

Eye drugs – prescribing and administering

General principles

There are several methods of achieving therapeutic drug concentrations within the eye and its surrounding structures. By far the most common is topical administration but, when higher concentrations of the drug are required, local injection or systemic administration is considered.

Prescription and/or administration of the latter is most commonly initiated in the Eye Clinic, with the exception of a few conditions – eg, suspected cases of giant cell arteritis.

Topical administration^[1]

Eye drops

- Principally absorbed through the cornea but absorption through conjunctival mucosa also occurs, giving rise to systemic effects.
- High intraocular concentrations are achieved if applied regularly.
- Drops may be in solution form (clear – eg, anaesthetic drops) or in suspension (cloudy – eg, steroids).
- There is a short drug-eye contact time so they tend to need a more frequent application.

Eye ointments

- Ointments allow a prolonged contact time; therefore, less frequent applications are required (good for night use).
- They help lubrication so that concurrent lubricant use is not always necessary (unless there was previous intensive usage or there is a large abrasion).

Instructions for patients using eye drops or ointments^[2]

Eye drops

- Wash hands before and after using drops.
- For contact lens users – see below.
- Shake the bottle.
- Instil in the lower conjunctival fornix and ideally keep the eye closed for 1-2 minutes after application.
- Only one drop is needed per dose.
- Minimise systemic absorption and adverse effects by closing eyes after administering eye drops, gently but firmly pressing the tear duct against the nose for at least one minute, and then removing excess solution with absorbent tissue.

Eye ointment

- Do not use with contact lenses (see below).
- Apply a small amount of ointment along the INSIDE of the lower eyelid and blink to help spread over the cornea. Wipe excess clean before subsequent application.
- It may cause blurring initially; this will resolve as the ointment melts away.

Children

- The instructions are similar but you may need to ask someone to hold the child (babies and toddlers can be wrapped in a blanket). You will need to pull down the lower lid gently while squeezing a drop into it. Then let go of the eyelid and allow the child to blink. Wipe excess liquid with a clean tissue.

- If this is difficult, an alternative method is:
 - Tilt your child's head back or lay them flat on their back with eyes closed.
 - Place the drop on to the side of the closed eye nearest the nose.
 - Either let your child's eye open or gently rub the eyelids so the drop will bathe the eye.

A leaflet and video about giving eye drops and eye ointment to children are available.^[3] ^[4]

Also note:

- If you find it hard to know whether a drop has gone into the eye, keep your drops in the refrigerator. **You will be more aware of the drop when it is cold than if it is at room temperature.**
- Note the expiry date and storage instructions.

Eye lotions

These are solutions used for irrigation of the conjunctival sac (to flush out particles and chemical irritants). Sterile normal saline is the norm but clean water will do in an emergency.

Irrigating^[5]

You will need a number of saline bags, a giving set and towels.

- Sit the patient by a sink. Instil anaesthetic drops and gently tilt the patient's head back so that they are holding it over the rim of the sink, explaining what you are going to do.
- Use a 500 mL bag of saline and empty it into the conjunctival sac through a standard giving set or by using a purpose-built irrigator if you have one.
- Ensure that both upper and lower fornices are irrigated.

- If treating a chemical injury, check the pH regularly (eg, between bag change-overs). You will need several bags; the volume required to reach a neutral pH varies but may be up to 10 L in severe cases.

See the separate [Eye Trauma](#) article for more information about chemical injuries and irrigating the eye.

Systemic absorption of topical drugs

- This occurs more readily with drops than with ointment; absorption occurs via conjunctival vessels.
- It can be limited to some degree by compressing the medial punctum and nasolacrimal sac on drop application ('press your finger firmly over your lids, next to the nose').
- The fellow eye may be affected by systemic absorption of the drug applied to the treated eye.^[1]
- A common culprit is beta-blockers - check risk factors.
- Usual rules regarding pregnant and breastfeeding patients apply.

Multiple drug treatment

- If the patient needs more than one drop, allow five minutes between each drop.
- If there is a mixture of drops and ointments: instil drops first and then ointment after 4-5 minutes.
- Topical and systemic treatment: check for duplication (eg, beta-blockers) and drug interactions (eg, carbonic anhydrase inhibitors and loop diuretics).

Avoiding microbial contamination

- Use single application packs in the surgery clinic/emergency department (eg, fluorescein drops).
- Wash hands before and after application; this is particularly important if you suspect, or are treating, infective eye disease.
- Discard bottles 28 days after opening.

'Drop allergy' - preservative toxicity^[2]

A wide variety of preservatives is used in ophthalmic topical medication to keep it sterile. These preservatives may be toxic to the precorneal tear film and about 10% of patients also experience a hypersensitivity reaction to the preservatives, notably to the most commonly used one: benzalkonium chloride.

They may experience redness, itching, burning, blurring of vision and, in more severe cases, punctate keratitis (tiny spots of fluorescein uptake on the cornea) or corneal oedema (the cornea goes hazy).

The patient often clearly relates symptoms with starting the drops. Change to single-dose drops: Minims® (they come in little individual plastic vials that can only be used once). Check with the ophthalmology team if there is doubt over a link between drops and symptoms and signs.

High phosphate concentration in eye drops may be harmful to the cornea (this was noted with phosphate used as a buffer for sodium hyaluronate artificial tears).^[6]

Topical drugs and contact lens wear

- If treatment is initiated in the community, it is essential that you should be happy that you are not treating a contact lens-induced corneal ulcer: this needs specialist treatment and monitoring.
- Avoid soft contact lens wear with drops unless preservative-free; hard lens wear is acceptable.
- Remove soft contact lenses before instilling drops and wait for at least 15 minutes before re-inserting them. With rigid (hard) corneal contact lenses, drops may be instilled while wearing the lens.^[7]
- Ointments and oily eye drops are not compatible with contact lens wear.

Common difficulties in topical administration - and helpful tips

- Drop instillation can be tricky ("I can't touch my eyes, Doctor", elderly patient with rheumatic hands): consider an ointment alternative or a drop dispenser (handed out by pharmaceutical companies for their individual product: talk to the dispensing chemist). Dispensers are re-usable.
- Ointment can be messy or awkward and can give rise to contact dermatitis: wipe excess away after application or consider drops.
- Adherence to treatment for chronic eye conditions (eg, glaucoma) may be improved by simplifying eye drop regimes, providing adequate information and giving individualised support.

Local injections and systemic treatment

Local injections: what to expect^[8]

If a patient is told that they will have an 'injection in the eye' (such as the local anaesthetic before cataract surgery or steroid treatment in severe uveitis), they will experience the following:

- An anaesthetic drop (of topical local anaesthetic) will be administered.
- A small spring will be applied to hold the lids open (painless).
- A small incision is made in the conjunctiva: they should not feel it.
- They will probably feel the agent being infiltrated in: the sub-Tenon approach is favoured (Tenon's fascia is a tough fibrous coat around the globe) - the needle does not penetrate the globe.
- The spring is removed and a pad is placed over the eye.
- Discomfort/pain varies between individuals and depends on what is being injected.
- Patients will commonly have a red eye or may have a small [subconjunctival haemorrhage](#) afterwards: this should begin to resolve over 24-48 hours.

Systemic treatment for ophthalmic problems

Physiological barriers limit systemically administered drug penetration to the eye, although this improves in inflamed states.^[1] Examples of systemic drugs used for eye conditions are antibiotics for [orbital cellulitis](#), steroids for [giant cell arteritis](#) and acetazolamide for severely [raised intraocular pressure](#).

Another important area of systemic drug prescription for ophthalmic problems is to control pain – eg, following a corneal abrasion. Topical local anaesthetics are not recommended (other than at the point of initial assessment); oral paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) are suitable choices in these patients.

Systemic treatment for systemic problems: effect on the eye

Ocular side-effects from systemic drugs, such as cataract formation from prolonged systemic steroid use, can occur. Other examples are listed below:

- Amiodarone: corneal deposits.
- Anticonvulsants: ocular motility dysfunction.
- Atropine: pupillary dilation.
- Digoxin: abnormalities of colour vision.
- Ethambutol, quinine: optic neuropathy.
- Hydroxychloroquine, chloroquine: retinal changes and corneal deposits.
- Isosorbide dinitrate: transient myopia.
- Opiates: pupillary constriction.
- Phenothiazines: retinal changes and ocular motility dysfunction.
- Sulfonamides and NSAIDs: Stevens–Johnson syndrome.
- Tamoxifen: retinal changes.

A number of drugs interfere with contact lens wear, including the oral contraceptive pill, aspirin, drugs affecting blink rate and drugs affecting lacrimation.^[7] See the separate [Contact Lenses \(Types and Care\)](#) and [Contact Lens Problems](#) articles for more information.

Over-the-counter eye preparations

There are a number of commonly-used over-the-counter preparations, examples of which include:

- Antihistamines – eg, Otrivine-Antistin®.
- Antimicrobials – eg, Brolene®, Golden Eye Ointment®, chloramphenicol antibiotic drops.
- Artificial tears – eg, Viscotears®, Lacri-Lube®.
- Astringents – eg, Eyedew Clear®, Optrex Fresh Eyes®.
- Mast cell stabilisers – eg, Opticrom® allergy eye drops.

Research

There is interest and research into methods of delivering drugs to the posterior segment of the eye; the current standard method is by intravitreal injection. Intraocular implants that allow drug release are at varying stages of development. ^[1]

References

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6. [Ozalp O, Atalay E, Alatas IO, et al](#); Assessment of Phosphate and Osmolarity Levels in Chronically Administered Eye Drops. *Turk J Ophthalmol*. 2019 Jun 27;49(3):123–129. doi: 10.4274/tjo.galenos.2018.43827.
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