Ophthalmic conditions requiring more than drops: oral therapeutic medications. The NZ experience

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	2003	2025
Ophthalmologists	19 P/T	50 P/T
Optometrists	1 P/T	9 P/T
Orthoptists	2 F/T	4 F/T
OPC / year	52,000	118,000
Acute consults / year	9,000	17,5000
Optom clinics	Retinal screening, paeds, CL	DRS, paeds, CLs, LV, Glaucoma, Corneal, Medical Retina, EEC, virtual Med Ret, Virtual Glaucoma

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Learning objectives:

- Present some cases of ophthalmic conditions that require oral medications to optimally treat
- Review the differential diagnoses of these conditions
- Review the current evidence for oral medication treatments
- Consider the contra-indications / considerations of use of the oral medications
- Discuss red flags when reviewing patients with these conditions
- Discuss the level of optometric management in these cases

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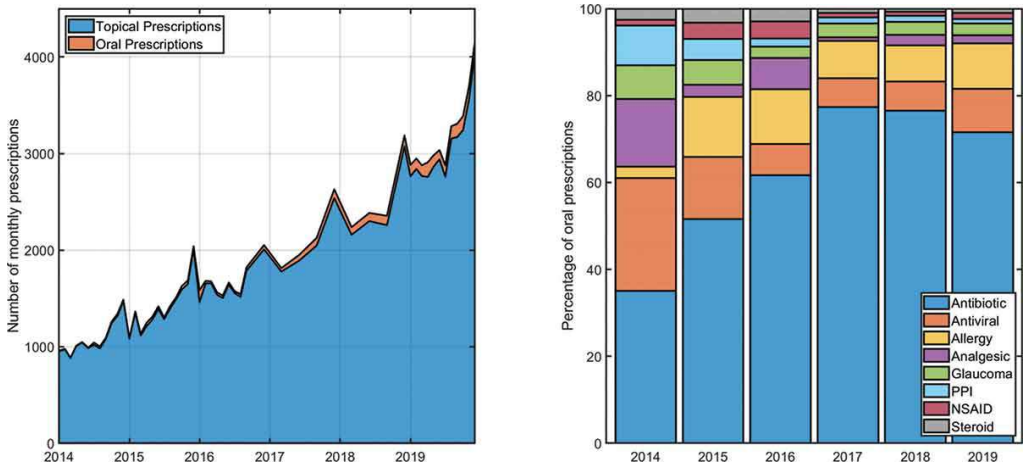
Topical vs oral medication Optometry Rx rates in NZ



Oral medication prescribing by optometrists in New Zealand. Turnbull and Craig, Clinical and Experimental Optometry, 2021, https://doi.org/10.1111/cxo.13089

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1. Oral antibiotics

- Since 2014, the vast majority of prescriptions (n = 2,568) were for antibiotics, which comprised 60 per cent of all oral medications prescribed.
- The most prevalent of these was the macrolide antibiotic, azithromycin, which alone represented 39 per cent of all prescribed oral medications.
- Other prescribed antibiotics included tetracyclines, such as doxycycline (18 per cent) and minocycline (1.0 per cent), and the penicillin-group antibiotic, amoxicillin (1.8 per cent).
- From following up with individual practitioners, it is known that a small number of these antibiotics were prescribed for the management of infectious ocular conditions such as preseptal cellulitis and hordeolum, but the majority of azithromycin and tetracycline was prescribed for the management of meibomian gland dysfunction.

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Case: Meibomian Gland Dysfunction

- 38 y o male suffered a fingernail vs left eye corneal abrasion approximately one month earlier which had responded to topical treatment from his GP (chloramphenicol ointment on a QID basis).
- He reported some intermittent subsequent episodes of stabbing pain in this eye since, particularly upon awakening, but which weren't uncomfortable enough to necessitate seeking further medical attention.
- He then awoke with severe pain in the morning approximately one month after the initial trauma, also experiencing photophobia, epiphora, and a foreign body sensation of the left eye.

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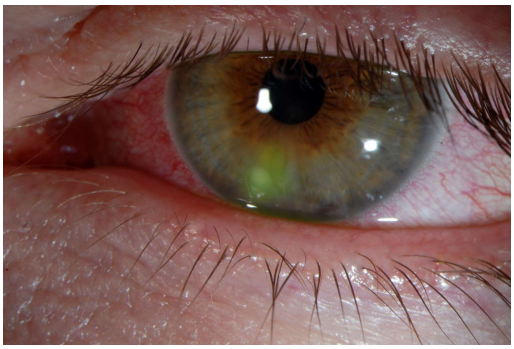

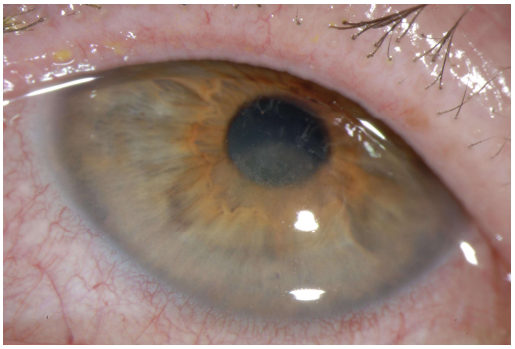

The presence of fragile epithelium indicates a higher risk of recurrence and that more intensive treatment is required to reduce this risk.
In cases of RCES, the contralateral eye should be carefully assessed for the presence of a basement membrane dystrophy, such as MDF dystrophy.

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Which oral antibiotic to use?

- doxycycline 100 mg PO *mane* x 6/52 (Per Os)
- azithromycin 250 mg tablets. PO. 2 tablets stat then 1 tablet *mane* x 3/7
- Both have been established as useful and effective treatments in the management of MGD (Foulks et al. 2013).
- One group recently compared pulsed oral Azithromycin (prescribed at 1g per week for 3 weeks) to oral doxycycline (prescribed at 100 mg BID for 6 weeks) for effectiveness and safety (Upaphong, Tangmonkongvoragul, and Phinyo 2023).
- The effectiveness of both drugs in the treatment of the MGD was equivalent within their pre-determined level
- However, there was a significant difference in the rates of gastro-intestinal adverse events, being 4.4% in the azithromycin group compared to 15.9% in the doxycycline group ($P = 0.03$).
- Similar rates of gastro-intestinal adverse events (6% vs 24%, $P < 0.005$) were found in another study which utilised different dosing regimens (4g total in 30 days of doxycycline and 1.25 g total of azithromycin in 5 days) (De Benedetti and Vaiano 2019).
- Given the significant difference in adverse event rates of the two drugs, azithromycin should be preferred over doxycycline in the treatment of MGD. The shorter treatment duration and (often) less frequent dosing of azithromycin would also be expected to provide better compliance rates.

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Mechanism of action in MGD

- Doxycycline is a tetracycline antibiotic
- Azithromycin a macrolide antibiotic
- Both drugs work in MGD to lower the levels of pro-inflammatory exotoxin induced cytokines and metalloproteins (including IL-8, IL-1, MMP-1 and MMP-9) that are present in the meibomian gland and tear film in MGD.

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Contra-indications to doxycycline

- Contra-indications to doxycycline include known hypersensitivity to any of the tetracycline class of antibiotics.
- As tetracyclines are deposited in growing bone and teeth (which can result in discolouration of teeth and rarely, dental hypoplasia), their use should be avoided in pregnant women and children under 12 years of age.
- Due to the 4-to-6-week course that is required to re-modulate the meibomian gland secretions, gastro-intestinal upset (nausea or diarrhoea) may be experienced due to alteration of the normal gut microbiome.
- Women may also develop thrush due to alteration of the vaginal microbiome by the antibiotic and rates of this side-effect are likely under-reported.
- Rare cases of benign intracranial hypertension have also been reported after taking tetracyclines.
- The tetracyclines can bind to metal complexes, so avoid taking with milk and ant-acids.
- Take in the morning with a big glass of water, never last thing at night.
- May cause photo-sensitisation, avoid strong sunlight.
- There is no current high-level evidence that the higher dosage of 200 mg *mane* or 100 mg BD is more effective than lower doses but do come with a risk of higher rates of side-effects (Yousuf et al. 2023).

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Contra-indications to azithromycin

- Contra-indications to azithromycin include known hypersensitivity to any of the macrolide class of antibiotics.
- It should be used with caution in patients with known cardiac neuro-electrical conduction conditions such as atrial fibrillation and particularly in cases of Long QT Interval Syndrome, a genetic condition affecting heart rhythm.

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Unusual side effects (doxycycline > azith)

- Black hairy tongue
- Disrupts the oral microbiome, allowing pigmented bacteria to flourish.
- Reversible with good oral hygiene, including tongue brushing.
- Advise to stay hydrated and avoid tobacco.
- Use probiotics to restore microbiome balance
- Same reason for teeth issues in kids / pregnancy
- Thymus may also become stained
- Especially with minocycline for acne

Photo credit: Alessandro Grandini

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Renal clearance rates

- Both oral medications should have the benefit to risk ratio assessed in patients with reduced renal clearance rates, such as in elderly or diabetic patients.
- Patients with renal clearance rates (eGFR of less than 50) should be discussed with a renal specialist as dosage titration may be indicated.
- (eGFR normally > 90, creatinine normally < 90)

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Augmentin for pre-septal cellulitis

- Augmentin 625 mg PO 1 tablet TDS x 7/7.
- (500 mg amoxicillin trihydrate and potassium clavulanate 125 mg)
- Amoxicillin is a beta-lactam class of penicillin antibiotic.
- The beta-lactam ring targets and inhibit cell wall synthesis by binding the enzymes involved in the synthesis of the cell wall.
- Clavulanate potassium is a beta-lactamase inhibitor that helps prevent bacteria from becoming resistant to the amoxicillin.
- Contra-indicated in patients with a history of hypersensitivity to beta-lactams, e.g. penicillins and cephalosporins
- Very good against anaerobic bacteria eg dacryocystitis Propionibacterium acne and Peptostreptococcus spp.

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Why not just keep sending them to the hospital?

- Optometrists may be much more accessible for patients than hospital eye departments.
- May be in a better position to diagnose and manage ophthalmic conditions such as MGD-related cases of secondary evaporative dry eye and marginal keratitis.
- In this case, the patient was reviewed on 7 occasions in the Emergency Eye Clinic, requiring 7 days of leave from work, in addition to expenses related to each visit, such as transport and parking costs.
- Often patients require a support person who may also be required to take leave from their job.
- A locally based optometrist that can review these patients in a convenient time slot as needed may be a preferable alternative for such patients.
- Improves your skill set, challenges you and makes your job more interesting.
- Improves your relationship with other health care providers and demonstrates your scope of practice to them, creating referrals.

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Red flags and clinical pearls

- Ask patient if allergies (NKDA)
- Ask if any kidney problems (doxycycline and azithromycin)
- Ask if any heart problems (azithromycin)
- Warn of GI upsets or thrush with doxycycline
- Advise to avoid taking with milk and ant-acids (doxycycline).
- Advise to take in the morning with a big glass of water, never last thing at night (doxycycline)
- (Just use azithromycin)

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2. Oral antihistamines

- The second most commonly prescribed class (n = 352)
- Slightly surprising to me given how disappointingly ineffective oral antihistamines are for ocular allergies (IMHO).
- However, are really good for (allergic) lid dermatitis.
- 8.2 per cent of all the oral medications.
- cetirizine (6.7 per cent), loratadine (0.7 per cent), and chlorpheniramine (0.8 per cent).
- Both cetirizine and loratadine (2nd generation antihistamines) have a lower affinity for central nervous system H receptors (relative to 1st generation chlorpheniramine), thereby reducing the risk of the common side-effect of drowsiness.
- These antihistamines are available for purchase over the counter but may be cheaper if prescribed.

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Oral antihistamines cont.

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Oral antihistamines cont.

- Antigen avoidance.
- Usual dosing:
- cetirizine 10mg PO *mane* or BD
- loratadine 10mg PO *mane* or BD
- chlorpheniramine:
- adults and children aged 12 years and older – 1 tablet every 4 to 6 hours. Do not take more than 6 tablets in 24 hours
- children aged under 12 years – doses are lower for children and babies, and they may take it less often than an adult. Do not give children < 6 years.
- older adults who are frail – 1 tablet every 6 to 8 hours. Do not take more than 3 tablets in 24 hours.

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Oral antihistamines summary

- Ask patient if allergies (NKDA)
- Ask if any kidney problems
- Avoid 1st generation antihistamines (chlorpheniramine) due to potential drowsiness (esp driving and machinery)
- Not a lot of potential use for ocular conditions (IMHO)
- Very good for allergic dermatitis of the lids (contact dermatitis)

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3. Anti-virals

- Acyclovir (and since 2016, valaciclovir) comprised 7.4 per cent of oral medications (n = 320).
- Most common indication for these oral drugs is herpes zoster ophthalmicus
- Also been used in the treatment of herpes simplex keratitis (esp. with stromal or endothelial involvement)
- Also as an alternative or adjunct to topical acyclovir in treating epithelial HSK, for those unable to use or comply with the required frequency of application of the topical form.

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Case: Herpes Zoster Ophthalmicus

- A 74 year-old female was seen by RJ in the Emergency Eye Clinic.
- Tingling on the left side of her face 2/7 prior but had not yet been started on oral antiviral medications as her GP was not certain of the diagnosis of herpes zoster ophthalmicus (HZO).
- GP was looking for confirmation of the diagnosis of shingles as well as ophthalmic investigation as she had an associated red LE and was concerned about the possibility of zoster keratitis or uveitis in the eye.
- Visual acuity testing showed unaided acuities of RE 6/6 LE 6/7.5
- IOPs were RE 16 mmHg LE 16 mmHg.
- She reported mild associated pain (2/10 on pain grading).

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Case: Herpes Zoster Ophthalmicus

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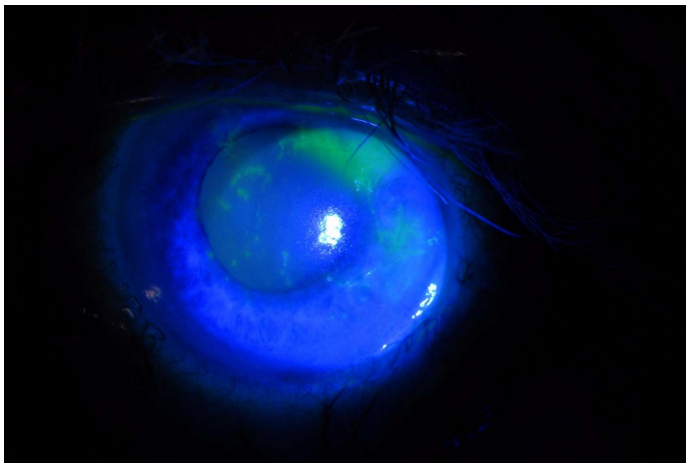
Case: Herpes Zoster Ophthalmicus



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Case: Herpes Zoster Ophthalmicus

- Reactivation of latent varicella zoster virus from earlier (usually childhood) infection.
- Occurs with increasing frequency in immune-compromised patients, as well as with increasing age from 50 years +
- Up to levels of 50% in patients 85 years of age and over (Hope-Simpson 1965).
- Hutchinson's sign is demonstrated when there is cutaneous involvement of the tip of the nose, as this area is innervated by branches of the naso-ciliary nerve

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Case: Herpes Zoster Ophthalmicus

- A DFE should be conducted at each consult to rule out zoster retinal involvement (ARN & PORN).
- Test the range of ocular movements at each consultation in cases of HZO as rates of extraocular muscle palsies have been reported as between 7% and 31%
- Herpes Zoster optic neuropathy (HZON) is a rare manifestation in HZO, with rates reported at 0.4% (Marsh and Cooper 1993).
- Testing of pupillary reactions, visual acuity, colour vision and formal visual fields (if HZON is suspected) should be conducted at each assessment of patients with HZO to rule out HZON.

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Choice of antiviral agent:

- Oral acyclovir +/- analgesia & NSAIDs (if appropriate)
- Well tolerated and is much more specific (approx. 200 x) for targeting viral genetic material than mammalian (Patel and Sawant 2007).
- However, it does have limited bioavailability and also a short half-life, therefore requires frequent (5 times per day) dosing is required to achieve optimal anti-viral effect.
- Valaciclovir is a l-valyl ester of acyclovir, which converts to acyclovir after oral administration.
- This results in a 3 to 5 fold increase in bioavailability when compared with oral acyclovir in humans (Lin et al. 2001), meaning that a TDS dosing is able to achieve the same anti-viral therapeutic effect.
- This may result in better compliance and valaciclovir should now be considered over oral acyclovir in the treatment of cases of HZO.

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Summary: Herpes Zoster Ophthalmicus

- ~~aciclovir 800 mg five times a day PO x 7 to 10 days~~
- valaciclovir:
- Adults—1000 milligrams (mg) PO three times a day for seven days.
- Children—Titrate by body weight (get GP to prescribe)
- HEDS study showed that anti-virals must be started < 72/24 of onset of symptoms to reduce the risk of post-herpetic neuralgia (aka Elderly suicide disease)

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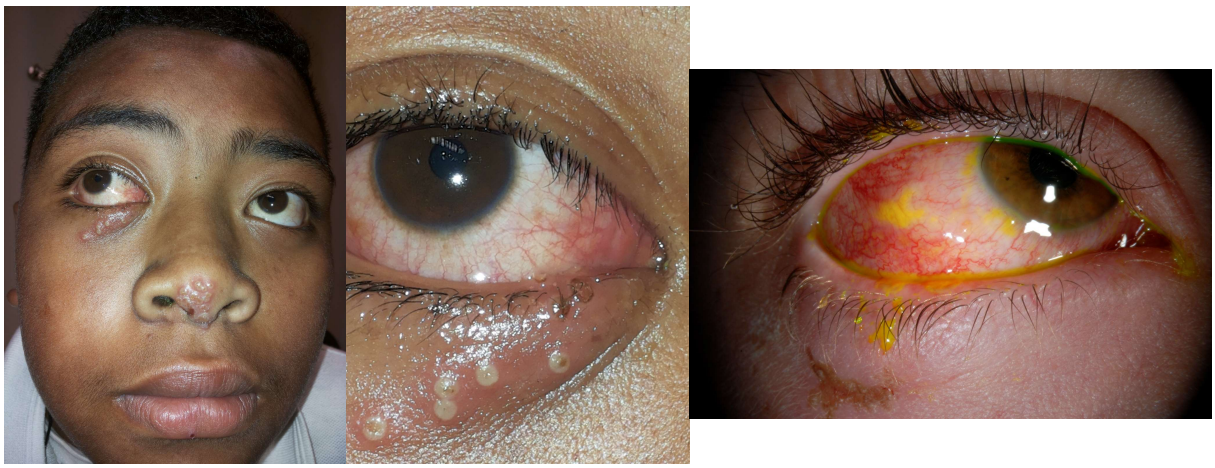
Herpes simplex blepharoconjunctivitis



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Herpes simplex blepharoconjunctivitis

- ~~aciclovir 400 mg five times a day PO x 7 to 10 days~~
- valaciclovir:
- Adults—500 milligrams (mg) PO three times a day for seven days.
- Children—Titrate by body weight (get GP to prescribe)

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4. Analgesia

- Really just paracetamol (as we'll cover combined analgesia and anti-inflammatories under NSAIDs)
- Paracetamol:
- Adults: 500 to 1000mg every four to six hours as necessary, with a maximum of 4000mg in any 24 hour period
- Children: 15 mg per kg, which can be given every four to six hours as required, with no more than four doses in 24 hours.
- Safe, can be bought OTC, but may be cheaper if prescribed
- Do not exceed maximum dosages as can be hepatotoxic
- Can also use Aspirin (325 mg to 650 mg every 4 to 6 hours) as needed to maximum dose of 3900 mg in 24 hours.
- (Just use paracetamol)

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5. NSAIDs

- Represented approximately 3-5% of all oral medications prescribed by optometrists in NZ (2014 to 2019)

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Case: Anterior scleritis

- A 70-year-old male was seen in the Emergency Eye Clinic at Greenlane Clinical Centre
- He presented with left eye redness and pain which had been painful enough to awaken him from sleep x 3 days
- Serological screening had been previously conducted in 2018 (1st presentation of diagnosed scleritis) but was negative to all investigations.
- His general medical history was positive for hypertension, gout and hypercholesterolaemia.
- His vision (aided) was RE 6/9+ (no imp PH) LE 6/15+ (no imp PH).
- IOPs were RE 12 mmHg LE 14 mmHg.

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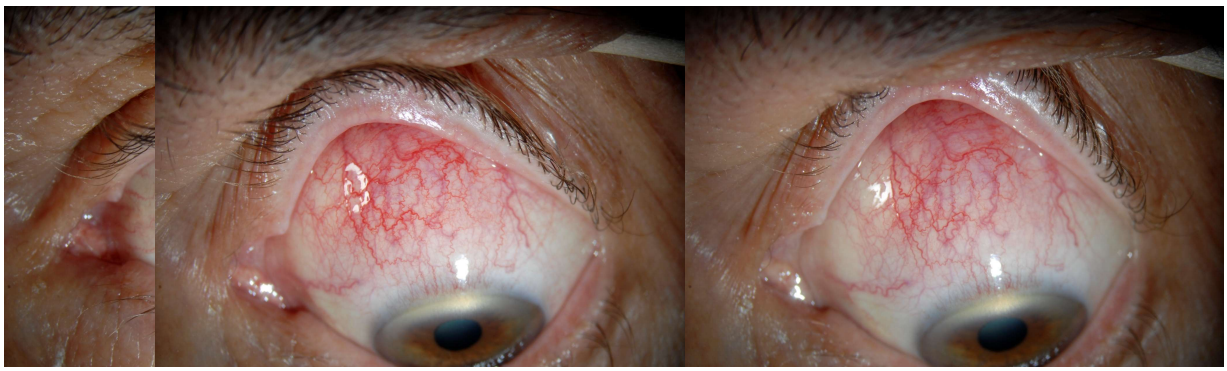
Case: anterior scleritis (sec gaze & g PHE)



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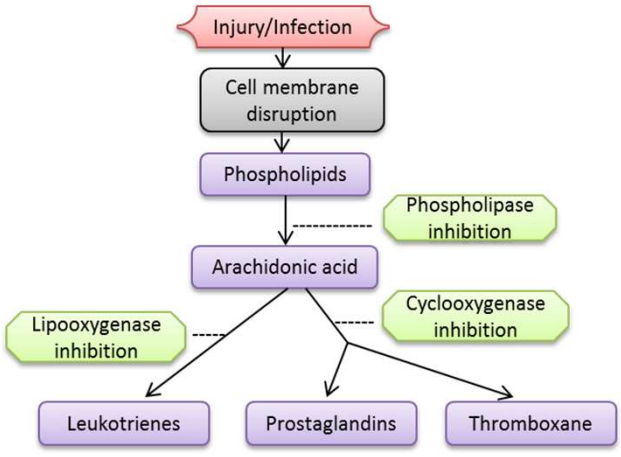
Mechanism of action (NSAIDs):



https://commons.wikimedia.org/wiki/File:Inflammatory_cascade.pngd

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Common NSAIDs and dosings

- Non-selective NSAIDs:
- diclofenac (Voltaren) 50mg q8-12h (max 150 mg / day)
- ibuprofen (Brufen) 400mg q4-6h or 600-800 mg q6-8h (max 3200 mg acute or 2400 mg chronic)
- aspirin 325 – 1000 mg q4-6h (max 4000 mg)
- (but to get significant anti-inflammatory effect risks toxicity)
- COX-2 selective:
- celecoxib 200 mg *mane* or 100 mg q12h (max 400 mg / day)
- (reduced GI upset risk, but still exists)

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Case: Anterior scleritis

- Given ibuprofen 400 mg PO TDS x 5 days
- Also omeprazole 20 mg PO *mane*
- Good response and resolution
- A note on the investigations:
- Approximately 50% of patients diagnosed with clinically determined scleritis will have no identifiable associated cause, approximately 30%–40% have an systemic autoimmune condition confirmed when immunological assessment is undertaken, most frequently granulomatosis with polyangiitis (formerly termed Wegener's granulomatosis) or rheumatoid arthritis (Sims 2012).

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Treatment of scleritis (anterior or posterior)

- Systemic medications that may be utilised to treat scleritis include:
- (initially) non-biologic agents (such as oral steroids, oral NSAIDs)
- biologic immunomodulators if the clinical response is insufficient or if cases become refractory. These include anti-tumor necrosis factor alpha and anti-CD20 agents (by sub-specialist ophthalmologists).
- Ocular and systemic morbidity is ultimately reduced by the timely (diagnosis and) treatment with sufficient sort and long term immunosuppression.

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Contra-indications to oral NSAIDs

- NSAIDs have the potential cause glucocorticoid-induced gastritis (Caplan et al. 2017), particularly in the presence of Helicobacter pylori.
- May exacerbate asthma
- May cause renal toxicity via a number of mechanisms (hemodynamically mediated acute kidney injury (AKI), electrolyte and acid-base disorders, acute interstitial nephritis (AIN), and papillary necrosis).
- Contra-indicated in patients with cardiac disease due to an increased risk of adverse cardiovascular events (both non-selective NSAIDs and cyclooxygenase (COX)-2 selective NSAIDs have been found to increase the risk of such events).
- Require titration in the presence of impaired renal function.
- (Probably shouldn’t be your first ever oral prescription)

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6. Steroids

- Rarely prescribed by optoms in NZ (max 2% of oral med scripts)
- Almost invariably within a hospital setting

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Case: Anterior scleritis

- Same patient (3 years later)!
- Seen in the Emergency Eye Clinic by the author (RJ) for a one-week scheduled review of left eye (LE) anterior scleritis.
- Initially presented with redness and pain which had been painful enough to awaken him from sleep (again).
- He has been prescribed G Pred forte 1% 6 x / day only as oral non-steroidal anti-inflammatory drugs (NSAIDs) were contra-indicated at the request of his cardiologist
- Medical history was now positive for hypertension, gout, congestive heart failure and he had undergone a recent CRT (Cardiac resynchronization therapy) implant
- No subjective improvement in symptoms noted by patient (unsurprisingly)
- Poor penetration into the sclera and high reliance on compliance from the patient often makes this treatment only minimally effective

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Case: Anterior scleritis (cont.)

- Prescribed a burst course of oral prednisone (30 mg PO x 3 days, then 20 mg PO x 3 days, then 10 mg PO x 3 days) by the RJ.
- Review was scheduled for 1 week, but he was advised to return sooner if he experienced any worsening of symptoms or had any concerns.
- He was reviewed on two further occasions, showing excellent efficacy and tolerance to the prescribed oral treatment.
- He has been subsequently discharged on an *sos* basis (return to clinic if any concerns or new symptoms but with no formal follow up booked).
- (usual dosing of 1 mg/kg of lean body weight)

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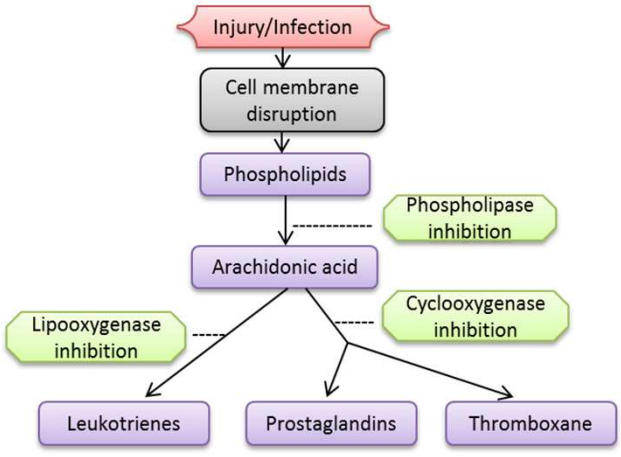
Mechanism of action (steroids):



https://commons.wikimedia.org/wiki/File:Inflammatory_cascade.pngd

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Contra-indications to oral steroids:

- Known allergies to steroids (rare as steroids are utilised for their anti-inflammatory role in the treatment of allergies).
- If a patient's history includes previous gastric ulcers or a history of psychosis, then oral steroids should be used with caution and the benefit to risk ratio reassessed.
- May increase intra-ocular pressure both during and after treatment.
- They may also raise blood sugar levels in diabetics which may require titration of hypoglycaemic agents.
- May raise triglyceride profile.
- There are no adequate studies on the risk to infants when using prednisone during breastfeeding and the benefits must be assessed against the potential risks.

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Contra-indications to oral steroids (cont.):

- 596 drugs currently known to have their potency affected by oral steroids.
- The oral prednisone should be titrated down from the usual dosing of 1 mg/kg of lean body weight, and to have a short dosing period (Delaleu et al. 2019) in the presence of impaired renal function.
- There are no adequate studies on the risk to infants when using prednisone during breastfeeding and the benefits must be assessed against the potential risks.
- A warning of the potential risk of acute psychosis in patients that are prescribed high dose oral steroids should be given to both patients and support persons. They should be advised not to make any significant changes in their life while on the course of oral steroids.
- (Probably shouldn't be your first oral prescription).

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7. PPIs

- Omeprazole, a proton pump inhibitor (PPI), was prescribed 63 times, comprising 1.5 per cent of the total prescribed medications.
- Seemingly unusual prescription for an optometrist?
- PPIs inhibit the production of acid in the stomach and in two-thirds of cases these were prescribed alongside anti-inflammatories, such as oral prednisolone (n = 45), to offset gastro-oesophageal side-effects, such as peptic ulcers that might arise from oral steroid and non-steroidal anti-inflammatory medication use.
- The source of prescriptions for this medication tended to be limited to optometrists working in collaborative relationships with ophthalmologists in a public hospital or private ophthalmology clinic setting, prescribed for patients on existing oral anti-inflammatory therapy.

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PPIs

- Omeprazole PO 20 mg *mane*
- Use as gastric cover even for short or pulsed oral steroid and NSAID prescribing.

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8. Diamox

- Acetazolamide, a reversible carbonic anhydrase inhibitor used mainly in glaucoma treatment, comprised 2.7 per cent of oral prescriptions (n = 115).

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Case: AACG

- A 71 year old Pacific Island female was seen in the EEC at 3 PM.
- 2/7 history of a painful and red right eye with reduced vision. The eye was aching for approximately four days prior to becoming red.
- The left eye was asymptomatic.
- Bilaterally phakic.
- Ocular history was positive only for prior bilateral pterygium excision 8 years earlier.
- She had type2 diabetes mellitus, diagnosed nearly 20 years earlier with an HbA1c of 63. She also had controlled hypertension and hypercholesterolaemia.
- +2.00 dioptres hypermetropic in each eye which gave visions of R 6/18 (no improvement with pinhole) and L 6/9.
- IOPs with the i-care tonometer were R 68 mmHg LE 17 mmHg. Applanation tonometry measured RE 64 mmHg LE 16 mmHg.

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Case: AACG cont.

- On examination, she showed 3+ diffuse conjunctival injection RE and had a white conjunctiva in the LE.
- The right eye showed diffuse corneal oedema with microbullae , whilst the LE cornea was clear.
- Van Herrick assessment showed narrow anterior chambers of both eyes.
- 1 drop of Alcaine (proxymetacaine 0.5%) were instilled in each eye and then 2 drops of glycerol BP 100% were instilled in the RE to better visualize the R anterior chamber during gonioscopy and the posterior of the eye.
- Gonioscopy showed a completely closed angle in the RE with no peripheral anterior synechiae (PAS). The left anterior chamber was closed superiorly and temporally, slit-only nasally and open to the posterior trabecular meshwork inferiorly.
- Both crystalline lenses showed nuclear sclerosis +++.
- Undilated views of the optic nerve heads showed 0.3 cupping with no disc swelling.

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Case: AACG cont.

- A diagnosis of RE acute primary angle closure was made.
- NKDA
- Her glomerular filtration rate (eGFR) was 86 and her creatinine level was 63.
- As her kidney function was excellent, she was given a stat dose of 500 mg Diamox (acetazolamide) orally at 3.45 PM.
- Also topical Iopidine (apraclonidine 0.5%), Pred forte (prednisolone acetate 1%), timolol 0.25% and Trusopt (dorzolamide 2%) to the RE.
- 90 minutes later, her pressure had reduced to RE 30 mmHg.
- Pilocarpine 2% was instilled in each eye and she underwent bilateral YAG laser peripheral iridotomies (LPIs) at 5.30PM.
- At 6.30 PM, her RE pressure was 17 mmHg. She was therefore discharged to home on pred forte 6x per day, Combigan BDS and Azopt BDS, all to the RE as well as to continue the oral Diamox 250 mg BDS PO with review set to the next morning to recheck the IOP and tolerance of the oral Diamox.

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Case: AACG cont.

- The next day her vision had further improved to RE 6/15 (pinhole 6/12) and LE 6/9+. IOPs were RE 15 mmHg LE 10 mmHg. As her angles were still narrow despite the LPIs, she continued her topical medications until she underwent successful RE cataract extraction 3 weeks later in her RE and 2 months later in her LE.
- At the final follow up, her vision was 6/7.5 unaided in each eye.
- Gonioscopy showed deep and quiescent anterior chambers with no PAS.
- 0.3 cupping in each eye with normal retinal nerve fibre layer thicknesses in each eye on the OCT scans.
- She was therefore discharged back to her optometrist for annual diabetic retinopathy checks.

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Diamox (acetazolamide)

- Diamox (acetazolamide)is a carbonic anhydrase inhibitor (CAI) which acts as a diuretic, eliminating fluid from the body. This property makes it useful for a number of conditions, including the treatment of acute angle closure glaucoma, idiopathic intracranial hypertension, altitude sickness and heart failure.
- Dosing:
- larger patients 500 mg PO stat
- Smaller patients 250 mg PO stat
- Patients in AACG may need intravenous if nauseated (unreliable dosing if vomit)

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Contra-indications to acetazolamide

- Contraindications to the use of CAIs include:
- known hypersensitivity to acetazolamide or other sulphonamides or those with sulphur allergies.
- Bodily states with adjusted blood chemistry also contraindicate the use of CAIs, such as hyperchloremic (excess blood plasma chloride level) acidosis, hypokalemia (low blood potassium) and hyponatremia (low blood sodium).
- Patients with reduced renal function (such as patients with end-stage diabetic renal failure) must have any potential benefits from the use of the drug balanced against the risk of further worsening renal function and altered blood chemistry considered.
- Often best done by speaking directly with the patient's renal physician who will usually recommend a titrated dose of 125 mg QDS.

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9. Odds and ends

- Intravitreals (Avastin, Lucentis, Eylea, triamcinolone)
- Sodium fluorescein 250 mg IV stat for FFA
- Indocyanine Green 25 mg IV stat for ICGA
- Anti-Protozoals (co-trimoxazole)
- Metformin?
- Lorazepam?
- Blood tests
- Pregnancy tests

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Summary / final clinical pearls:

- Like mycophagology, get to know a few really well that you are comfortable with and stick to these.
- Scope is determined by (Registration Board), experience, inter-professional relationships and geographic isolation.
- Despite the range of medications prescribed, the ODOB in NZ has not been alerted to any out-of-scope prescribing of oral medications.
- Further, there have not been any adverse incidents specifically relating to the issuing of therapeutic prescriptions by optometrists in New Zealand reported to the Accident Compensation Corporation or Health and Disability Commission.
- This suggests that despite their ability to manage a broader range of ocular conditions, the optometry profession, as a whole, is practising appropriately and appears still to be referring and/or co-managing (rather than independently managing cases) requiring more complex therapeutic management.

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Summary / final clinical pearls (cont.)

- Avoid prescribing oral medications for kids if less experience
- Ask if any possibility of pregnancy and reassess benefit : risk ratio
- Co-manage more advanced cases with GP &/or a collegial ophthalmologist.
- Avoid abbreviations (even accepted ones) in prescribing ***
- Communication is key. You are prescribing a medical treatment and you must let everyone know that needs to know!
- Thank you and good luck with your (new and exciting) career!

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