et al.[17] on the use of topical antibiotics for bacterial keratitis did not find evidence of increased risk of corneal perforation with fluoroquinolones compared with other antibiotic combination therapies (usually aminoglycoside plus cephalosporin).

Using animal models, it has been shown that topical quinolones increase the expression of ocular surface inflammatory markers MMP-1, MMP-2, MMP-8 and MMP-9,[18] suggesting the potential for corneal cytotoxicity and impaired wound healing. These agents are toxic to the corneal keratocytes and endothelial cells;[19] effect is maximum with ciprofloxacin, followed by ofloxacin, gatifloxacin and moxifloxacin and least with levofloxacin.

Why are there so many adverse effects? Do fluoroquinolones alter human cells and how?

This class of antibiotics does not just harm microbes but can damage human cells too (as can other antibiotics). The key question is why, or *how* does the damage occur?

The underlying cause appears to be the adverse effects on mitochondria which are similar in humans and bacteria; the mitochondria of human cells are thought to have evolved billions of years ago from bacteria-like cells.

Kalghatgi et al.[20] have reported that antibiotics build up reactive oxygen-containing molecules in mitochondria causing severe oxidative stress and preventing them from functioning normally. The mitochondrial depletion and mutation can be delayed[21] and this could account for the latency of symptoms.

Relative risk	Adverse effect	Evidence
Reasonably Likely (> 10%)	Local irritation, burning, stinging and itching	Reviewed in Thompson 2007[12] Hyndiuk et al. 1996[15]
	Corneal precipitates	Hyndiuk et al. 1996[15]
	Corneal perforation	Mallari et al. 2001[16]
Common (> 1% to 10%)	Eyelid oedema and lid margin crusting	Hyndiuk et al. 1996[15]
	Blurred vision	Reviewed in Thompson 2007[12]
Infrequent (0.1 to 1%)	Chemosis	Hyndiuk et al. 1996[15]
	Hyperaemia	Reviewed in Thompson 2007[12]
Rare (< 1%)	Lacrimation	Hyndiuk et al. 1996[15]
	Superficial punctate keratitis	Hyndiuk et al. 1996[15]

Table 1.
Ocular side-effects of topical fluoroquinolones

It has also been shown that ciprofloxacin causes DNA breaks in mitochondria in mammalian cell culture models.[21] The fluoroquinolones may also bind iron atoms from the active sites of enzymes that modify DNA, and this could lead to epigenetic changes that cause adverse effects.[22]

Can the damage to the mitochondria be prevented or treated?

There are currently no effective treatments to prevent these adverse effects and the damage does not seem repairable. Michalak et al.[8] suggests a range of possible treatment avenues to investigate, for example a) reduction of the oxidative stress, b) restoring the altered mitochondrion potential, c) stimulating mitochondrial proliferation, and, d) regulating the disturbed gene expression and enzyme activity.

Mitochondria targeted antioxidants protect against mitochondrial damage and may be useful in preventing damage.[23] It is unknown whether taking a simple antioxidant like vitamin C in conjunction with antibiotic treatment might limit some of these effects. Although some minerals (for example calcium, iron, magnesium, zinc) bind to these antibiotics and prevent their absorption and thus reduce their effectiveness.[24]

Clinical translation

The fluoroquinolones do have actions against human cells, that is, they have more than just antibacterial activity. Patients taking these agents should read the warning on the packaging. They need to be aware of the potential risks and to contact their doctor immediately if they experience symptoms like numbness, weakness, tingling, burning or pain.

Patients using ocular forms should be monitored for corneal thinning and risk of corneal perforation. It is possible but unproven as to whether taking an antioxidant, like vitamin C, might reduce the risk of side-effects. These agents are not for long-term use.

This work has been published in longer form as a viewpoint article. Schmid KL. Fluoroquinolones are a potent form of chemotherapy. *Clin Exp Optom* 2020; doi:10.1111/cxo.13102

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Melbourne Rapid Field

Home-monitoring and sensitive clinic-based detection of vision problems

Professor Algis J Vingrys
PGCertOcTher BSc (Optometry) PhD FAAO FARVO
The Department of Optometry and Vision Sciences, The University of Melbourne

Selwyn Prea
B.Optom, M.Phil (Optometry)
The Department of Optometry and Vision Sciences, The University of Melbourne and The Royal Victorian Eye and Ear Hospital

George Kong
MBBS BMedSci PhD FRANZCO
The Royal Victorian Eye and Ear Hospital

The COVID-19 pandemic has placed a great strain on the way optometrists and patients can interact. Many patients are wary of attending clinics for fear of contracting the virus. However, eye disease continues, and the need of practitioners to follow their patients who have chronic conditions such as diabetes, AMD or glaucoma remains. Practitioners need to screen those with complaints of vision change or loss; and they need to determine who warrants a clinical work up. Likewise there is a need for a device that does not make direct contact with patients' faces and eliminates the threat of aerosolised droplets that spread between patients. This is where the Melbourne Rapid Field (MRF) comes into its own.

Developed by Glance Optical, the MRF is the world's first iPad tablet perimeter and visual acuity test. With the MRF, patients can use their own iPad, an Apple or PC computer or any other tablet, to undertake testing at home, guided by a voice-over set of instructions built into the software.

The MRF can also be used in the office, by patients waiting in reception or at home prior to coming to the clinic. The portability of the MRF means that it can be used on clinical rounds or domiciliary visits to identify eye or vision disorders that traditionally require complex and expensive equipment for testing. Even as telehealth redefines the expectations of the standard clinical work up, these novel applications provide practitioners with increased flexibility in screening and testing of their patients.

The MRF in the clinic

Several studies identify that the MRF returns similar outcomes to the Humphrey Field Analyzer (HFA, 24-2 Sita Standard and Fast) for both global (in paragraph below) or regional thresholds.[1] This was confirmed by trials undertaken in Cambridge, UK and Delhi, India in two very diverse clinics.[2] The MRF also has a retest performance that is similar to the HFA[2] implying that it can be used with confidence to monitor visual field defects over time.

We find that children can do the test easily[3] and that it can be used to identify cases of stroke within a week of hospital admission.[4]

An independent clinical trial confirmed that the MRF global index (MD) was highly-correlated with the HFA MD (r = 0.89) and that the diagnostic capacity (sensitivity and specificity) of the MRF was not significantly different from the HFA (AUC: 0.84 MRF vs 0.85 HFA, p > 0.05) in 60 cases of glaucoma and 25 controls.[5]

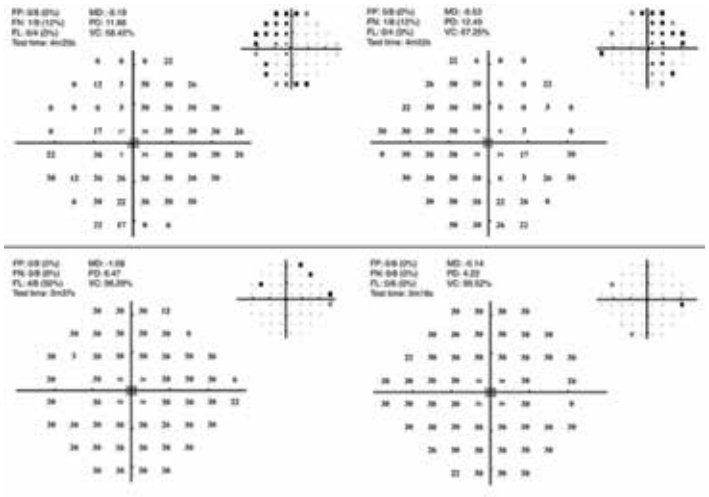

Figure 1.
The MRF visual field results for Case 1 measured at the patient's bedside. Top panels show the dense superior bitemporal hemianopia on admission to hospital. Bottom panels show the improved visual field two weeks after surgery (modified with permission of Nesaratnam et al.[6]).

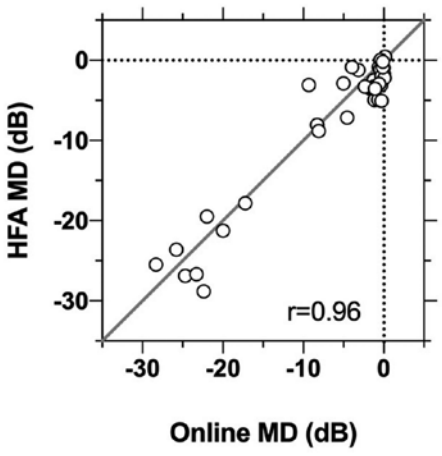

Figure 2.
The visual field global index (MD) returned by a telehealth consult online and the most recent HFA test undertaken by the same patient in the clinic (about six to 12 months ago.) The correlation between the two data sets (n = 36 eyes) is very high (r = 0.96) confirming that clinicians can be confident in the outcome returned from telehealth.

Bedside testing

The tablet application of the MRF has been used to test 110 stroke patients by their bedside. Here it was found that the majority of patients had abnormal visual fields or reduced acuity-in-noise but retained near normal visual acuity. Nesarathan et al. report the case of a 73-year-old female who was admitted to hospital with a three-week history of frontal headache and blur on her left. She had no nausea, diplopia, facial pain or paraesthesia although she had presented seven months prior with nausea and vomiting. At this previous event, magnetic resonance imaging (MRI) of the head found no obvious mass or abnormality and she was medicated and released. At the present visit, fundoscopy found normal optic discs in both eyes.

Given her report of vision disturbance, visual acuity and visual field testing was performed at her bedside using the MRF on an iPad. Her visual acuities were 6/18 OU (6/12 pinhole). A dense superior bitemporal visual field loss was noted (Figure 1, upper panel).

This finding directed her investigators to refer for MRI and pituitary hormone assays as well as an ophthalmology consult for formal vision and visual field evaluation. A Humphrey 24-2 test, performed two days later, confirmed the presence of a dense superior bitemporal visual field loss, consistent with Figure 1. MRI identified a mass in the pituitary region.

Neurosurgical intervention was undertaken two days later and two weeks post-operatively the patient's acuity was RE 6/4 and LE 6/5 with visual fields vastly improved (Figure 1, lower panel).[6]

Telehealth in action

Recently Dr Kong's office received a phone call from a 68-year-old female who reported a three-month loss of vision in her upper visual field of her left eye. She was concerned about contracting COVID-19 and preferred not to come into the clinic.

Dr Kong ordered visual acuity and 24-2 visual field testing with the online option of the MRF and sent her the URL details so that she could do the testing at home on her son's PC. She was instructed to wear her normal reading glasses for the testing and guided through the procedure by a 'voice over' assistant. She was also reminded to save the test after she had finished so that it would be stored on the cloud for the purpose of reviewing her data. (Clinicians are informed by email once the data is saved and ready for review.)

In this case, the patient's visual acuities were RE 6/4.8 and LE 6/19. Her visual fields showed a normal outcome in her RE and a superior scotoma that crossed the vertical midline in her LE. The normal RE result assured the clinician that the patient understood how to perform the test. After seeing the test results, the patient agreed to visit Dr Kong's clinic where a dilated fundus exam exposed a retinal detachment in the inferior region of her left eye. She was referred urgently to a retina specialist.

Clinicians can have confidence in the online outcome if the MRF test application is calibrated properly. A 'voice over' guides the patient through the calibration process. The same voice over guides the patient through the test(s) to ensure successful completion.

Our analysis of early data collected from the patient performing the test at home using the browser of the patient's own PC or tablet returns a strong correlation (r = 0.96) to their last HFA test undertaken in the clinic (some six to 12 months old) for the mean deviation parameter (Figure 2).

Self-monitoring for progression

One of the challenges in clinical eye care is finding early progression or changes in patients who have chronic eye disease. This has been amplified by the COVID-19 pandemic. The AREDS-2 Home study followed 1,520 participants with AMD for a mean of 1.4 years: 763 undertook self-monitoring at home and 757 were reviewed using standard clinical care.[7] The home-monitoring group were tasked with doing the test every day, and on average, they returned a result about every two days. This trial found that patients at high risk for choroidal neovascular membrane (CNVM) benefited from home monitoring as it allowed earlier detection of CNVM onset. The more timely intervention resulted in a smaller loss of visual acuity (median loss of four letters) compared with standard clinical care (median loss of nine letters).[7]

Figure 3 shows the MD for one glaucoma patient who has unilateral glaucoma in the left eye and who has been self-monitoring their visual field using an iPad on a weekly basis over four months. The RE (blue data) is normal and returns a flat slope for the linear trend: thick blue line (-0.1 dB/yr). On the other hand, the LE (orange data) gives an abnormal MD (-19.8 dB) confirming the presence of glaucoma and shows a significant downward trend (-2.1 dB/yr) in its data over the same period. This change has been identified in four months well before the next scheduled clinical review, due two months later.

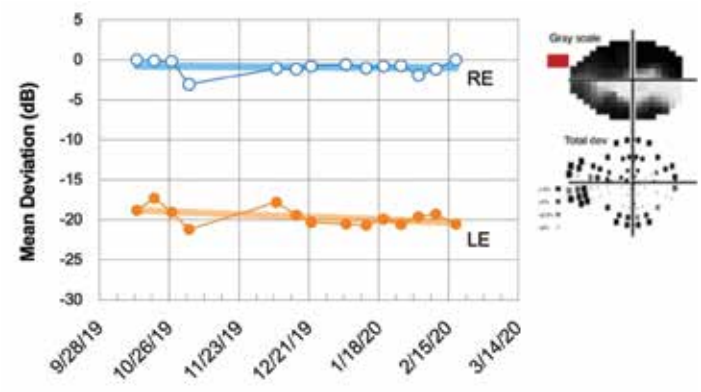

Figure 3.
A four-month time series returned by a patient having unilateral glaucoma who self-monitored using an iPad at home. The unilateral advanced glaucoma is evident from the visual field plot in the Right panel and the low MD values in the left eye over four months of data collection (LE, orange, average MD of -19.8 dB). The unaffected RE (blue) returns a normal MD and a flat linear trend (-0.1 dB per yr) over the same four months. The LE shows a progressive loss of MD over the same period (-2.3 dB per yr) despite treatment. In this case, the continuing loss was exposed two months before the next clinical review.

Conclusion

Melbourne Rapid Fields (MRF) software is registered with the Therapeutic Goods Administration (TGA) in Australia as a perimetry device. It has recently been translated to an online version that will work on most PC browsers.

Members of Optometry Australia and the New Zealand Association of Optometrists can order MRF tests (or get a free trial) through Designs for Vision at a considerable discount.

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DISRUPT INFLAMMATION IN DRY EYE DISEASE[1–3]

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Indication: Treatment of moderate to severe dry eye disease in adults for whom prior use of artificial tears has not been sufficient. **Contraindications:** Patients with hypersensitivity to lifitegrast or any of its excipients. **Dosage and administration:** Single-dose ampoule for ophthalmic use only. Discard after use. Adults and elderly: Instil one drop in affected eye(s) using a single-use container per administration, twice a day. Paediatric population: There is no relevant use of XIIDRA in children and adolescents aged below 18 years old in the treatment of dry eye disease. Contact lenses should be removed prior to the administration of XIIDRA and may be reinserted 15 minutes following administration. **Precautions:** •Prior to initiating therapy, a comprehensive eye examination is recommended to determine the aetiology of the symptoms and treat any reversible underlying conditions. •Allergic-type hypersensitivity reactions, including anaphylaxis, have been reported, rarely. Immediately discontinue administration and initiate appropriate treatment if hypersensitivity reactions occur. •The safety and efficacy of XIIDRA have not been established in paediatric patients. •Use in Pregnancy: Category B1. There are no or limited amount of data from the use of lifitegrast in pregnant women. The use of XIIDRA may be considered during pregnancy, if necessary. •Lactation: It is not known whether lifitegrast, or any of its metabolites, are excreted in human milk. **Interactions:** Due to the low systemic absorption, it is unlikely that lifitegrast contributes to systemic drug interactions **Adverse effects**: •Very common (≥10%): Eye irritation, dysguesia, eye pain, instillation site reactions, •Common (1 to 10%): Eye pruritus, lacrimation increased, vision blurred, headache. •Unknown: conjunctivitis allergic, swollen tongue, anaphylactic reaction, hypersensitivity, type IV hypersensitivity reaction, asthma, dyspnoea, pharyngeal, oedema, respiratory distress, angioedema, dermatitis allergic. Based on TGA approved Product Information dated 4 September 2020 (xii040920m).

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NOVARTIS

Leigh Plowman
BOptom
Otway Optical, Colac, VIC

The truth about false eyelashes

False eyelashes may appear intricate. But what are your patients risking?

Every day, millions of Australians use skincare and makeup. Without it, some people wouldn't leave home to shop, work or see friends. According to Roy Morgan Research, over 5.3 million Australian women purchased cosmetics in a six-month period.[1] On Google, over 1,700 people per month search for 'false eyelashes' in Australia. This number has doubled between 2007 and 2018, according to Google Trends.[2]

Case study

My patient, Ms W, was a 45-year-old woman. She presented due to bilateral conjunctival hyperaemia.

Slitlamp examination showed false eyelashes, liquid foundation and eyelid pencil.

At the slitlamp, I took photos of the anterior eye with my smartphone (Figure 1). Even photos on handheld devices can be useful for explanation. For this patient, I showed her the false eyelashes and glues. I then recommended that we do a dry eye work-up with the Oculus Keratograph K5.

Infrared and colour images were taken (Figure 2). Keratograph showed significant nasal conjunctival redness in both eyes. She also had mild bilateral pingueculae.

Her lids showed migration of eyelid pencil close to the meibomian gland orifices. Significant tear film debris was present.

Meibography showed Grade 3 inferior and Grade 1 superior meibomian gland atrophy (Figure 3).

Tear meniscus height and non-invasive break-up time were within normal limits.

Wearers of false eyelashes are commonly not educated about their product. Whether patients wear 'strips' or individually glued-on eyelashes, a makeup artist (or a friend) or sometimes the product instruction manuals may tell the person to avoid washing the eyelid area. This is due to fear of losing or damaging lashes.

I shared the keratograph images with my patient. I explained that false eyelashes are like 'cosy sleeping bags' for Demodex mites and bacterial eyelid flora. Her reaction was surprise. She said that she wore cosmetics every day and wouldn't consider stopping them anytime soon.

I explained options such as using cosmetics that have been tested for the eyes (for example, mascara). If she insisted on wearing false eyelashes, I would recommend using eyelid cleansers such as hypochlorous acid or tea tree cleansers to reduce anterior blepharitis.

Discussion

What do we know from the literature? We know that the following issues can occur as a result of make-up use:

- Corneal abrasion - due to sharp fragments of artificial eyelash fibres and glue scratching the cornea[3]
- Tractional alopecia - where long, heavy lashes are re-applied to natural lashes. Over time, this weakens the lash follicles. Instead of normal sized lashes, smaller, more brittle lashes grow.[3]
- Keratoconjunctivitis - due to invasion of glue or removing agents. In their investigation of 107 women (age 21-52 years) who visited ophthalmology clinics with complaints resulting from eyelash extensions, Amano et al. found that 64 had keratoconjunctivitis due to invasion of glue or removing agents[4]
- Allergic blepharitis - immediate reaction to glues/fixing components[4]
- Conjunctival erosion - due to eyelid-fixing tapes as shown in three of the 107 patients investigated by Amano et al[4]
- Subconjunctival haemorrhage - due to compression during removal of extensions[4]

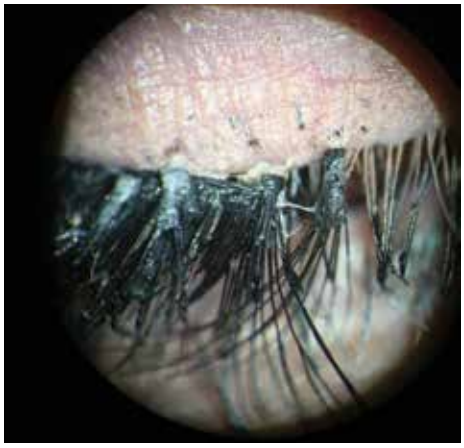

Figure 1.
Ms W's false eyelashes

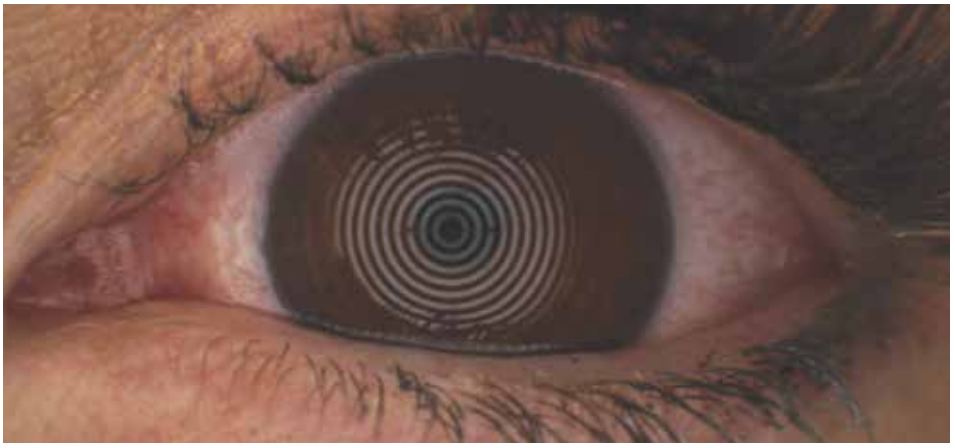

Figure 2.
Oculus Keratograph K5M overview and redness

• Contact dermatitis is rare, but has also been reported. Patients can develop hypersensitivity reactions due to frequent use.[5]

The fixing glues themselves can potentiate problems. The most common component in eye lash glues is cyanoacrylate, the adhesive chemical in superglue. Cyanoacrylate, is a monomer formed from the condensation of formaldehyde and cyanoacetate. It bonds in seconds through contact with weak bases and on contact with a variety of human tissues.[6]

Yan et al. detected formaldehyde in concentrations above the standard threshold level in all three glues tested. Formaldehyde is a known respiratory carcinogen and eye irritation 'appears very soon after exposure to formaldehyde.'[7]

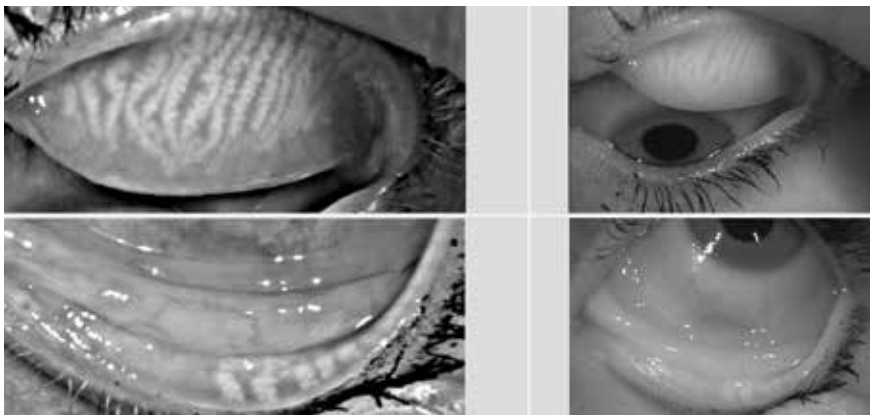

Figure 3.
Meibography showing Grade 3 inferior and Grade 1 superior meibomian gland atrophy

My patient also wore liquid foundation and eyeliner. In a review, Wang et al. found that 'evidence has demonstrated the migration of externally-applied cosmetic material across the eyelid margin.' This may 'predispose eye cosmetic wearers toward tear film instability and dry eye development.'[8]

Liquid foundation commonly contains water and preservatives. My patient's brand was unknown. However, common preservatives may include: phenoxyethanol, parabens or chlorphensin. Wang et al. state that 'methylparaben, ethylparaben, phenoxyethanol and chlorphenesin are toxic to meibomian glands.'[9]

Dry Eye Disease

As optometrists, we see patients everyday with symptoms of dry eye or ocular surface disease. According to TFOS DEWS II, females are at a higher risk of dry eye disease than males.[10]

Cosmetics can instigate the vicious cycle of dry eye disease. They contribute to inflammation and hyperosmolarity, which exacerbate the disease. Cosmetic products can interfere mechanically (by affecting the weight of lashes and airflow around them), clogging meibomian glands, introducing safe havens for bacteria and demodex, and destabilising the delicate ocular surface.

Cosmetics and skincare products are often stored until long after their use-by date (for example, three to six months after opening). More than this, every time a product is used, the products themselves are re-inoculated with microbes. The longer they're kept, the greater the potential for ocular infection or inflammation.

In cosmetics, you may find ingredients like formaldehyde-releasers or known toxic preservatives mixed into commonly used products Consider the analogy of alkaline burns. We rate the potential severity based on the alkaline chemical, concentration and exposure duration. Imagine having these toxic ingredients on your skin and eyes for over 12 hours per day.

Patient conversations

Ask your patients with dry eye disease about their skincare and makeup products. You can use free websites like EWG's Skin Deep Database (www.ewg.org/skindeep) or use Think Dirty App (thinkdirtyapp.com). These resources can help you uncover ingredients that may be exacerbating dry eye disease.

If your patient is concerned about ceasing makeup wear, suggest ways to reduce potential ocular surface risk. The first step is educating your patient about their eyes and eyelids. Secondly, recommend regular eyelid hygiene with your favourite eyelid cleanser. Hypochlorous acid sprays are easy to use and will not interfere with the lashes. Importantly, they won't significantly add much to a person's end-of-day beauty routine.

Next time you have a red eye or blepharitis patient, start a conversation about cosmetics. Ask your patient how often they wear cosmetics, what products they use, and what they use to remove their cosmetics. You might find a key to reducing long term inflammation and dry eye.

Newer eye-friendly products are starting to become available. Brands include 'Eyes Are The Story' (www.eyesarethestory.com), Inika Organic (www.inikaorganic.com) and MooGoo (www.moogoo.com.au). These products may be a viable way for your patients to wear cosmetics.

Put simply, some people just love wearing cosmetics. However, some people have to cease wearing cosmetics or alter some of their beauty routines due to dry eye disease.

As optometrists, we are ideally placed to advise patients on the best eye care tips for them. Help your patients to choose non-toxic cosmetics and skincare, and potentially alleviate some of the issues associated with make up wear.

The most common component in eyelash glues is cyanoacrylate, the adhesive chemical in superglue.

1. Roy Morgan Research. Dec 2018. http://www.roymorgan.com/findings/7869-top-cosmetics-december-2018-201902220527. Accessed 24th July 2020.

2. Google Trends. https://trends.google.com. Ahrefs Keyword Volume Software https://ahrefs.com

3. Yan MK, Kocak E, Yoong K et al. Ocular injuries resulting from commercial cosmetic procedures. *Clin Exp Optom* 2020; 103: 430-433.

4. Amano Y, Sugimoto Y, Sugita M. Ocular disorders due to eyelash extensions. *Cornea* 2012; 31:121-125.

5. Shanmugam S, Wilkinson M. Allergic contact dermatitis caused by a cyanoacrylate-containing false eyelash glue. *Contact Dermatitis* 2012; 67: 309-310.

6. Yusuf IH, Patel, CK. A sticky sight: cyanoacrylate 'superglue' injuries of the eye. *BMJ Case Rep* 2010; 2010: bcr11.2009.2435.

7. Vazquez-Ferreiro P, Carrera Hueso FJ, Alvarez Lopez B et al. Evaluation of formaldehyde as an ocular irritant: a systematic review and Meta-analysis. *Cutan Ocul Toxicol* 2019; 38: 169-175.

8. Wang MT, Craig JP. Investigating the effect of eye cosmetics on the tear film: current insights. *Clin Optom* (Auckl) 2018; 10: 33-40.

9. Wang J, Liu Y, Kam WR et al. Toxicity of the cosmetic preservatives parabens, phenoxyethanol and chlorphenesin on human meibomian gland epithelial cells. E*xp Eye Res* 2020; 196: 108057

10. TFOS DEWS II: Epidemiology Report. https://www.tfosdewsreport.org/report-epidemiology_report/71_36/en/

NEW[1]

Cequa™

ciclosporin 900 microgram/mL

Coming soon

The first approved ciclosporin treatment delivered via nanomicellar technology for Dry Eye Disease in Australia*

*First TGA approved nanomicellar ciclosporin ophthalmic solution with a dry-eye related indication[1]

PBS Information: This product is not PBS listed

Please review Product Information before prescribing available from https://sunophthalmology.com.au/pi or Sun Pharma by calling 1800 726 229

CEQUA™ ciclosporin 900 microgram/mL eye drops ampoule. **Indications:** Increases tear production in patients with moderate to severe keratoconjunctivitis sicca (dry eye) where prior use of artificial tears has not been sufficient. **Contraindications:** Hypersensitivity to the active substance or excipients. Active or suspected ocular or peri-ocular infection, malignancies or premalignant conditions **Precautions:** *Potential for eye injury and contamination:* avoided by not touching the eye or other surfaces with the ampoule tip. *Contact Lenses:* remove contact lenses prior and reinsert 15 minutes after administration. Careful monitoring of patients with severe keratitis is recommended. *Infections:* resolve existing or suspected ocular or peri-ocular infections before initiating treatment and if an infection occurs during treatment, withhold temporarily until infection resolves. *Effects on the immune system:* may affect host defenses against local infections and malignancies so regular examination of the eye(s) is recommended, e.g. at least every 6 months, when used for long periods. *Paediatric use:* safety and efficacy is not established below the age of 18. **Pregnancy:** Category C **Adverse effects:** *Very Common and Common:* instillation site pain, conjunctival hyperemia and punctate keratitis. **Dosage and administration:** one drop twice daily (approximately 12 hours apart) into the affected eye(s). Response to treatment should be reassessed at least every 6 months. Can be used concomitantly with artificial tears, with a 15-minute interval between products. **Storage:** Store below 25°C. Do not freeze. Store the ampoules in the original foil pouch. Protect from light. **Date of preparation:** May 2020.

▼ This medicinal product is subject to additional monitoring in Australia. This will allow quick identification of new safety information. Healthcare professionals are asked to report any suspected adverse events at https://www.tga.gov.au/reporting-problems.

Sun Pharma ANZ Pty Ltd ABN 17 110 871 826, Macquarie Park NSW 2113 Ph: 1800 726 229. Fax: +61 2 8008 1613. Med Info: 1800 726 229
Adverse events may be reported to Sun Pharma by either email: adverse.events.aus@sunpharma.com or phone: 1800 726 229.
Date of preparation: May 2020. CEQ05/2020opa1

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

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Throughout the COVID-19 pandemic, Vision Eye Institute has continued to provide necessary eye care services for our patients. Now, with restrictions easing, we are phasing in the return of routine consultations and surgeries. Our commitment to the health and wellbeing of our patients, staff and doctors remains our top priority and we will continue to observe strict infection control protocols and social distancing measures at all times.

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