Supplement to
AUSTRALIAN OPTOMETRY

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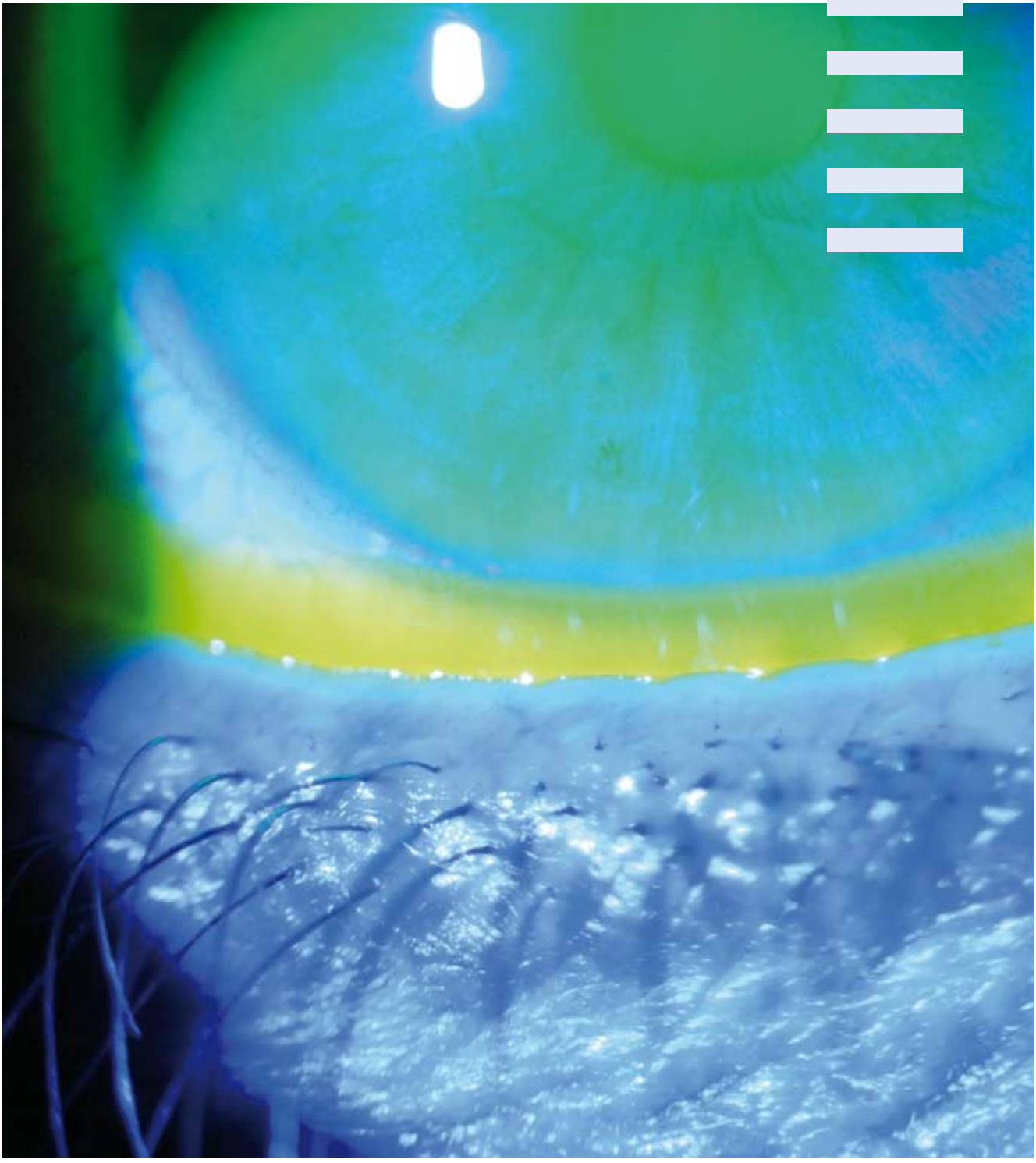
December 2010



- Effective comanagement
- Watery eye
- Uveitis
- Post-LASIK tear dysfunction
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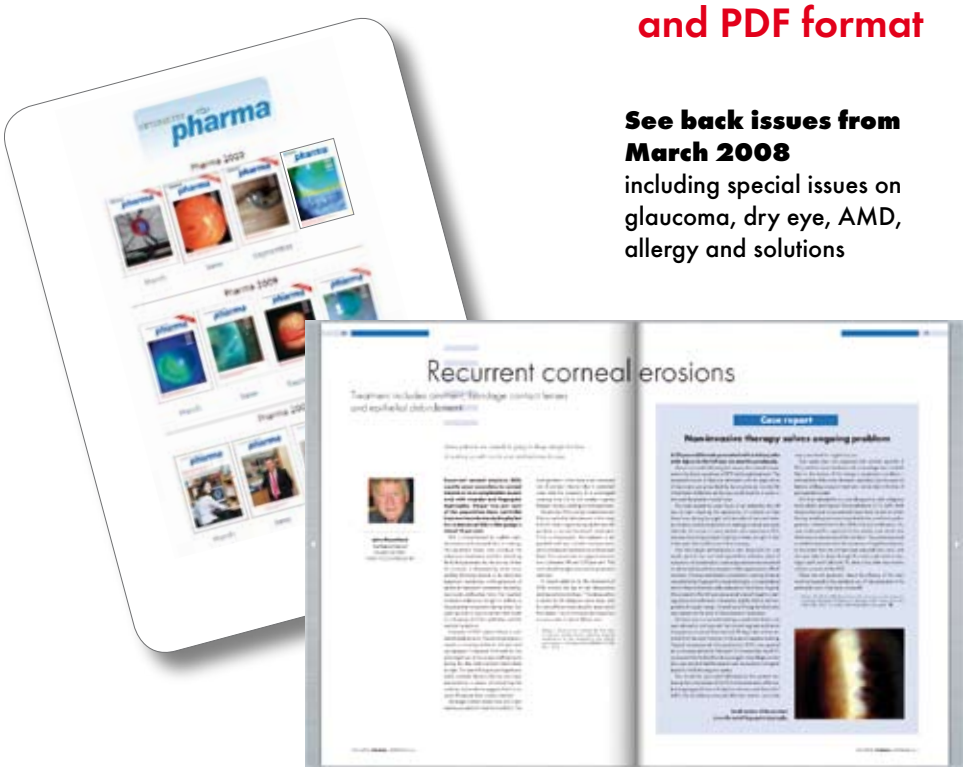

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AUSTRALIAN OPTOMETRY **pharma**

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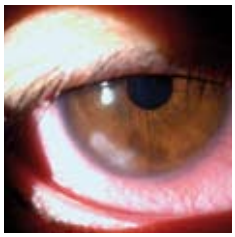
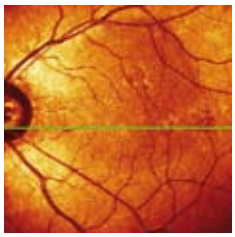
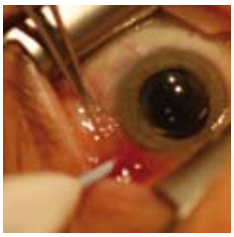
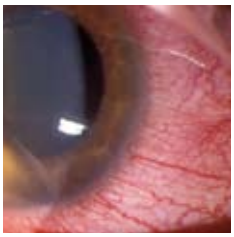
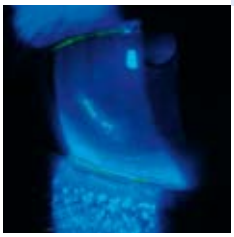

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COVER
Highly concentrated tear film in obstruction

Ozurdex dexamethasone slow-release

The first injectable, sustained-release steroid implant promises to reverse the visual deterioration in patients with macula oedema due to a vein occlusion

Grid laser photocoagulation or observation is the traditional therapy for macular oedema due to a central retinal vein occlusion (CRVO) or branch retinal vein occlusion (BRVO).

Grid laser photocoagulation provides modest visual outcomes and is typically used only with a BRVO. Practitioners are exploring the use of intravitreal steroids and anti-vascular endothelial growth factor (anti-VEGF) agents for the treatment of vein occlusions.[1]

The United States Food and Drug Administration (FDA) has approved Ozurdex, the first injectable, sustained-release steroid implant for the treatment of CRVO and BRVO.[2]

Retinal vein occlusions

Retinal vein occlusions are the second most common retinal vascular disease, occurring in 0.6 per cent of patients older than 43 years of age.[3] The visual consequences of CRVO and BRVO can be devastating due to the subsequent macular oedema. Eighty-seven per cent of patients with ischaemic CRVO have visual acuity of 6/120 or worse. Ischaemic CRVO is characterised by 10 or more disc areas of non-perfusion, poor visual acuity, deep intraretinal haemorrhages and cotton-wool spots. Patients with ischaemic CRVO must be monitored closely for anterior segment neovascularisation, which may lead to neovascular glaucoma.

Non-ischaemic CRVO is less destructive, with 57 per cent retaining a visual acuity of 6/9 or better. Non-ischaemic CRVO typically presents with a mild decrease in visual acuity, good retinal perfusion, a small number of retinal haemorrhages and few cotton wool spots. Although non-ischaemic CRVO is not as disconcerting and may resolve without treatment, up to 30 per cent of patients will convert to ischaemic CRVO.[4]

Ocular risk factors for retinal vein occlusions include glaucoma, ocular hypertension, short axial length (hyperopia), arteriolar narrowing and arteriovenous nicking.[2] In addition, systemic conditions associated with BRVO are hypertension, hypercholesterolemia, sarcoidosis, lyme disease, serpiginous chorioditis and thrombophilic conditions.[3] Central retinal vein occlusions may be consequential to hypertension, diabetes mellitus, cardiovascular disorders, clotting disorders, vasculitis, autoimmune disorders, oral contraceptives, alcohol consumption or closed head trauma.[5]

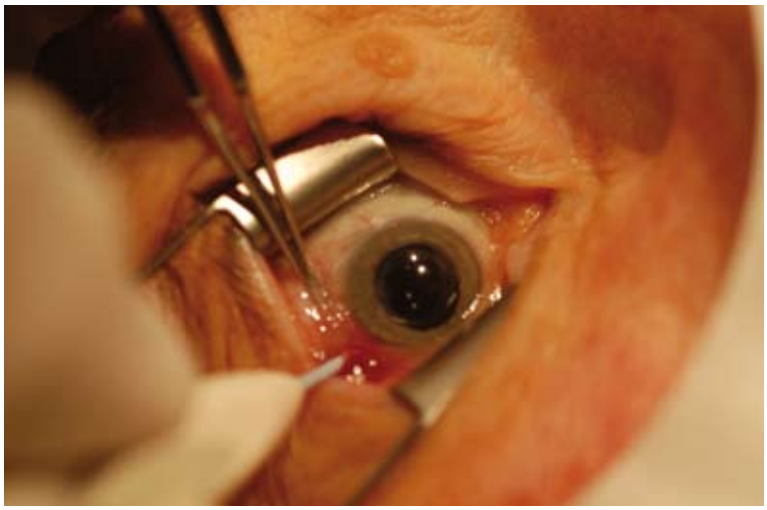

Figure 1. Insertion of the Ozurdex applicator

Ozurdex overview

In June 2009 the FDA approved Ozurdex, an intravitreal steroid implant, as a first-line therapeutic option for macular oedema secondary to a retinal vein occlusion. The tiny rod-shaped implant contains 0.7 mg dexamethasone via Allergan's Novadur solid polymer drug delivery system.[2]

Once injected into the vitreous, it slowly releases the corticosteroid dexamethasone over a six-month period, with the maximum benefit seen between 60 and 90 days.[6,7] The implant comprises lactic acid and glycolic acid, which biodegrade into water and carbon dioxide.[1] The steroid blocks the inflammatory cascade by inhibiting multiple inflammatory cytokines.[8] Its anti-inflammatory properties work to reduce capillary leakage, inhibit fibrin deposition, strengthen

intravitreal implant

Alyssa M Neyens OD
Leonid Skorin Jr
DO OD FAAO FAOCO

endothelial tight junctions and prevent migration of inflammatory cells.[1,8]

Although Ozurdex is FDA approved only for the treatment of macular oedema following a CRVO or BRVO, it is expected to be approved for additional indications in the future. Allergan submitted a new drug application of Ozurdex for the treatment of intermediate and posterior uveitis. In addition, it is in phase three FDA trials for the treatment of diabetic macular oedema.[7]

Administration

The intravitreal injection of Ozurdex should be done under controlled aseptic conditions. First, local anaesthetic is injected and broad spectrum microbicides are applied. The Ozurdex foil pouch should be removed from its carton and the applicator examined for damage. Remove the cap from the applicator. Carefully pull the safety tab straight off the applicator. Position the applicator parallel to the patient's limbus. Insert the needle with the bevel up and at an oblique angle. Advance the needle into the sclera one millimetre and then redirect the needle down towards the centre of the eye. A shelved pathway is created by changing the needle direction. The needle should be advanced until the sleeve touches the conjunctiva (Figure 1). Depress the implant release button, listening for a clicking sound. The needle should then be removed in the opposite manner it was inserted.[8]

Follow-up

After the intravitreal injection of Ozurdex, the patient should be monitored periodically for increased intraocular pressure and endophthalmitis.[2] Within 30 minutes of the injection, the practitioner should check the perfusion of the optic nerve head and intraocular pressure. The patient should return to the practice in two to seven days, and again in one month for biomicroscopy and tonometry.[8] It is important to educate patients that if their eye becomes red, light sensitive or painful, or if changes occur in vision, they should seek medical care immediately.[6]

Contraindications

Ozurdex is contraindicated in patients with eye infections such as herpes, vaccinia, varicella, mycobacterial and fungal infections. In addition, it should not be used in patients with advanced glaucoma or allergies to corticosteroids.[6] Ozurdex should be used with caution in patients who have previously experienced increased intraocular pressure secondary to a steroid.

Complications

The most common complication to Ozurdex is increased intraocular pressure, occurring in 25 per cent of patients.[2] In these patients, known as 'steroid responders', topical glaucoma medications should be prescribed for the duration of the Ozurdex implant. Less commonly, Ozurdex may cause the development of posterior subcapsular cataracts, subconjunctival haemorrhages, eye pain, conjunctival hyperaemia, vitreous detachments and headaches (Figure 2). Other serious but rare complications to Ozurdex include endophthalmitis and retinal detachment.[6]

Discussion

Ozurdex was found to be a safe and effective treatment option for macular oedema secondary to retinal vein occlusions in a large clinical trial of 853 patients. The study showed 20 to 30 per cent of participants with the implant gained three or more lines of vision within one to two months. In comparison, seven to 12 per cent of the study participants who received the placebo had an improvement of three or more lines of vision.[6]

The implant's safety and efficacy was also studied in a randomised, sham-controlled trial of 1,267 patients with vision loss due to macular oedema associated with a vein occlusion. The study found that there was a clinically significant difference in best corrected visual acuity between those who

Continued page 4

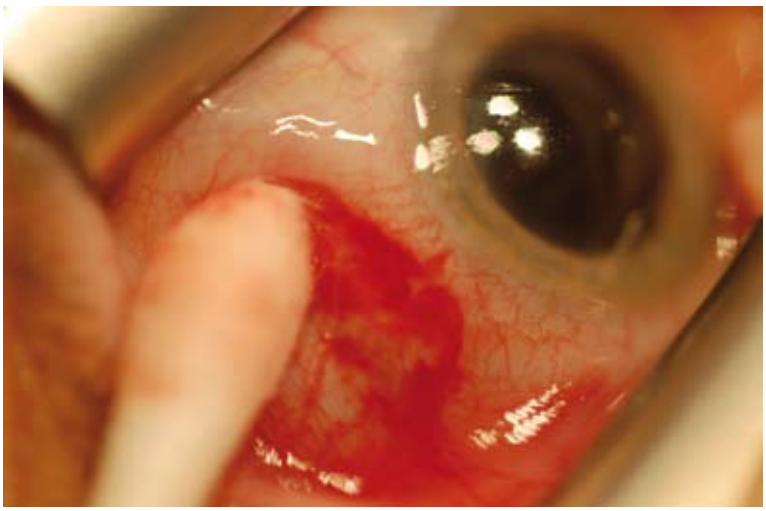

Figure 2. Subconjunctival haemorrhage post-injection; note self-sealing injection site

Ozurdex

From page 3

Case report

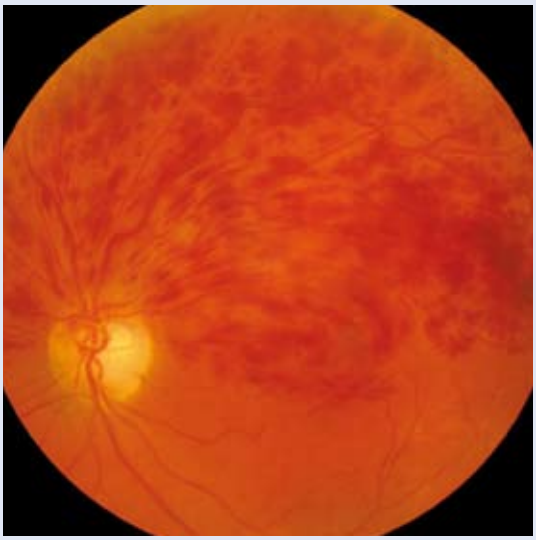

Figure 3. Superior hemiretinal vein occlusion

A 77-year-old Caucasian male presented with a complaint of decreased vision in both eyes.

The patient needed to use a magnifier to read the newspaper. His past ocular history was positive for a hemi-retinal vein occlusion in the left eye two months prior, a BRVO in the right eye in 2006 and mild cataracts in both eyes. The patient's systemic health was unremarkable and his family medical history was positive for diabetes.

His visual acuities with spectacles correction were 6/9 in the right eye and 6/30 in the left eye. Pupils, extraocular motilities, confrontation fields and intraocular pressures were all normal. Slitlamp examination of the anterior segment found 2+ nuclear sclerosis cataracts in both eyes. The dilated fundus examination of the right eye was remarkable for microaneurysms of the macula, with no oedema. The left eye had scattered dot and blot haemorrhages in superior half of the retina, along with macular oedema (Figure 3). The cup-to-disc ratio was 0.35 in the right eye and 0.45 in the left eye, with no neovascularisation noted. All other findings were unremarkable.

The patient was diagnosed with a hemiretinal vein occlusion with secondary macular oedema in the left eye, and a history of branch retinal vein occlusion in the right eye. The findings were discussed with the patient and he chose to schedule a return visit for an Ozurdex injection in the left eye.

The Ozurdex was injected in the left eye one week later with no complications and normal intraocular pressure post-injection. The patient was instructed to return to the practice for a pressure check one week later or sooner if complications occurred. At his one week follow-up visit, the patient noted a subjective improvement of his vision in the left eye; his visual acuity had improved to 6/18. His intraocular pressure and slitlamp findings were normal. He was scheduled to return to the practice one month later for another intraocular pressure check, as indicated by the manufacturer's recommendations.

received the Ozurdex injection and those who received the placebo. The amount of time needed to obtain a three-line improvement in visual acuity was also significantly less in the Ozurdex group than the placebo group. As previously discussed, Ozurdex can cause increased intraocular pressure; this study found the peak incidence to occur at day 60 with 16 per cent of patients having ocular hypertension.[9]

Conclusion

As sustained release is becoming the future of drug delivery, Ozurdex is a viable option for patients with macula oedema due to a vein occlusion. The intravitreal implant allows the potent steroid to be continuously released over a six-month period, improving the efficacy of the dexamethasone. Ozurdex is a relatively safe drug; its most common side-effect is increased intraocular pressure, which can be stabilised with topical glaucoma medications.

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Case report

Episcleritis reponds to Flarex

Justine Guimm
BOptom (Hons)

Initial visit

PC presented with a red left eye, complaining of ocular discomfort. Visual acuity was not affected. The patient had high blood pressure but was not taking any medications. There was no ocular history or family ocular history. IOP was 13 mmHg in both eyes at 2.15 pm.

A slitlamp examination of the left eye revealed primary findings of episcleritis (temporally) with a sectoral injection of the episcleral and secondary findings of meibomianitis grade 2 and anterior blepharitis grade 1. Anterior chamber was quiet and there was no discharge.

PC was prescribed Flarex in the left eye, four times per day.

Review at Week 1

PC had no symptoms and was experiencing no discomfort but still had a mild injection of the episcleral. IOP was 13 mmHg in the RE and 21 mmHg in the LE at 12.30 pm. The increase in LE IOP compared to his first visit made PC suspicious of using a steroid responder, which was also supported by asymmetrical IOP measurements in each eye while PC was using Flarex in LE only.

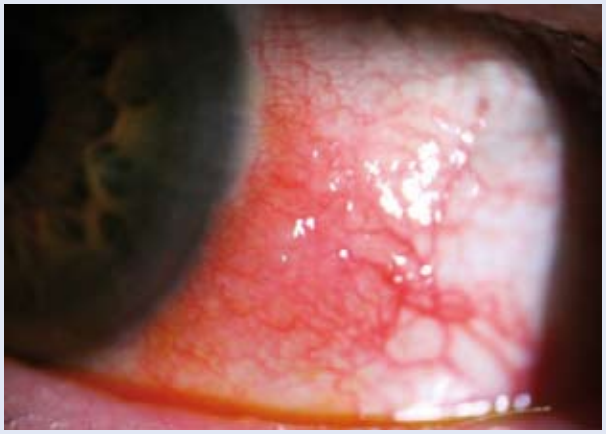
Slitlamp examination revealed that the meibomianitis grade 2 and anterior blepharitis grade 1 had almost resolved but episcleritis was still present. Inflammation was under control and taper could commence. No management was required for the rise in IOP of the left eye.

PC was prescribed Flarex gtt in the left eye, tapered over three days from tid to bid and then once daily for two days. The treatment initiated for lid disease was Chlorsig in both eyes ung at night-time and warm compresses/lid scrubs in both eyes. Further review in two weeks was requested.

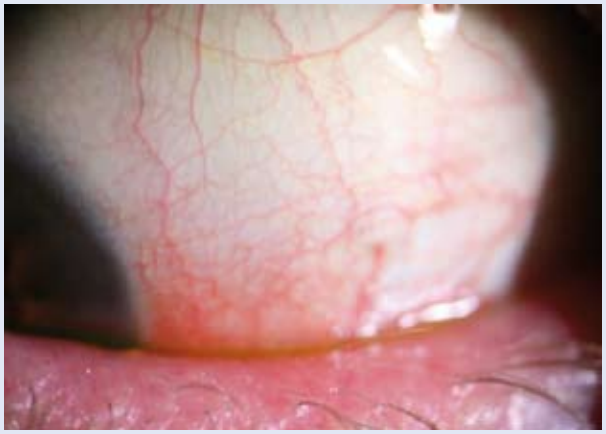
Review at Week 3

The patient presented with no symptoms. The IOP was 14 mmHg in the RE and 15 mmHg in the LE. Slitlamp examination revealed meibomianitis grade 1, mild blepharitis and generalised conjunctival hyperaemia but the episcleritis had cleared up.

The patient continued using warm compresses/lid scrubs and asked to return if symptoms recurred. In addition, the patient was provided with education for recurrence of episcleritis. ■



Initial visit



Week 1

Fuchs's corneal dystrophy gene variants can increase risk 30-fold

Variation in the gene associated with Fuchs's corneal dystrophy (FCD) contributes significantly to the development of the disease.

Researchers in the United States looking at the transcription factor 4 gene (TCF4) have found that alleles in this gene, which encodes the E2-2 protein, are associated with FCD, and increase by a factor of 30 a patient's likelihood of suffering from the disease if they have two copies of the genetic variants.

The researchers examined the genomes of 280 FCD patients and compared them with 410 control patients. The association between the presence of gene variants and patients with FCD discriminated between FCD and control patients with 76 per cent accuracy.

FCD is the leading cause of corneal transplants in the USA, affecting five per cent of people over the age of 40 years.

Researchers said they conducted the study because although rare genetic variations contributing to the development of FCD had been found, they were not aware of research that had identified common variants.

● Baratz KH, Tosakulwong N, Ryu E et al. E2-2 protein and Fuch's corneal dystrophy. *N Engl J Med*. 2010; 363: 11: 1072-1075. ■

Steps to good comanagement

Malcolm Gin
BScOptom

Comanagement has become more relevant since the introduction of optometric therapeutic legislation in the late 1990s. The advent of digital photography, internet and email has significantly improved the way optometrists are able to collaborate with other health-care practitioners, especially for optometrists practising in rural areas.

Communication

Effective communication is the cornerstone of any comanagement relationship. Written correspondence is essential as this protects all parties from claims of misconduct. SMS and emails are great for busy lifestyles, especially if photos can be attached. As one eminent ophthalmologist used to say 'We stick together or we sink together'.

Verbal communication is often necessary for unusual and unexpected findings so accessibility of both optometrist and ophthalmologist is paramount. I schedule regular meetings with referring practitioners to discuss advances in techniques or new procedures implemented at their surgeries.

Equipment compatibility

It is important that your equipment is compatible with that of the referring surgeon. For example, the readings of the ultrasound pachymeter in my practice may vary from the readings at another practitioner's practice, which may be due to equipment variation and user operation. These possible variations must be considered, especially for glaucoma and refractive surgery patients. I am particular about having my tonometers recalibrated regularly and objectively offsite, and I regularly monitor variations relative to other comanagement practitioners.

Spending time at the ophthalmologist's surgery and discussing with the ancillary staff the equipment that they use is the best way to understand why variations in results may occur. I am investigating an effective way of exporting visual field analysis data to the ophthalmologist so that the results can be factored into the patient's progression analysis.

Mutual respect

When comanaging, it is important to convey observations and facts rather than opinion. I take on the role of an objective observer and often help patients understand some of the pre- and post-surgical information that has been provided by the ophthalmologist. To ensure that all information explained to the patients is consistent, it is essential that the surgeon's reports contain adequate information to keep the optometrist informed. This is particularly applicable in refractive surgery cases.

Protocols and procedures

Cataract surgery comanagement is a major part of my liaison with referring surgeons and each surgeon has a different way of managing and treating their patients. Topical medication regimens include antibiotics, anti-inflammatories and, in some cases, pre-operative NSAIDs to reduce the risk of macula oedema. Frequency and treatment periods vary so it is important to familiarise yourself with each surgeon's preferences.

It is also important to know the various surgeons' opinions and use of toric, aspheric, blue blocking and multifocal IOLs so that patients interested in these new technologies can be directed to a surgeon whose expertise matches their interests.

Common post-surgery complications

An elevated IOP due to viscoelastic retention is the most common one-day post-cataract surgery side-effect. Generally IOP will subside with no intervention but if it is above 25 mmHg, the prescribing of either brimonidine or aproclonodine may be necessary.

The problem of swinging toric IOLs has resolved to some extent with the advent of tacky acrylic materials but refraction day one and location of IOL markers such as a toric contact lens is imperative if vision is substandard. Review in one week to see whether relocation or replacement of the IOL may be required. If vision is still not optimal, then tangential astigmatic keratotomy (TAK), limbal relaxation incision (LRI) or even LASIK may be offered.

With modern phacoemulsification cataract extraction techniques, it is unusual to have greater than a 1+ anterior chamber reaction after one week. If the condition persists, retained lens cortex, infection or therapeutic toxicity might be present.

Trust your gut instincts

Don't be the last person the patient consulted before going blind. Surround yourself with people you respect and if something does not feel right, refer the patient to an expert in the field, no matter how inconvenient it may be.

Conclusion

Comanagement is a team approach to a patient's vision problems. It allows ophthalmologists to pursue their surgical interests, and better use of the skills and expertise of well-trained optometrists.

This vindicates the government's decision to grant therapeutic access to optometrists.

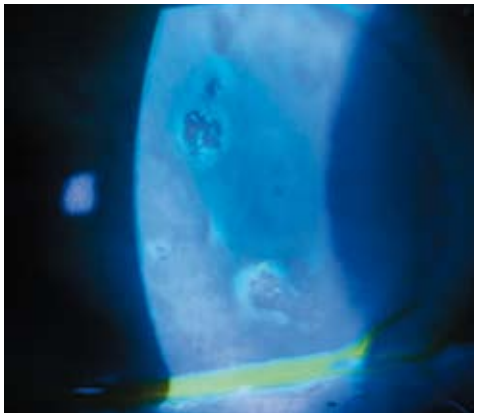


Figure 1. 16 June 2008: right cornea showing her normal fluorescein staining

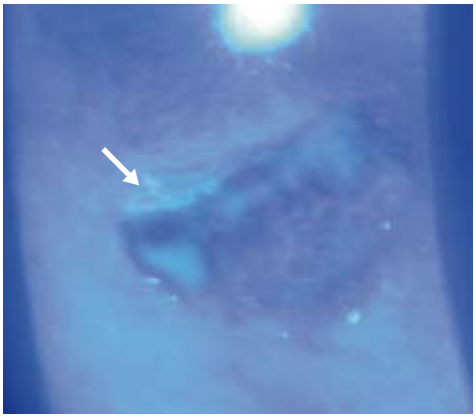


Figure 2. 20 June 2008: dendritic ulcer (arrow)

Do not prescribe steroids sight unseen

VR has had herpes interstitial keratitis for more than 60 years and has used topical steroids with the visual prodrome of glare and discomfort. She has only light perception in this eye due to her corneal scarring, although her latest episode was slightly different (Figures 1 and 2).

With her heavily scarred cornea it was difficult to assess any new changes but the subtlety of a small dendrite was obviously indicating herpetic epithelial disease. Both an antiviral and steroids were indicated, not steroids alone.

Trust your clinical findings but have greater trust in clinical photography

MW presented for a routine examination as she had a strong family history of glaucoma. Her right optic papilla are evident in Figures 3 and 4.

In the past year retinal shunt vessels had developed both inferiorly and temporally. Emailing these photos to the retinologist led to the co-ordination with her general practitioner for both CT and MRI scans. This ruled out the possibility of optic nerve head drusen and vascular occlusive disease prior to MW consulting the retinologist. This saved time for all parties, especially the patient who was required to make only one trip to Melbourne.

Be mindful of medications with age and pregnancy

Three years ago a 13-year-old boy who had had congenital cataract surgery presented with an episode of acute pupil block with an IOP over 50 mmHg. His painful red eye was due to his vitreous moving anteriorly and sealing off his pupil.

Urgent action was necessary. With the surgeon located 2.5 hours away, an immediate decision had to be made about his therapy. No anti-glaucoma medications have been approved for patients of this age group but after consulting with the ophthalmologist, aprochlonidine was prescribed, based on his weight being the same as that of an adult.

Not all topical ophthalmic medications have approval for children and pregnant women. ■

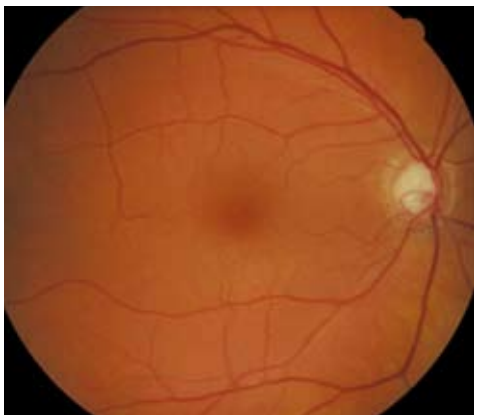


Figure 3. 11 November 2006

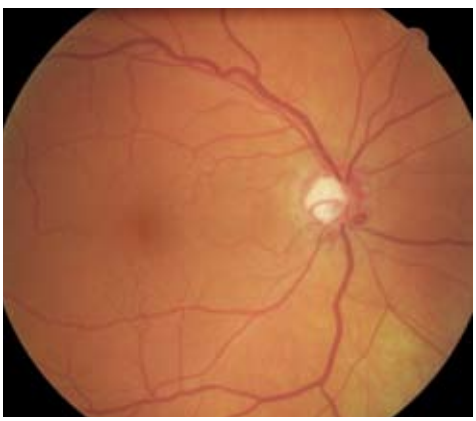
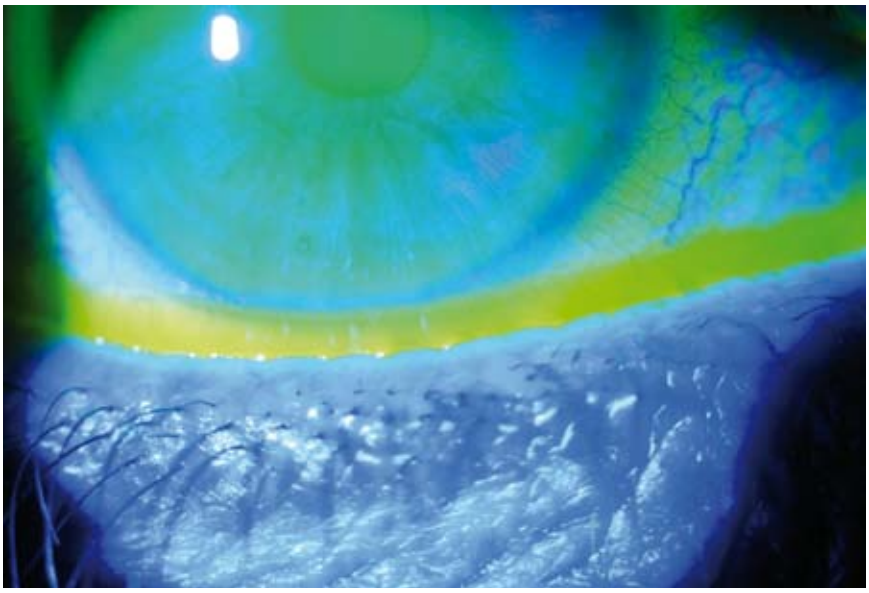


Figure 4. 15 November 2007

The watery eye
Common conditions and

Dr Thomas G Hardy
MBBS FRANZCO



Highly concentrated tear film in obstruction

The presentation of watery eyes is common, with many possible and often coexistent underlying causes ranging from the relatively innocuous and very common, to the potentially fatal and very rare.

When managing patients with watery eyes, it is important to differentiate between those with problems of primarily (reflex) hypersecretion of tears secondary to an irritative stimulus (also known as lacrimation, hyperlacrimation or reflex tearing), and those with disorders of tear drainage (some people refer to the watering in this group as epiphora).

Some patients will have combined underlying problems such as facial palsy with exposure keratopathy and paralytic ectropion. There are also occasions when one would expect symptoms opposite to those that the patient experiences, such as failed DCR yet resolution or cure of watering.

Here I discuss some of the more common causes of watery eyes that do not require surgical management. The surgical group is largely made up of disorders of eyelid or eyelash position, and all forms of lacrimal drainage apparatus stenosis or obstruction.

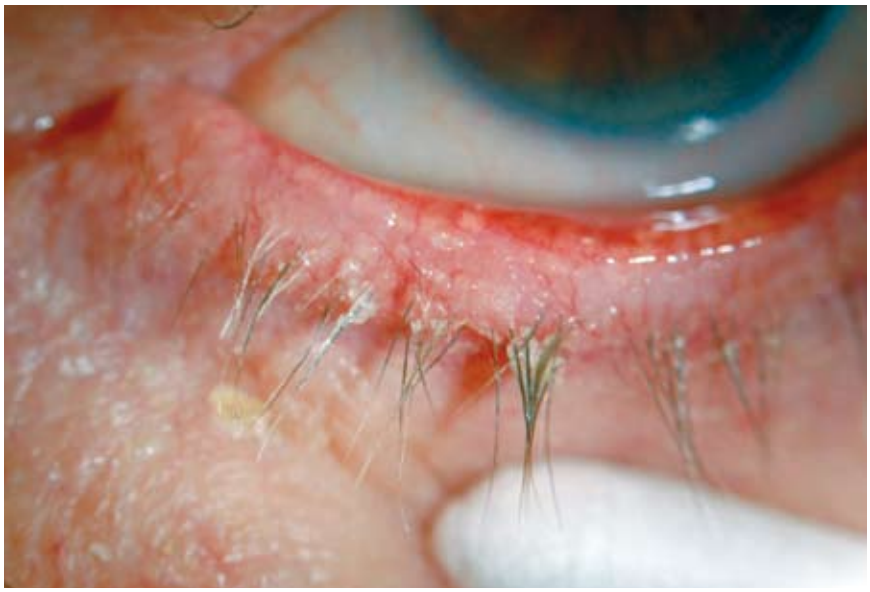
Hypersecretion of tears can result from a wide range of conditions. The vast majority of conditions in this group result from inflammation of the ocular surface, either the cornea or conjunctiva. Deeper inflammations cased by such as conditions as episcleritis, scleritis and uveitis tend to not cause so much watering relative to the amount of pain. Clinical assessment is helpful to distinguish this group from the obstructive/surgical group. Hypersecretion is usually associated with some degree of discomfort including irritation, itching, burning, foreign body sensation or frank pain. It may be seasonal or associated with identifiable precipitating irritants; may be worse in warmer and drier weather; and may be relieved by the use of topical lubricants, anti-inflammatories or immune modulators such as antihistamines and steroids.

Watering often occurs with or shortly after the symptoms of discomfort. Cases of hypersecretion are more commonly bilateral, yet it is not uncommon for bilateral lacrimal obstruction and some causes of hypersecretion to be asymmetric or even unilateral, such as cases of ocular surface disease in blepharitis. Apart from signs of an underlying cause of hypersecretion such as papillary conjunctivitis, an elevated and dilute fluorescein-stained tear film—as opposed to an elevated tear film with concentrated fluorescein (suggestive of obstruction)—suggests increased tear production.

Eyelash or eyelid malposition and stenosis or obstruction of the lacrimal drainage apparatus at any level may be absent, but when these findings also occur, one has to decide which feature—hypersecretion or obstruction—predominates. The alternative is to recommend a trial of therapy directed to the cause of hypersecretion.

The most commonly encountered cause of hypersecretion is blepharitis. The term blepharitis includes several disorders of a chronic, intermittent and relapsing nature. Anterior lid margin disease causes inflammation of the lid margins. Posterior lid margin disease causes abnormal or absent lipid secretion from the meibomian glands, which supply the oily layer that prevents tear

non-surgical therapies



Blepharitis

evaporation. They may occur in isolation or in combination, resulting in thickened, inflamed lid margins, blocked glands and an abnormal tear film.

Blepharitis is sometimes combined with *Staphylococcus aureus* infection. There may be an associated hypersensitivity to Staphylococcal antigens, resulting in further conjunctival and lid inflammation, and marginal ulcers. Patients may have any combination of the variables of blepharitis. Symptoms and signs include chronic grittiness, dryness, watering, swelling and redness of the lid margins, crusting and swollen, plugged meibomian glands. There may be associated dry eyes, marginal keratitis (corneal ulcers), chalazia and acne rosacea of the face.

Treatment of lid margin disease includes application of hot compresses, lid scrubs (commercially available preparations may be more effective than dilute baby shampoo), massage, and tear film supplements such as lubricant drops, and possibly the recently available external lipid layer spray supplement. If there is evidence of acne rosacea of erythematous rash over nose and cheeks, possible treatments to consider include emollient, low-dose doxycycline or metronidazole gel. Dermatological referral should also be considered.

Any form of conjunctivitis may be associated with watering, often with varying degrees of discharge, which may be frankly purulent in bacterial infection. Accurate diagnosis is critical and therapy should be directed to the underlying cause. Allergic eye disease typically causes itching as a predominant symptom. This group includes seasonal or perennial allergic conjunctivitis, which is managed with mast cell stabilisers, antihistamines or steroids.

The much rarer atopic keratoconjunctivitis (AKC) often requires more aggressive therapy including immunosuppression. Giant papillary conjunctivitis may occur in contact lens wearers, prosthetic eyes or other foreign bodies, and is treated by removing the offending stimulus, and cleaning the contact lens or prosthesis, and with mast cell stabilisers and steroids. Vernal keratoconjunctivitis is managed as per AKC, but systemic immunosuppression may be required. Floppy eyelid syndrome may cause giant papillae and watering, and is managed by weight loss, treatment of often co-existing sleep apnoea, taping, lubrication and often surgery. Chronic follicular reactions can occur in blepharitis, trachoma, molluscum and chronic topical therapy.

Corneal inflammation of any form, which includes marginal, microbial, exposure, neurotrophic and other forms of keratitis, and any corneal epithelial surface defect, for example due to trauma or trichiasis/distichiasis, will be associated with some degree of non-specific watering. Treatment is directed to the underlying cause.

Other less common causes of hypersecretion include primary excessive tear production. Gustatory lacrimation (crocodile tears), which is inappropriate tearing in response to eating or chewing, should be sought in the history-taking of patients with facial palsy. Injection of botulinum toxin into the lacrimal gland can be very effective, with a small risk of dry eye, ptosis, diplopia or lagophthalmos. The gland may also be denervated surgically. Dacryoadenitis and cholinergic agents may also lead to excessive tear production from the lacrimal gland.

The patient with the watery eye can be considered in terms of conditions that result in excessive tear production (treatment primarily medical) or deficient tear drainage (treatment primarily surgical), or a combination of the two. ■

Post-LASIK tear dysfun

Effective screening of LASIK candidates can help prevent the onset of post-operative complications

LASIK is the most common eye procedure in the world today. Although the satisfaction rates with this surgery are reported as being between 87 to 99 per cent,[1] post-LASIK tear dysfunction or dry eye is common.

Toda and co-workers[2] found that at one month after LASIK, 40 per cent of patients had symptoms or signs of dry eye and at six months 20 to 40 per cent still had symptoms or signs of dry eye. For the majority of patients it is a mild and temporary problem, but for a significant minority the condition may persist, affecting quality of life and satisfaction with the procedure.

Dry eye remains an issue for many patients post-LASIK even though advances in technology such as femtosecond laser, aspheric ablations and faster excimer lasers have improved outcomes and reduced other causes of dissatisfaction post-LASIK such as uncorrected refractive error, haloes and flap related complications. Dry eye is probably the most common cause of post-LASIK dissatisfaction.

Two studies at large US tertiary institutions found that 29.8 per cent and 27.8 per cent of the patients seeking a second opinion because of dissatisfaction after LASIK had a diagnosis of dry eye.[3,4] One study also found that while some patients presented with classic dry eye symptoms, many presented with generalised visual complaints and unhappiness with visual quality. The authors commented that patients with persistently dry eyes after LASIK were among the unhappiest of all patients in this study. This highlights the importance of proactively diagnosing and treating dry eye post-operatively in all patients.

Post-LASIK dry eye is primarily the result of sectioning of corneal nerves during surgery. This results in a neurotrophic cornea, which then causes dysfunction of the ocular-surface lacrimal gland functional unit, with secondary effects such as reduced blink rate, tear hyperosmolarity and inflammation. Other factors such as topical drug and preservative toxicity can have contributory roles. In certain patients, especially if dry eye is persistent, a degree of neuropathic pain due to up-regulation of pain receptors can often lead to a mismatch between degree of symptoms and signs.

There is consensus that pre-operative identification of high-risk patients and pre-operative optimisation of the ocular surface is imperative. In other words, prevention is definitely better than cure. The Dry Eye Workshop recommends validated questionnaires such as the Ocular Surface Disease Index (OSDI) and tear break up time (TBUT) as the most practical screening methods. Schirmer's tear test can give false negatives due to reflex tearing and its theoretical basis is fundamentally flawed in a neurotrophic setting.

Other risk factors should be identified pre-operatively in a comprehensive history. Patient risk factors include a history of contact lens intolerance, Asian females and possibly older age.[5,6] A history of contact lens intolerance may be due to an underlying degree of dry eye. Surgical factors that increase dry eye risk are hyperopic ablations, larger ablations and the use of a microkeratome rather than the preferred femtosecond laser for LASIK flap creation.[7,8] Peripheral and deeper ablations increase the amount of corneal nerves affected. A microkeratome flap that is typically thicker in the periphery also results in more sectioning of corneal nerves. A surface ablation may be considered as an alternative for patients with more pronounced dryness.

When a patient is identified as being at risk, pre-operative treatment such as preservative free artificial tears, punctal occlusion, topical steroids and nutritional supplements such as omega 3s and vitamin C should be employed. Restasis (cyclosporine A 0.05%) has been shown in studies to aid return of corneal sensitivity post LASIK but is available only on restricted access (Special Access Scheme) in Australia.[9,10] While it is possible to pretreat and moderate dry eye symptoms following LASIK, patients with severe dry eye should not be considered for the procedure. These patients include those with Sjögren's syndrome and who manifest dry eye problems despite treatment.

Post-operative treatment of post-LASIK dry eye also involves the use of preservative-free artificial tears, punctal occlusion, topical steroids, nutritional supplements and Restasis. Early proactive treatment is recommended to prevent the self-perpetuating inflammatory cascade of dry eye. Early treatment may also prevent the up-regulation of pain receptors and the emergence of neuropathic pain, which leads to persistent dry eye symptoms even in the absence of signs.

Autologous serum eye-drops are an increasingly-used therapy as it has been shown in multiple studies to reduce persistent epithelial breakdown and improve tear break up time.[11] Autologous serum contains vitamin A, epidermal growth factors and transforming growth factors, which help heal the ocular surface. Several institutions are looking at ways of producing a manufactured serum rather than requiring the patient to donate blood for this purpose.

ction not cut and dried

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Antidepressants have also sometimes been used as a method to improve persistent dry eye pain as these agents can neuromodulate pain symptoms.[12]

In summary, dry eye is underappreciated as a cause of dissatisfaction post LASIK. The vast majority of patients who undergo LASIK are extremely satisfied. Pre-operative identification and pretreatment of patients is the key to minimising post-operative dry eye problems. When it does occur, post-operative dry eye should be treated early and aggressively to prevent persistent, neuropathic dry eye symptoms.

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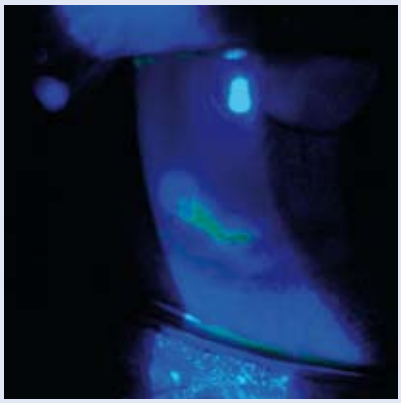
Clinical QUIZ

Dr William Trinh
BOptom OD



A 28-year-old female with conventional daily, low oxygen, hydrogel contact lenses presented to the practice complaining that her right eye had been red and sore for the previous four days. The Chlorsig eye-drops she had been using had had no effect. Her ocular history included high astigmatic myopia and giant papillae conjunctivitis. Her general medical history was uneventful.

On examination, she had a best visual acuity of 6/24 in the right eye and 6/6 with pinhole occluder. There was a 3 x 1 millimetre epithelial defect with dense infiltrates and 3+ conjunctival injection with 2+ anterior chamber reaction (Figures right).

What are your diagnosis and management?

ANSWER PAGE 19

Foetus at risk from

Which is greater—the risk to a foetus when a pregnant woman uses anti-glaucoma medication, or the risk to the mother if treatment is reduced or suspended? **Gary Oshry** investigates

Although most women with glaucoma may be treated efficiently during pregnancy, practitioners must be mindful of the possibility of adverse effects and be prepared to alter or terminate treatment if needed.

Glaucoma medications may damage the foetus or negatively affect the outcome of the pregnancy.[1] Because of the smaller blood volume and immature structures and metabolic system of the foetus, the plasma levels of ophthalmic medications taken by the mother may exceed the therapeutic range in the foetus.

Minimise drug exposure

Findings on the potential systemic effects of glaucoma medication on the mother and the developing foetus have been inconclusive due to lack of large-scale studies—cases of women of child-bearing age having glaucoma are rare—and there are no glaucoma drugs that are deemed to be completely risk-free.[2] Therefore, when prescribing medications for pregnant women or women planning a pregnancy, you need to assess the benefits of treatment against the risks to the foetus and mother if treatment is reduced or suspended.

For example, according to the National Health and Medical Research Council (NHMRC) Guidelines, during pregnancy it may be possible to minimise the number or concentration of medications to achieve target IOP. Pregnancy often causes a reduction in IOP in mid- to late-term, possibly from hormonal changes or decreased episcleral venous pressure, which may allow certain pregnant patients to be monitored on reduced medications or without treatment.[2] IOP drops between 13 and 18 per cent in the third trimester of pregnancy and this often persists for several months after pregnancy.[3]

One study recommends discontinuing glaucoma medications through the first trimester, as this is when the developing foetus is at the greatest risk, when the organ systems are being formed.[4] The author states that if medications cannot be stopped, then the use of beta blockers, topical CAIs, alpha agonists and parasympathomimetics can be continued, but beta blockers and alpha agonists should be discontinued after the eighth month of pregnancy to avoid complications in the neonate.

The theoretical risks of vision loss from elevated eye pressure and decreased blood flow to the optic nerve during the pushing phase of labour should also be discussed with the mother and perhaps the obstetrician.[4]

In Australia the risk of drug use during pregnancy is categorised into seven groups, depending on the severity. It is preferable to use category B1, B2 and C medications during pregnancy.[2] Category B1 and B2 drugs have been proven to not increase the frequency of malformation or have any other direct or indirect harmful effects on the foetus. It is possible that category C drugs may cause harmful effects on a foetus or neonate but the effects may be reversible. Category B3 medications should be used only in special circumstances after careful consideration of the risks and benefits of treatment. Studies of the effects of B3 drugs on animals have shown evidence of an increased occurrence of foetal damage, the significance of which is considered uncertain in humans.

Examples of category risk during pregnancy include:[2]

- Category C: timolol, betaxolol, levobunolol
- Category B1: brimonidine
- Category B2: pilocarpine
- Category B3: apraclonidine, latanoprost, bimatoprost, travoprost, brinzolamide, dorzolamide and acetazolamide.

Refer to the NHMRC Guidelines for a comprehensive list of glaucoma medication categories.

Careful monitoring

A study published in *Clinical and Experimental Optometry*[1] states that although most women with glaucoma may be treated efficiently during pregnancy, once medication is started the patient should be monitored frequently.

In the study, six pregnant glaucomatous patients who were referred to the glaucoma clinic after their first trimesters were advised to continue their medication. Patients were monitored throughout their pregnancy and two years after delivery. The control group comprised 24 mothers with no systemic disease or exposure to medications and with comparable age and gestational age on delivery.

Three newborns in the case group had a low birth weight, all of whom had foetal exposure to timolol, latanoprost and carbonic anhydrase inhibitors in their first trimester of pregnancy. The author states that because timolol can reach significant plasma levels

anti-glaucoma drugs

when applied topically, it may have been responsible for this finding, although the mothers' genetic problems may have been a factor.

There was no evidence of any other congenital abnormalities and the psychophysical development of all children was normal up to two years after birth.

The authors recommend the use of topical forms of glaucoma medications, especially gel formulations (if applicable), to reduce systemic side-effects. Patients should be instructed to use only one drop of medication on each application, applying digital pressure over the medial part of the lower eyelid or gently closing the eyelids for one or two minutes to minimise systemic drug absorption.

Regarding the FDA safety level classification, topical brimonidine may be the best initial choice during pregnancy but because brimonidine, timolol and prostaglandin analogues have possible adverse effects on delivery, lactation and the neonate, it is advisable to replace these medications in the last month of pregnancy. Carbonic anhydrase inhibitors may be the best choice in this period.

Stages of pregnancy

Women wishing to conceive and who have glaucoma should be encouraged to discuss their reproductive plans with a health-care practitioner prior to becoming pregnant so appropriate treatment can be planned to minimise risk to the foetus and mother. Razeghinejad and Nowroozzadeh[1] say that treatment will depend on the degree of the patient's glaucomatous damage, the level of her IOP and personal preferences. In the study, the authors outline the types of medications that can be used in each stage of pregnancy to reduce the risk of side-effects.

In the first trimester, brimonidine and prostaglandin analogues seem to be safe, although beta-blockers and carbonic anhydrase inhibitors should be avoided.

In the second and third trimesters, brimonidine can be used and topical carbonic anhydrase inhibitors, beta-blockers, and prostaglandin analogues should be used with special caution. If beta-blockers are used, regular monitoring of foetal heart rate, rhythm and foetal growth is necessary to detect any arrhythmia or early signs of intrauterine growth retardation.

In the late third trimester and during lactation, avoidance of brimonidine is advisable as it penetrates the blood brain barrier easily and can result in neonatal central nervous system depression. If beta-blocker usage is planned, the lower concentration preparations are preferable. Topical carbonic anhydrase inhibitors seem to be a suitable option in this period.

When breastfeeding, in the majority of cases the use of glaucoma medications is safe, although particular caution should be taken if a breastfeeding mother is taking beta-blockers or alpha2-agonists.[2] The use of punctal occlusion should also be emphasised to reduce the potential for systemic absorption in the mother and therefore reduce potential transfer into breast milk.

> **Pregnancy often causes a reduction in IOP in mid- to late-term ... which may allow certain pregnant patients to be monitored on reduced medications or without treatment.**

Surgery

According to Coppens and colleagues,[4] if a woman has advanced glaucoma and elevated pressures or if she is taking multiple medications, serious consideration should be given to surgery before conception.

The authors state that during pregnancy, filtering surgery can be considered if glaucoma is progressive and an adequate IOP cannot be obtained with medications, although it is preferable to defer surgery until the second trimester to reduce the foetus's exposure to potentially teratogenic anaesthetic agents. Postoperatively, topical erythromycin and steroids in ointment or in drops using punctal occlusion are safe.

Managing glaucoma during pregnancy through surgery may expose the patient to additional risks such as the use of local anaesthetics, post-operative medications, gastro-oesophageal reflux and its associated complications, and an increased risk of aortic and vena cava compression by the uterus in the second and third trimesters due to supine positioning.[2]

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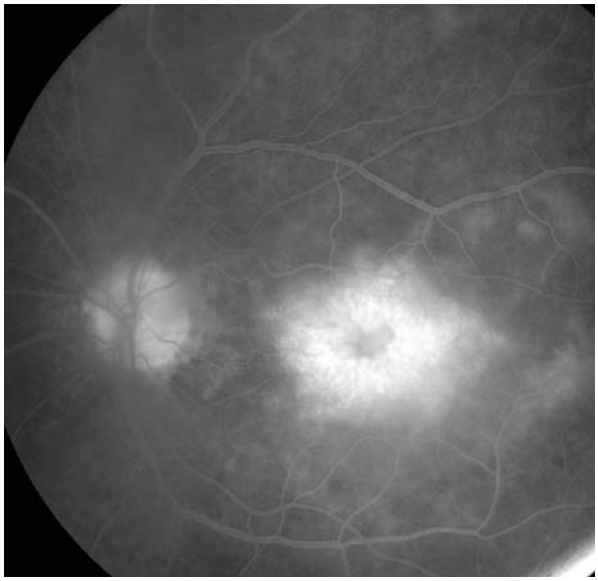
Beware the flipside of

Kelly Minnich BA
Leonid Skorin Jr
OD DO FAAO FAOCO

Patients undergoing cataract surgery either with pre-existing glaucoma or intraocular pressure (IOP) spikes post-operatively often require prostaglandin analogues. Prostaglandin analogues are a relatively new class of glaucoma medications commonly prescribed for their potent IOP lowering effects, convenient dosing regimen and limited number of side-effects.[1]

Although no concrete cause and effect relationship has been established, several cases have been published relating the use of prostaglandin analogues with cystoid macular oedema (CME). CME is the swelling, with or without cystic spaces, of the retina around the fovea, and its occurrence after cataract surgery is referred to as Irvine-Gass Syndrome.[2] It remains a frustrating post-operative complication for patients undergoing cataract surgery and their eye-care providers.

Although its incidence is declining due to improvement in cataract extraction technique, CME is the most common cause of decreased vision following the procedure.[3] There are known risk factors for CME, including diabetes mellitus, pseudophakia with a ruptured posterior capsule, epiretinal membrane, retinal vein occlusion, and a history of uveitis, yet there is no accepted consensus and the pathogenesis remains unclear.[4] One speculation, which is the focus of this paper, is that prostaglandin analogues, along with lowering IOP, have a significant inflammatory effect that could induce CME.[5]



Fluorescein angiogram showing classic CME pattern of petaloid hyperfluorescence surrounding the fovea

The proposed pathogenesis of Irvine-Gass Syndrome begins with surgical trauma increasing the production of endogenous prostaglandins in the aqueous humour, an aspect that has been proven in several studies after cataract surgery.[4] These prostaglandins undergo an inflammatory cascade through the cyclo-oxygenase pathway and disrupt the blood-aqueous barrier. Xalatan (latanaprost) has been shown to enhance this disturbance, further illustrating the relationship between prostaglandins and CME.[6]

The disruption of the blood-aqueous barrier causes a diffusion of prostaglandins and other inflammatory mediators into the vitreous and eventually into the retina, where they disrupt the blood-retinal barrier. This stimulates leakage of the retinal capillaries, resulting in the pooling of serum in the retinal tissues. It has been proposed that the preservative in the prostaglandins (benzalkonium chloride) may be causing the CME rather than the medications themselves. This is disputed as cases of CME have been reported with Travatan Z (travoprost), which uses SofZia rather than benzalkonium chloride as its preservative.[7]

The peak incidence of CME is six to eight weeks following cataract surgery.[3] Patients present with gradual and painless decrease in vision, reduced contrast sensitivity, and central scotoma or metamorphopsia. Clinical examination reveals retinal thickening and possibly a blunting of the foveal light reflex.[2,3] The gold standard diagnosis for CME is fluorescein angiography (FA), which shows leakage of perifoveal capillaries in the early phase and a petaloid hyperfluorescence in the late phase. Optical coherence tomography (OCT) may detect retinal thickening even before FA, therefore it may play a role in the management of CME.[2]

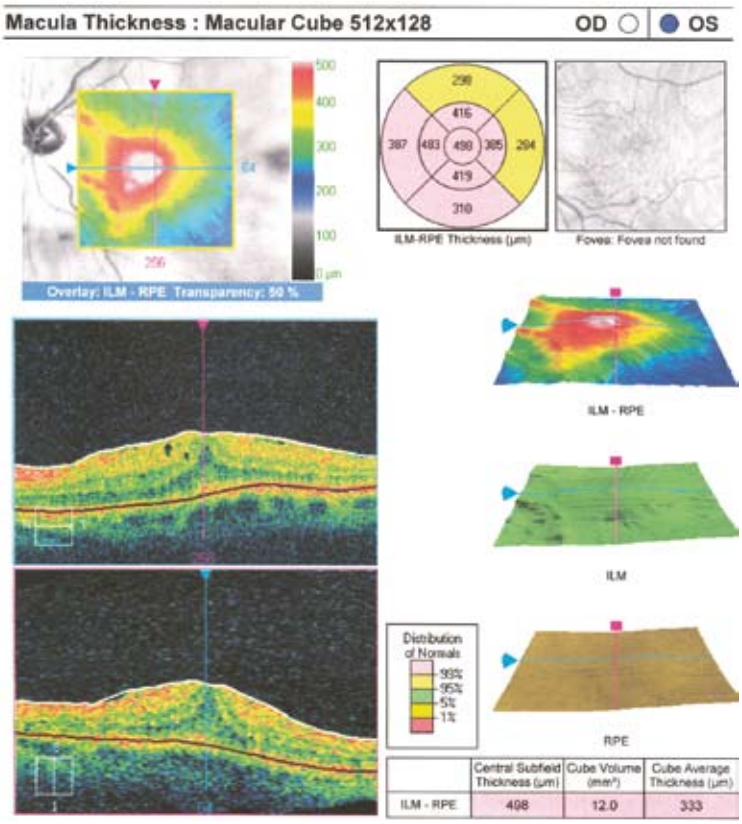
The treatment for CME is controversial. Spontaneous resolution can occur so it is difficult to determine the efficacy of medication. Some reports illustrate a rapid resolution of CME after cessation of prostaglandin therapy, particularly with the concurrent use of topical non-steroidal anti-inflammatory drugs (NSAIDs).[8] NSAIDs, which inhibit the production of prostaglandins by disrupting the cyclo-oxygenase cycle, have been shown to be beneficial for both the prevention and the treatment of CME.[9] Mikaye and Ibaraki demonstrated that patients taking diclofenac along with latanoprost prevented CME while IOP was unaffected.[10]

IOP-lowering drugs

The association between prostaglandins and CME is unclear. The pathogenesis is most likely to be multifactorial yet many investigators agree that inflammation is the major feature in the development of CME after cataract surgery.[11] Therefore, it is important for practitioners to be aware of the potential complications of prostaglandin analogues, which are inflammatory in nature. There are few randomised clinical trials and no clear guidelines to follow regarding their use peri-operatively, so many practitioners practise based on subjective reports or their own experience.[1]

Some practices discontinued the use of prostaglandins prior to surgery, although we have not experienced any cases of CME linked to prostaglandin use, so we do not suspend these medications. It is not uncommon to encounter increases in IOP post-operatively as some viscoelastic may be left in the eye and it congests drainage through the trabecular meshwork. The practitioner can choose whether to treat these IOP spikes and the modality with which they are treated. Generally, we treat post-operative IOP spikes over 30 mmHg. The surgeon will perform a side-port incision release or prescribe medications such as beta blockers, alpha agonists or carbonic anyhydrase inhibitors.[12] These medications may be preferred due to their immediate mechanisms of action (increasing aqueous humour outflow or decreasing its production) compared to prostaglandins that may take longer to work by structural modification in the uveoscleral pathway. We also prophylactically treat all patients with topical NSAIDs to decrease the risk of post-operative CME.

Further research into prostaglandins is needed to clarify the pathogenesis of CME and allow us to better care for surgical patients.



OCT demonstrating macula thickening with cystic spaces

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Uveitis presents in

Case report

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JK is a 27-year-old man who presented with the sudden onset left red eye, rapidly followed by light sensitivity and an ocular ache of two day's duration. Apart from a similar episode that had affected his right eye 18 months previously, he denied any other past ocular history.

Examination revealed a visual acuity of 6/5 in the right eye and 6/5- in the left. Intraocular pressures were 16 mmHg in the right eye and 8 mmHg in the left. Anterior segment examination of the right eye was normal. Examination of the left eye revealed marked ciliary injection (Figure 1) and normal conjunctivae on tarsal eversion. The corneal epithelium was intact and there were no corneal stromal opacities. The left pupil was constricted and 2+ anterior chamber cells were noted, with trace flare and multiple fine inferior keratic precipitates. Dilated fundal examination revealed the occasional anterior vitreal cell and no haze in the left eye. The discs and maculae were normal with no areas of chorioretinitis seen on full peripheral examination.

On further questioning, JK stated that the episode in his right eye had been diagnosed as 'an itis or something' and responded well to topical steroids. He also admitted to having had lower back pain and stiffness on waking in the mornings since his teenage years.

Investigations included syphilis serology, which was negative, as well as an HLA-B27 blood test, which was positive, and plain X-rays of his lumbar spine. These X-rays revealed changes consistent with ankylosing spondylitis (Figure 2).

JK was commenced on hourly g. Prednefrin Forte (Allergan) to his left eye in combination with g. Homatropine 2% TDS (Alcon). His symptoms were noted to settle

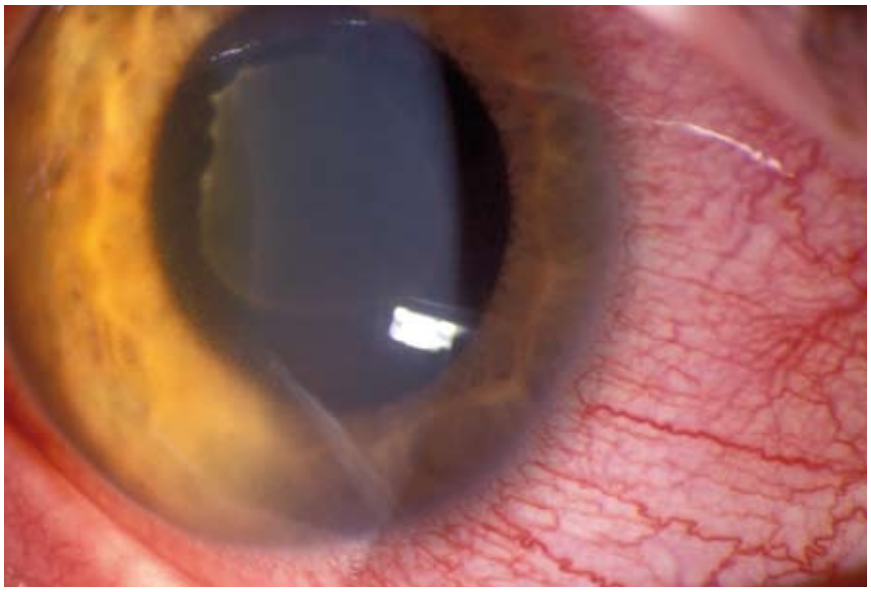

Figure 1. Slitlamp image of the left eye of JK at presentation showing typical ciliary injection and fine keratic precipitates

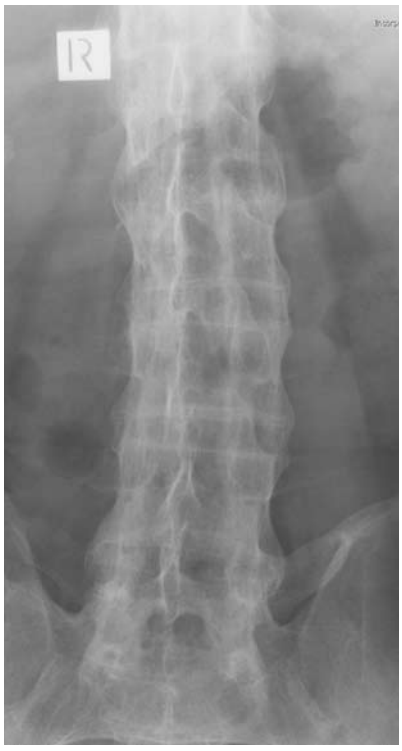

Figure 2. Plain X-ray of the lumbar spine showing the typical 'bamboo spine' seen in advanced cases of ankylosing spondylitis, where ossification of the spinal ligaments and paravertebral connective tissues result in bony fusion of the vertebrae

many guises

within 24 hours of starting treatment. He was also referred to a rheumatologist for ongoing management of his ankylosing spondylitis. With frequent follow-up JK was able to wean and cease his eye-drops over the next four to six weeks.

Type of uveitis	Primary site of inflammation/ site of maximal inflammation
Anterior	Anterior chamber
Intermediate (includes pars planitis)	Vitreous
Posterior	Retina and/or choroid
Panuveitis	Anterior chamber, vitreous, retina and/or choroid

Table 1. Anatomical classification of uveitis

Discussion

Uveitis is a term that encompasses all forms of intraocular inflammation and therefore represents a heterogenous group of diseases. It can be subclassified anatomically according to the anatomical site of maximal inflammation[1] (Table 1).

Anterior uveitis, where the site of maximal inflammation is based around the iris and ciliary body (also known as iritis or iridocyclitis), is the most common form of uveitis, and accounts for over 50 per cent of cases.[2] Typical presenting symptoms include periocular ache, ocular injection, photophobia and in some cases blurred vision. Typical signs include ciliary injection, anterior chamber cell, flare and keratic precipitates. Complications such as posterior synechiae may also be seen at presentation.

The causes of uveitis are best divided into infectious and non-infectious causes. Non-infectious, or autoimmune uveitis, can then be further subdivided into idiopathic, those associated with a defined ocular inflammatory disease such as birdshot chorioretinopathy, and those associated with a systemic autoimmune disease (Figure 3).

Acute anterior uveitis (AAU), characterised by the acute onset and rapid progression of symptoms as illustrated by this case, is the most common uveitis presentation and is associated with HLA-B27 in up to 50 per cent of cases.[3] HLA-B27 refers to human leukocyte antigen-B27. Although human leukocyte antigens have an integral role in the body's immune processes, where they are involved in the presentation of antigens to immune cells (T cells), the exact mechanism by which HLA-B27 causes uveitis and other systemic diseases is still to be elucidated.

The systemic diseases associated with HLA-B27 include ankylosing spondylitis, psoriatic arthritis, reactive arthritis and uveitis (also known as Reiter's syndrome) and inflammatory bowel disease (Crohn's disease, ulcerative colitis). A summary of some of the more common systemic diseases associated with uveitis is shown in Table 2.

Ankylosing spondilitis is an inflammatory arthritis that typically affects the sacroiliac and lower lumbar spine and is most often seen in adolescent men. Patients typically have a history of lower back pain that is improved with activity but aggravated by long periods of rest, which is why their back pain is often worst on waking in the morning. Investigations to help confirm the diagnosis therefore include a HLA-B27 and X-rays of the lumbar and sacroiliac spine. Systemic treatments often initially consist of the use of oral non-steroidal anti-inflammatories (NSAIDS) such as ibuprofen (Neurofen) or indomethacin (Indocid) but more severe cases may require immune suppression.

AAU is best treated with the aggressive use of a topical potent steroid such as g. Prednefrin Forte (Allergan) used every hour while awake in combination with a topical cycloplegic such as Homatropine 2% TDS (Alcon), with arrangements to review the patient within three to five days to ensure treatment response.

Prior to commencing treatment, you must first ensure the following.

- The patient does indeed have AAU and does not have signs of posterior segment inflammation. A thorough, fully-dilated examination must be done—both at the slitlamp and with an indirect ophthalmoscope—to exclude this possibility. If a fully-dilated examination cannot be performed, the patient requires prompt referral to an ophthalmologist, as posterior segment inflammation will not respond to topical treatment and can rapidly lead to blinding complications.
- Care must be taken to first exclude the possibility of an infectious cause of a patient's uveitis, such as herpetic disease, as the use of such treatments will worsen the inflammation and may lead to sight-threatening complications.
- The patient has had prior episodes that have been uncomplicated and have responded well to topical therapy alone. All first presentations of uveitis should be referred to an ophthalmologist to confirm the diagnosis and exclude the possibility of other mimicking conditions, such as acute retinal necrosis, which can rapidly lead to blindness if inappropriately treated with topical therapy.
- Patients who have a reduction in vision associated with their uveitis presentation are best promptly referred to an ophthalmologist, as a reduction in visual acuity on presentation is often due to posterior segment involvement—such as significant vitritis or cystoid macular oedema—which rarely responds to topical therapy alone.

Once treatment has been commenced, regular follow-up is required to ensure treatment response and to ensure no further complications occur, such as raised intraocular pressure in steroid responders. Treatment must then be tapered slowly, as the sudden cessation of treatment will result in a rapid recurrence of inflammation that is often more severe and harder to control than the initial episode. A typical tapering regimen of

Continued page 18

Uveitis presents in many guises

From page 17

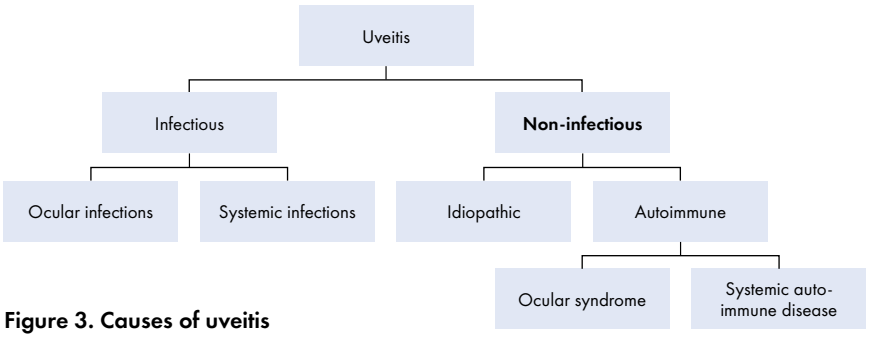

Figure 3. Causes of uveitis

Disease	Type of uveitis most often associated with disease	Typical presenting ocular symptoms	Common associated systemic symptoms
Sarcoidosis	Chronic, unilateral or bilateral, granulomatous panuveitis	Slowly progressive ocular injection, photophobia, floaters and decreased/ blurred vision	Chronic cough, shortness of breath
Ankylosing spondylitis	Unilateral acute anterior uveitis	Acute unilateral ocular injection, photophobia and periocular ache	Lower back pain that is worst at rest
Behcet's disease	Acute, often explosive, unilateral or bilateral panuveitis	Acute ocular injection, photophobia, floaters and severe visual loss	Oral and genital ulcers, rash, inflammatory arthritis
Juvenile idiopathic arthritis	Chronic bilateral anterior uveitis	Usually asymptomatic	Young children with inflammatory arthritis
Vogt-Koyanagi-Harada disease	Acute bilateral granulomatous panuveitis	Acute bilateral ocular injection, photophobia and blurred vision	Acute onset severe headaches, tinnitus

Table 2. Common systemic diseases associated with non-infectious uveitis

g. Prednefrin Forte is a decrease of about one drop per week. For example, hourly drops until quiescence is seen, then a reduction to two hourly for one week, then 6x/day for one week, then QID for one week, TDS for one week, BD for one week, et cetera. Topical homatropine can be ceased without weaning once the uveitis is quiescent.

Acknowledgement
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Financial disclosures
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1. Jabs DA, Nussenblatt RB, Rosenbaum JT. Standardization of uveitis nomenclature for reporting clinical data. Results of the First International Workshop. *Am J Ophthalmol* 2005; 140: 3: 509-516.
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3. Chang JH, McCluskey PJ, Wakefield D. Acute anterior uveitis and HLA-B27. *Surv Ophthalmol* 2005; 50: 4: 364-388.

Vitamin D boost

Patients with diabetic retinopathy are more likely to have a vitamin D deficiency, according to a poster presented at the American Academy of Ophthalmology and Middle East Africa Council of Ophthalmology 2010 Joint Meeting.

The data show that more than 75 per cent of patients with diabetic retinopathy were deficient in vitamin D, defined as being below 30 ng/mL. People with proliferative retinopathy had the lowest mean levels at 21.1 ng/mL.

Several reasons were proposed to explain why maintaining adequate levels of vitamin D might protect against the onset of retinopathy, including its beneficial role in maintaining normal glucose metabolism and lowering the production of inflammatory cytokines that are upregulated in type 2 diabetes.

AAO 2010; Abstract PO223.

News briefs

Home truths

Men are far more likely to suffer ocular injuries than women, according to the annual Eye Injury Snapshot conducted by the American Academy of Ophthalmology (AAO) and American Society of Ocular Trauma (ASOT).

The survey found that in 73.5 per cent of cases, eye injuries affected men.

In addition, the AAO reports that 52 per cent of eye injuries occur in the home. It recommended that every household have at least one pair of protective eyewear—meeting American National Standards Institute eye protection standards—to be worn when doing high-risk projects or activities at home to protect against common ocular injuries.

Improved formula

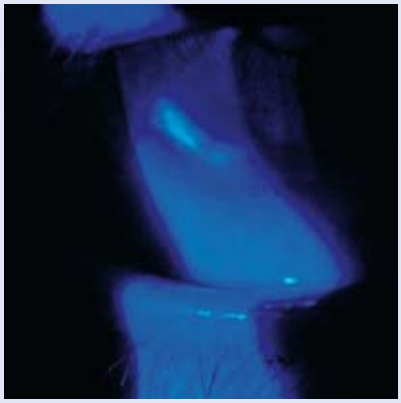
The United States Food and Drug Administration has approved the use of a once-daily formulation of bromfenac 0.09% ophthalmic solution, which could improve the management of post-operative inflammation and ocular pain in cataract surgery patients.

The FDA says that the once-daily eyedrop, manufactured by Ista Pharmaceuticals, is beneficial for patients recovering from cataract surgery and should enhance patient compliance as it is more convenient compared with Xibrom, the company's previously approved formulation.

The new formulation is known commercially as Bromday and should be applied directly to the affected eye or eyes as a single drop, occurring one day before cataract surgery and every day for two weeks after surgery.

Clinical QUIZ

ANSWER
Contact lens related bacterial keratitis



Day 2

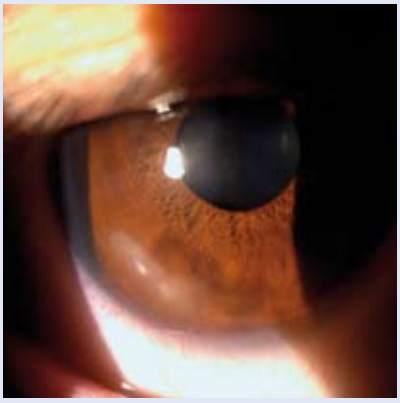
Management

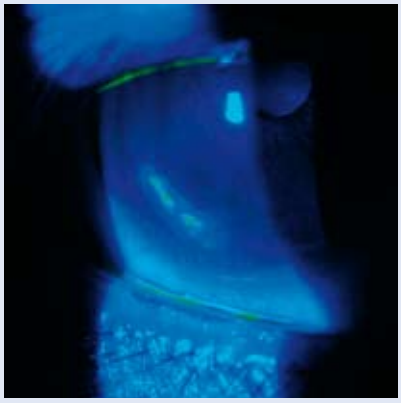
The patient was diagnosed as having contact lens related bacterial keratitis. She was advised to discontinue Chlorsig eye-drops and was prescribed Ciloxan eye-drops, one drop every 15 minutes for six hours and then every 30 minutes until bed-time, and hourly the next day.

When reviewed the next day, the patient reported that the right eye was no longer painful. The corneal epithelium was healing and the conjunctiva was less injected. Ciloxan was continued at one drop every four hours.

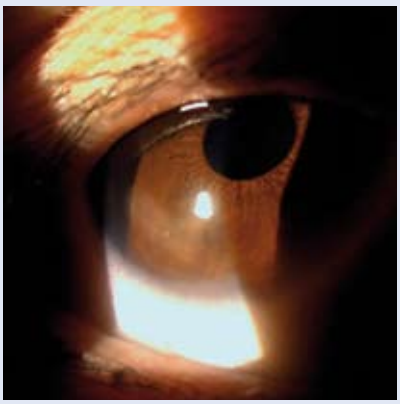
By day four the right cornea had continued to improve with Ciloxan. By day 10 the corneal epithelium wound was completely sealed with best corrected visual acuity of R 6/7.5 and L 6/6. Patient continued Ciloxan qid and Fluorometholone (FML) eye-drops qid was added to the treatment to reduce the degree of stromal scarring.

The patient was reviewed on day 20 with minimal corneal stromal scarring.

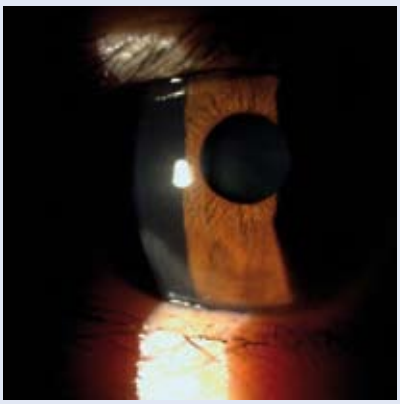


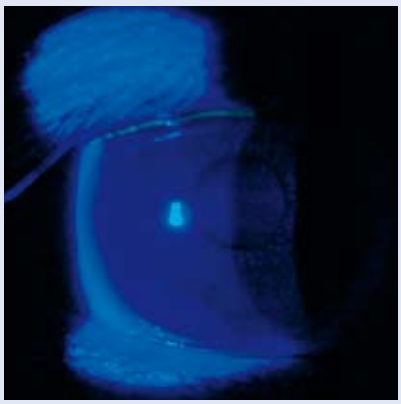


Day 4



Day 10





Day 20

Discussion

The therapeutic and dosing schedule for the treatment of contact lens related corneal keratitis varies, depending on the severity and location of the infiltrates. Due to the prevalence and possibility of *Pseudomonas aeruginosa* in contact lens related keratitis, Chlorsig eye-drops are an inappropriate choice of broad spectrum antibiotics. It is generally agreed that empirical treatment with a fluroquinolone should be considered in these cases.

In this case the key clinical features that allude to bacterial keratitis are evident in the size of the epithelial defect and infiltrates. Ciloxan was therefore an appropriate choice with intensive dosing and a regular follow-up schedule. ■

Abstracts

Dr Laura Downie
PhD BOptom PGCertOcTher
DipMus(Prac) AMusA

Pingueculae link to CL wear

Contact lens use has been identified as a risk factor for the development of pingueculae.

A group of contact lens wearers (n = 600; RGPs n = 94, soft lenses n = 506) was compared to an age- and gender-matched control group of non-contact lens wearers.

An age-related increase in pingueculae was observed in both groups, although the grade of pingueculae at the temporal conjunctiva was significantly higher in contact lens wearers than in the control group. This indicates an association between contact lens wear and the genesis of temporal pingueculae.

Eye(Lond) 2010; Sep 10 (Epub ahead of print).

Humorous flow

A study has suggested an association between thicker corneas, lower aqueous production and reduced uveo-scleral outflow in ocular hypertensive patients.

Aqueous humour dynamics (flow, outflow facility and uveo-scleral outflow), intraocular pressure and pachymetry data were retrospectively compared between a control group and an ocular hypertensive group. Significant negative correlations were found between central corneal thickness and aqueous flow, and between corneal thickness and uveo-scleral outflow for both groups. In healthy controls, a positive correlation was observed between aqueous flow and uveo-scleral outflow.

The authors concluded that ocular normotensive eyes and hypertensive eyes may differ in their ability to increase uveo-scleral outflow with increases in aqueous inflow.

Invest Ophthalmol Vis Sci 2010; Sep 29 (Epub ahead of print).

AIDS is a sensitive issue

Abnormal contrast sensitivity has been shown to be an independent risk factor for increased mortality in patients with AIDS.

A total of 3,395 eyes were examined over a 10-year period in the study entitled Longitudinal Study of the Complications of AIDS. Abnormal contrast sensitivity was evident in 16.8 per cent of the population at enrolment. A positive relationship between the presence of abnormal contrast at study entry and mortality was observed.

It was concluded that abnormal contrast sensitivity may be a marker of systemic, life-threatening microvascular disease in other organs.

Am J Ophthalmol 2010; 149: 5: 807-816.

Iris recognition unreliable

Iris recognition technology is impaired in some patients with acute anterior uveitis.

This prospective study examined the effect of eye pathology on iris recognition. Patients with anterior segment eye disease had iris photographs taken at presentation to an ophthalmologic referral unit and at post-treatment follow-up visits. The principle outcome measure was the mathematical difference in iris recognition templates between patient's irides before and after treatment.

Results showed that iris recognition was not significantly affected by corneal oedema, peripheral iridotomies or conjunctivitis, although anterior uveitis may cause current recognition systems to fail and should be considered in the development of this biometric technology.

J R Soc Interface 2009; 6: 34: 489-493.

Lenses carry bio-burden

Smoking and lens bacterial bio-burden have been identified as strong risk factors for corneal infiltrative events (CIE) during extended wear of silicone hydrogel contact lenses.

Subjects were fitted with lotrafilcon A contact lenses for continuous wear and observed for one year. The main exposures of interest were corneal staining and bacterial contamination of lenses.

Of the 205 subjects examined, about 53 per cent had repeat episodes of corneal staining yet this factor was not associated with development of a CIE.

The frequency of substantial bacterial bio-burden on worn lenses at the time of a CIE was 64.7 per cent, compared to 12.2 per cent during uncomplicated wear.

The study concluded that over 70 per cent of the total risk of CIE is attributable to contact lens bacterial contamination. Smoking was also associated with a CIE.

Invest Ophthalmol Vis Sci 2010; June 10 (Epub ahead of print).

Keep an eye on Crohn's disease

An association has been described between the auto-inflammatory condition Crohn's disease and sub-clinical corneal abnormalities.

Central, corneal confocal microscopy was performed on patients with established Crohn's disease (n = 30) and age- and a gender-matched healthy control group (n = 30).

Patients with Crohn's disease were observed to have changes to the basal corneal epithelium, activation of keratocytes and a lower density of dendritic cells.

The authors concluded that Crohn's disease may be associated with sub-clinical corneal inflammation.

Cornea 2010; Sep 28 (Epub ahead of print)

Dry eye sets off alarm bells

Patients with dry eye disease are significantly more likely to have systemic comorbidities, according to a nationwide population-based study conducted in Taiwan.

Regression analysis and odds-ratio (OR) risk analysis revealed that compared to patients without dry eye, patients with symptomatic dry eye had a higher prevalence of systemic comorbidities including systemic lupus erythematosus (OR = 3.98), rheumatoid arthritis (OR = 2.86), depression (OR = 2.11), psychoses (OR = 1.87), and various cardiovascular diseases.

Acta Ophthalmol 2010; Aug 31 (Epub ahead of print)

New dimension in vascular testing

The retinal fractal dimension, a method of quantifying the geometric pattern and complexity of the retinal vasculature, has been identified as a potential global measure of systemic microvascular disease.

A cross-sectional study of 208 long-term patients with type 1 diabetes was performed from a population-based Danish cohort. The retinal fractal dimension was measured using a semi-automatic computer-based program.

Eyes with a lower fractal dimension score were more likely to have proliferative diabetic retinopathy and neuropathy.

There was also a trend between lower fractal scores and nephropathy, but not macrovascular disease (for example, coronary heart disease, stroke and peripheral artery disease).

Ophthalmology 2010; 117: 7: 1400-1405.

Central serous retinopathy

Case report

Michael Yapp
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Centre for Eye Health, UNSW

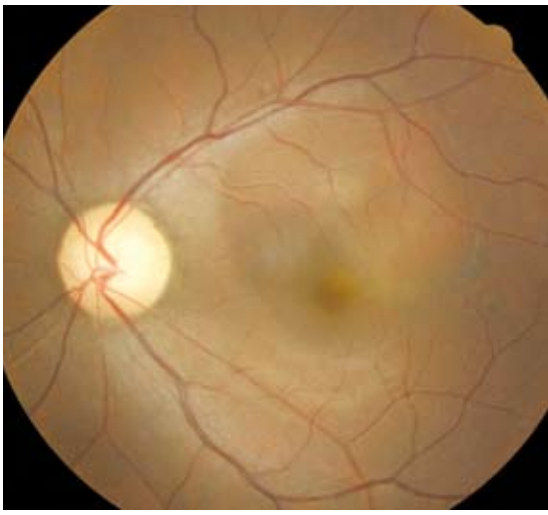

Figure 1. Fundas image showing a circular area of altered colouration

A 44-year-old male was referred to the Centre for Eye Health (CFEH) by his optometrist for advanced imaging of a suspected central serous retinopathy (CSR) in his left eye.

Corrected visual acuities were RE 6/6 with a low hyperopic correction, and LE 6/6 with a low hyperopic and astigmatic correction. The referring practitioner noted that the patient had distortions to the Amsler grid in the left eye.

Fundus photography (Figure 1) showed a circular area of altered colouration of about two disc diameters superior to and including the macula.

CFEH examined the area using the Zeiss Cirrus optical coherence tomography (OCT) instrument's Macular Cube scan (Figure 2). A sensory retinal detachment was identified based on four key findings from the OCT:

- internal limiting membrane (ILM)-retinal pigment epithelium (RPE) overlay
- ILM-RPE thickness map numerically quantifying the height of the ILM from the RPE
- colour-coded ILM-RPE thickness graphic
- OCT horizontal and vertical scans through the area marked on the fundus image.

Imaging of the left eye was also undertaken using the Heidelberg Spectralis OCT, with a line scan (Figure 3) of the central macula. The sensory detachment of the retina is obvious but temporal to this area was an irregular RPE that also appeared detached.

The OCT results were sent to the referring optometrist, with a recommendation for follow-up OCT scans.

Seven weeks later the patient attended the CFEH again. At this point the Cirrus OCT (Figure 4) suggested that the central macula was thinner than the normative database. The ILM was 444 µm closer to the RPE than initially, and this time the macula area appeared with normal architecture. The

Continued page 22

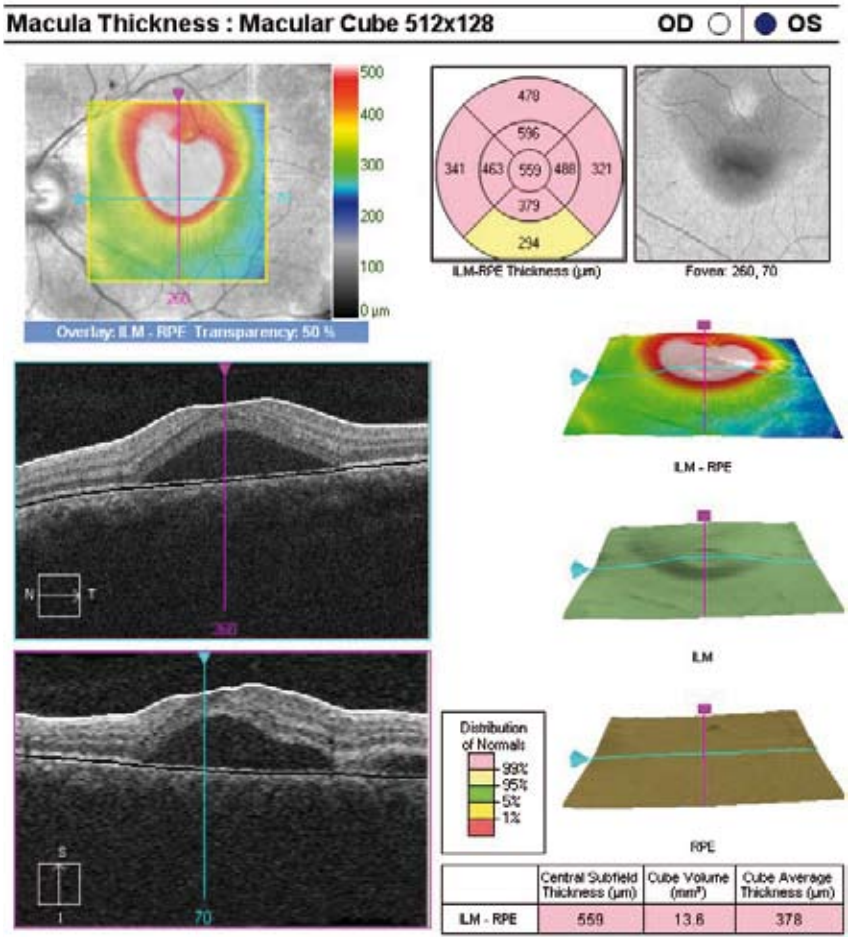

Figure 2. A sensory retinal detachment identified with a Cirrus OCT

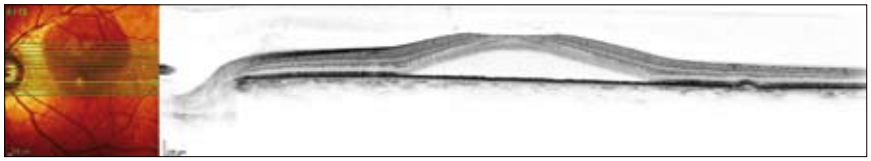

Figure 3. Line scan of the central macula showing an irregular RPE that also appeared detached

Central serous retinopathy

From page 21

Spectralis OCT (Figure 5) also suggested normal macula architecture, but indicated that the RPE detachment, previously noted temporal to the macula, was still present and therefore posed an increased risk to this patient of CSR recurrence in the left eye. CFEH advised the referring optometrist to continue monitoring the patient.

Discussion

CSR occurs mostly in young or middle-aged men with Type A personalities. Factors that can aggravate the condition include alcohol, stress, steroids and hypertension.[1]

The patient usually exhibits a relative hyperopic refractive shift due to the elevated sensory retina, and the resultant corrected visual acuity is often around 6/6. Symptoms include unilateral vision disturbance and metamorphosia, micropsia and/or a relative scotoma.[1,2] These symptoms can be caused by a lack of information between blur and accommodation, the Stiles-Crawford effect leading to reduced and altered light capture, and the altered principal visual direction leading to spatial distortion.[3]

The course of the condition is usually relatively short, with resolution occurring through the spontaneous absorption of the sub-retinal fluid over a three- to six-month period, and a resultant return to normal or near normal visual acuity.[1] It has been shown that eyes with resolved CSR have lower retinal sensitivity in the central macula, even after good visual acuity has been achieved,[4] and Kanski claims that recurrences of CSR are likely to occur in up to 50 per cent of patients.[1]

Prolonged CSR recovery can take up to 12 months and chronic CSR is characterised by progressive RPE changes.[1] In most cases no treatment is required, although Argon laser photocoagulation can be used for rapid resolution, or photodynamic therapy if there are subfoveal leaks or for chronic cases.[1]

Evidence from the enhanced imaging of OCT suggests that patients with CSR have thick choroids and that the condition may be caused by increased hydrostatic pressure in the choroid.[5] Indocyanine green (ICG) studies point to a choroidal circulation that demonstrates a hyperpermeability coexisting with areas of hypofluorescence indicating a diffuse dysfunction of the choroidal circulation.[6] This build-up of choroidal fluid ultimately leads to the RPE leakage seen on fluorescein angiography.

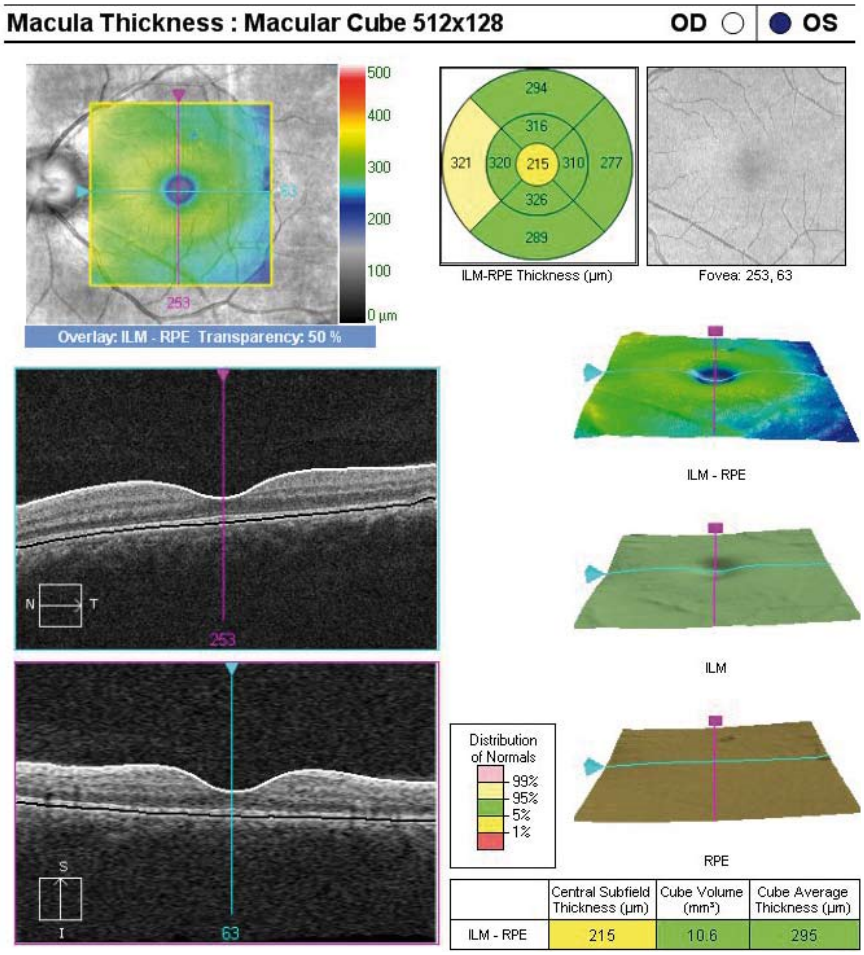

Figure 4. Seven weeks later the macula area appeared with normal architecture

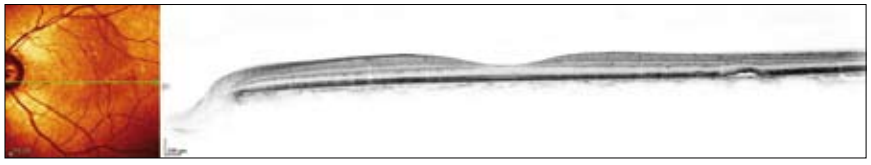

Figure 5. Spectralis OCT shows the RPE detachment still present, indicating an increased risk of CSR recurrence

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5. Imara Y, Fujiwara T, Margolis R, Spaide R. Enhanced depth imaging optical coherence tomography of the choroid in central serous retinopathy. *Retina* 2009; 29: 1469-1473.
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Scheduled drugs that may be used or prescribed by optometrists

1 December 2010

Commercially available drugs

Anti-infectives
Chloramphenicol
Ciprofloxacin*
Framycetin
Gentamicin sulfate*
Ofloxacin*
Sulfacetamide
Tetracycline
Tobramycin*
Aciclovir*

Anti-inflammatories
Dexamethasone
Fluorometholone
Fluorometholone acetate
Hydrocortisone
Prednisolone
DiclofenacL
Flurbiprofen
Ketorolac

Decongestants, anti-allergics and astringents
Antazoline
Ketotifen
Levocabastine
Lodoxamide
Naphazoline
Olopatadine
Pheniramine
Sodium cromoglycate
Tetrahydrozoline

Anti-glaucoma preparations
Apraclonidine
Betaxolol
Bimatoprost
Brimonidine
Brinzolamide
Dorzolamide
Latanoprost
Pilocarpine
Timolol
Travoprost

Mydriatics and cycloplegics
Atropine
Cyclopentolate
Homatropine
Pilocarpine*
Phenylephrine
Tropicamide

Local anaesthetics
Amethocaine
Lignocaine*
Oxybuprocaine
Proxymetacaine

Drugs which may be available through compounding pharmacy service

Anti-infectives
Azithromycin*†§
Bacitracin*
Cephazolin*†§
Gramicidin§
Neomycin
Polymixin
Vidarabine*†

Anti-inflammatories
Cyclosporin*§

Anti-glaucoma preparations
Carbachol
Dipivefrin
Levobunolol

* Not available in ACT
† Not available in South Australia
§ Not available in Tasmania

PBS list of medicines for optometrists

1 December 2010

	Product	Max qty	Repeats
Antiglaucoma preparations			
Betaxolol eye-drops, suspension, 2.5 mg (as hydrochloride)/mL, 5 mL	Betoptic S	1	5
Betaxolol eye-drops, solution, 5 mg (as hydrochloride)/mL, 5 mL	Betoptic		
	BetoQuin	1	5
Bimatoprost eye-drops 300 mg/mL, 3 mL	Lumigan	1	5
Bimatoprost with timolol eye-drops containing 300 mg bimatoprost with timolol 5 mg (as maleate)/mL, 3 mL	Ganfort 0.3/5	1	5
Brimonidine eye-drops containing brimonidine tartrate 2 mg/mL, 5 mL	Alphagan		
	Enidin	1	5
Brimonidine with timolol eye-drops containing brimonidine tartrate 2 mg with timolol 5 mg (as maleate)/mL, 5 mL	Combigan	1	5
Brinzolamide eye-drops 10 mg/mL, 5 mL	Azopt		
	BrinzoQuin	1	5
Brinzolamide with timolol eye-drops containing brinzolamide 10mg/mL with timolol 5mg (as maleate)/mL, 5mL	Azarga	1	5
Dorzolamide eye-drops 20 mg (as hydrochloride)/mL, 5 mL	Trusopt	1	5
Dorzolamide with timolol eye-drops containing dorzolamide 20 mg (as hydrochloride) with timolol 5 mg (as maleate)/mL, 5 mL	Cosopt	1	5
Latanoprost eye-drops 50 micrograms/mL, 2.5 mL	Xalatan	1	5
Latanoprost with timolol eye-drops 50 micrograms latanoprost with timolol 5 mg (as maleate)/mL, 2.5 mL	Xalacom	1	5
Pilocarpine eye-drops containing pilocarpine hydrochloride 10 mg/mL, 15 mL	Isopto Carpine		
	Pilopt	1	5
	PV Carpine		
Pilocarpine eye-drops containing pilocarpine hydrochloride 20 mg/mL, 15 mL	Isopto Carpine		
	Pilopt	1	5
	PV Carpine		
Pilocarpine eye-drops containing pilocarpine hydrochloride 40 mg/mL, 15 mL	Isopto Carpine		
	Pilopt	1	5
	PV Carpine		
Pilocarpine eye-drops containing pilocarpine hydrochloride 60 mg/mL, 15 mL	Pilopt	1	5
	PV Carpine		
Timolol eye-drops 2.5 mg (as maleate)/mL, 5 mL	Tenopt		
	Timoptol	1	5
Timolol eye-drops 5 mg (as maleate)/mL, 5 mL	Tenopt		
	Timoptol	1	5
Timolol eye-drops (gellan gum solution) 2.5 mg (as maleate)/mL, 2.5 mL	Timoptol XE	1	5
Timolol eye-drops (gellan gum solution) 5 mg (as maleate)/mL, 2.5 mL	Timoptol XE	1	5
Timolol eye gel 1 mg (as maleate)/g, 5 g	Nyogel	1	5
Travoprost eye-drops 40 micrograms/mL, 2.5 mL	Travatan	1	5
Travoprost with timolol eye-drops 40 micrograms travoprost with timolol 5 mg (as maleate)/mL, 2.5 mL	Duotrav	1	5

By writing a PBS prescription for an antiglaucoma agent, the prescriber is certifying that the criteria set out in the PBS guidelines are satisfied

	Product	Restriction	Max qty	Repeats
Anti-viral eye preparations		Restricted:		
Aciclovir eye ointment 30 mg per g (3%), 4.5 g	Zovirax	Herpes simplex keratitis	1	0
Antibiotics		Unrestricted		
Chloramphenicol eye-drops 5 mg/mL (0.5%), 10 mL	Chlorsig		1	2
	Chloromycetin		1	2
Chloramphenicol eye ointment 10 mg/g (1%), 4 g	Chlorsig		1	0
	Chloromycetin		1	0
Framycetin sulfate eye-drops 5 mg/mL (0.5%), 8 mL	Soframycin		1	2
Sulfacetamide sodium eye-drops 100 mg per mL (10%), 15 mL	Bleph-10		1	2
Anti-inflammatory agents		Unrestricted		
Fluorometholone eye-drops 1mg/mL (0.1%), 5 mL	Flucon		1	0
	FML Liquifilm		1	0
Fluorometholone acetate eye-drops 1 mg/mL (0.1%), 5 mL	Flarex		1	0
Flurbiprofen sodium eye-drops 300 µg/mL (0.03%) single dose units 0.4 mL, 5	Ocufen		1	0
Hydrocortisone acetate eye ointment 10 mg/g (1%), 5 g	Hycor		1	0
Anti-allergy agents		Restricted:		
Sodium cromoglycate eye-drops 20 mg/mL (2%), 10 mL	Cromolux	Vernal keratoconjunctivitis	1	5
	Opticrom		1	5

Continued

	Product	Restriction	Max qty	Repeats
Tear supplements		Restricted:		
Carbomer eye gel 2 mg/g (0.2%), 10 g	Geltears	Severe dry eye including	1	5
	PAA	Sjögren's syndrome	1	5
	Viscotears Liquid Gel		1	5
Carmellose sodium with glycerin eye-drops 5 mg-9 mg per mL (0.5%-0.9%), 15 mL	Optive		1	3
Carmellose sodium eye-drops 10 mg/mL (1%), 15 mL	Refresh Liquigel		1	5
Carmellose sodium eye-drops 5 mg/mL (0.5%), 15 ml	Refresh Tears plus		1	5
Hypromellose eye-drops 3 mg/mL (0.3%), 15 mL	In a Wink Moist'ing		1	5
(contains sodium perborate)	Genteal		1	5
Hypromellose eye-drops 5 mg/mL (0.5%), 15 mL	Methopt		1	5
Hypromellose with carbomer 980 ocular lubricating gel 3 mg-2 mg/g (0.3-0.2%), 10 g	HPMC PAA		1	5
	Genteal gel		1	5
Hypromellose with dextran eye-drops 3 mg-1 mg/mL (0.3%-0.1%), 15 mL	Poly-Tears		1	5
	Tears Naturale		1	5
Polyethylene glycol 400 with propylene glycol drops 4 mg-3 mg/mL (0.4-0.3%); 15 mL	Systane		1	5
Polyethylene glycol 400 eye drops 2.5 mg per mL (0.25%), 15 mL	Blink Intensive Tears		1	5
Polyvinyl alcohol eye-drops 14 mg/mL (1.4%), 15 mL	PVA Tears		1	5
Polyvinyl alcohol eye-drops 30 mg/mL (3%), 15 mL	PVA Forte		1	5
Polyvinyl alcohol eye-drops 14 mg/mL (1.4%), 15 mL	Liquifilm Tears		1	5
Polyvinyl alcohol eye-drops 30 mg/mL (3%), 15 mL	Liquifilm Forte		1	5
Polyvinyl alcohol eye-drops 14 mg/mL (1.4%), 15 mL (contains sodium chorite/hydrogen peroxide as preservative)	Vistil		1	5
Polyvinyl alcohol eye-drops 30 mg/mL (3%), 15 mL (contains sodium chorite/hydrogen peroxide as preservative)	Vistil Forte		1	5
Unpreserved tear supplements		Authority required:		
Carbomer 974 ocular lubricating gel 3 mg/g (0.3%), single dose units 0.5 g, 30	Poly Gel	Severe dry eye syndrome in patients sensitive to preservatives in multi-dose eye-drops	3	5
Carbomer eye-gel 2 mg per (0.2%) , single dose units 0.6 mL, 30	Viscotears		3	5
Carmellose sodium eye-drops 5 mg/mL (0.5%), single dose units 0.4 mL, 30	Cellufresh		3	5
Carmellose sodium eye-drops 10 mg/mL (1%) , single dose unit 0.4 mL, 30	Celluvisc		3	5
Carmellose sodium eye-drops 2.5 mg/mL (0.25%), single dose units, 0.6 mL, 24	TheraTears		4	5
Carmellose sodium ocular lubricating gel 10 mg/mL (1%), single dose 0.6 mL, 28	TheraTears		3	5
Hypromellose with dextran eye-drops 3-1 mg/mL (0.3-0.1%), single 0.4 mL, 28	Bion Tears		3	5
Polyethylene glycol 400 with propylene glycol drops 4 mg-3 mg/mL (0.4-0.3%); single dose units 0.8 mL, 28	Systane		2	5
Polyethylene glycol 400 eye drops 2.5 mg per mL (0.25%), single dose units 0.4 mL, 20	Blink Intensive Tears		5	5
Soy lecithin eye spray 10 mg/mL (1%), 10 mL	Tears again		2	5
Topical ocular lubricant ointments		Unrestricted		
Paraffin compound eye ointment 3.5 g	Polyvisc		2	5
	Duratears		2	5
Paraffin pack containing 2 tubes compound eye ointment 3.5 g	Polyvisc (2 pack)		1	5
Paraffin pack containing 2 tubes compound eye ointment 3.5 g	Ircal (2 pack)		1	5
	Lacri-Lube (2 pack)		1	5

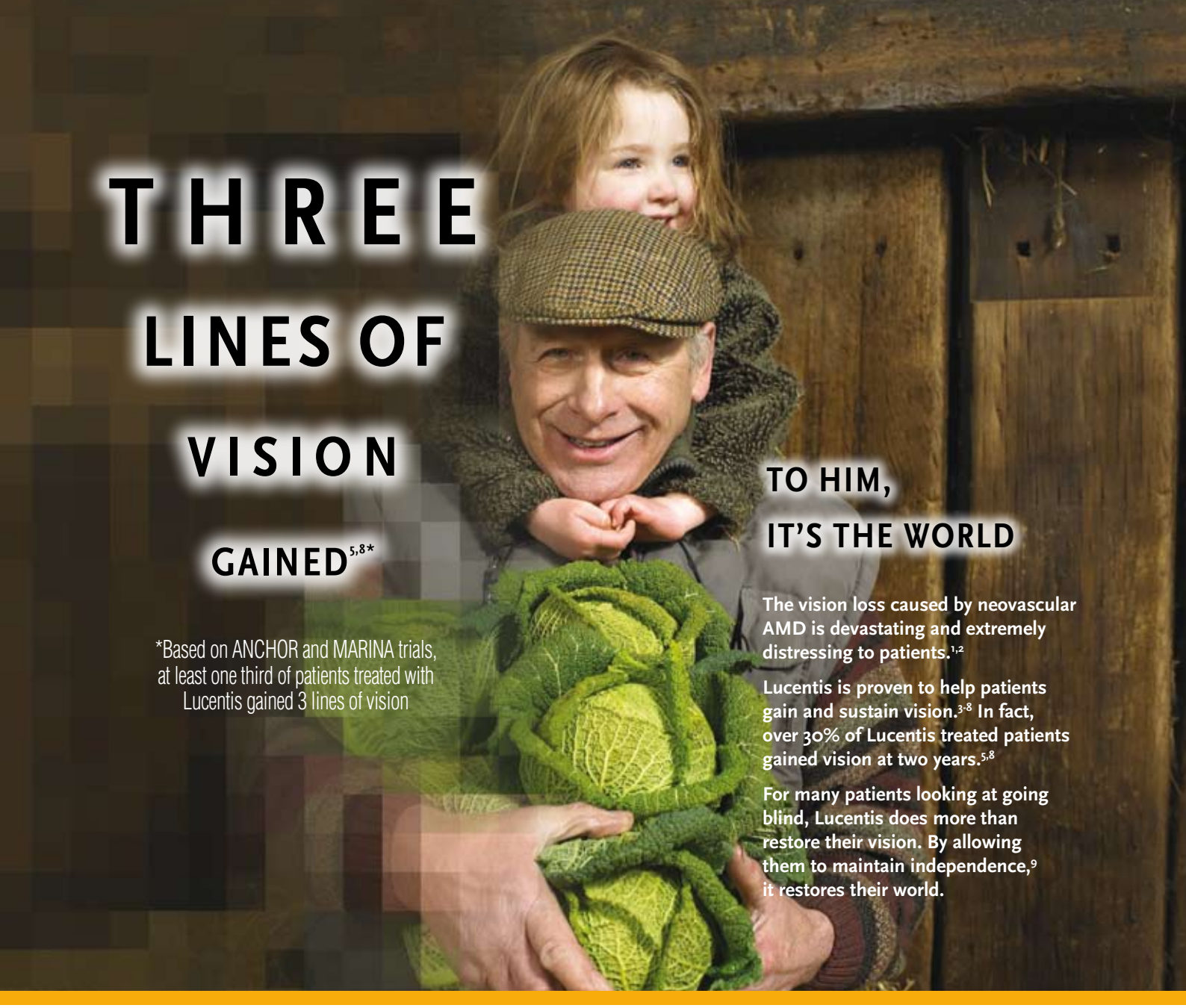
PBS-listed medicines available to medical practitioners only

Anti-infectives
Ciprofloxacin
Gentamycin
Ofloxacin
Tobramycin

Anti-inflammatories
Dexamethasone
Prednisolone

Anti-glaucoma preparations
Apraclonidine

Mydriatics and cycloplegics
Atropine
Homatropine
Pilocarpine



Please refer to the Product Information before prescribing. Product Information is available from Novartis Pharmaceuticals Australia Pty Limited or visit www.novartis.com.au. For further information please contact Medical Information & Communication on 1800 671 203.

Indication: Treatment of neovascular (wet) age-related macular degeneration (AMD). 0.5 mg or 0.3 mg is recommended to be administered by intravitreal injection once a month. **Dosage and administration:** Recommended dose is 0.5 mg (0.05 mL) or 0.3 mg (0.03 mL) given monthly. Interval between doses should not be shorter than 1 month. Treatment might be reduced to one injection every 3 months after the first three injections but, compared to continued monthly doses, dosing every 3 months may lead to an approximate 5-letter (1-line) loss of visual acuity benefit, on average, over the following 9 months. Patients should be evaluated regularly. Must be administered by a qualified ophthalmologist using aseptic techniques. Broad-spectrum topical microbicide and anaesthetic should be administered prior to injection. Patient should self-administer antimicrobial drops four times daily for 3 days before and after each injection. Not recommended in children and adolescents. **Contraindications:** Hypersensitivity to product components, active or suspected ocular or periocular infections, active intraocular inflammation. **Precautions:** Intravitreal injections have been associated with endophthalmitis, intraocular inflammation, rhegmatogenous retinal detachment, retinal tear and iatrogenic traumatic cataract. Proper aseptic injection techniques must be used. Monitor patients during the week following injection to permit early treatment if an infection occurs. Intraocular pressure and perfusion of the optic nerve head must be monitored and managed appropriately. Safety and efficacy of administration to both eyes concurrently have not been studied. There is a *potential* risk of arterial thromboembolic events following intravitreal use of VEGF inhibitors. *A numerically higher stroke rate was observed in patients treated with ranibizumab 0.5mg compared to ranibizumab 0.3mg or control, however, the differences were not statistically significant. Patients with known risk factors for stroke, including history of prior stroke or transient ischaemic attack, should be carefully evaluated by their physicians as to whether Lucentis treatment is appropriate and the benefit outweighs the potential risk.* As with all therapeutic proteins, there is a potential for immunogenicity with Lucentis. No formal interaction studies have been performed. Should not be used during pregnancy unless clearly needed; use of effective contraception recommended for women of childbearing potential; breastfeeding not recommended. Patients who experience temporary visual disturbances following treatment must not drive or use machines until these subside. **Side effects:** Very common: Conjunctival haemorrhage, eye pain, vitreous floaters, retinal haemorrhage, *intraocular pressure increased,* vitreous detachment, intraocular inflammation, eye irritation, cataract, foreign body sensation in eyes, lacrimation increased, visual disturbance, blepharitis, subretinal fibrosis, ocular hyperaemia, visual acuity blurred/decreased, dry eye, vitritis, eye pruritis, *nasopharyngitis,* headache, *arthralgia.* Common: Ocular discomfort, eyelid oedema, *eyelid pain,* conjunctival hyperaemia, posterior capsule opacification, punctate keratitis, corneal abrasion, anterior chamber flare, *injection site haemorrhage,* eye haemorrhage, retinal exudates, injection site reactions, conjunctivitis, *conjunctivitis allergic, eye discharge, photopsia,* photophobia, maculopathy, detachment of the retinal pigment epithelium retinal degeneration, retinal disorder, retinal detachment, retinal tear, *retinal pigment epithelium tear,* vitreous haemorrhage, vitreous disorder, uveitis, iritis, iridocyclitis, *cataract subcapsular, influenza, anaemia, anxiety, stroke, cough, nausea, allergic reactions (rash, urticaria, pruritis, erythema).* Uncommon: Keratopathy, *iris adhesions, corneal deposits,* dellen, corneal striae, *injection site pain, injection site irritation, abnormal sensation in eye, hyphema,* cataract nuclear, angle closure glaucoma, endophthalmitis, eyelid irritation, blindness, corneal oedema, hypopyon. Rare but serious adverse reactions related to intravitreal injections include endophthalmitis, rhegmatogenous retinal detachment, retinal tear and iatrogenic traumatic cataract.

**Please note changes to Product Information in italics.*

1. Brown MM, et al. Can J Ophthalmol. 2005;40:277-287. 2. Williams RA, et al. Arch Ophthalmol. 1998;116:514-520. 3. Novack GD. Ann Rev Pharmacol Toxicol. 29008:48:61-78. 4. Dalton M. Treatment regimens for AMD focussing on anti-VEGF. EyeWorld January 2007. Available at: http://www.nei.nih.gog/health/maculardegen/armd_facts.asp. Accessed 10 Jan 2008. 5. Rosenfeld PJ, et al. N Engl J Med. 2006;355:1419-1431. 6. Brown DM, et al. N Engl J Med. 2006;355:1432-1444. 7. LUCENTIS Approved Product Information. 8. Brown DM, et al. Ophthalmol. 2009;116:57-65. 9. Chang TS, et al. Arch Ophthalmol. 2007;125:1460-469.

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