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needling is haemorrhage – either sub-conjunctivally or into the anterior chamber. If your view is obscured, then you should stop and try another time.

A hyphaema requires the patient to be reassured, as their vision will be affected: you should wait until you are sure the active bleeding has stopped. Let the patient rest for 30–60 minutes then check for ongoing haemorrhage and a pressure rise, since the blood can sometime obstruct drainage completely. Once stable, manage the patient as for a hyphaema post-trabeculectomy: discharge the patient and review within one week as appropriate.

The other post-needling complication is hypotony. I personally have only had to take one patient back to theatre for this to date. If the anterior chamber has significantly shallowed, let the patient rest and see if it reforms spontaneously. If it does, then manage the patient as for a low pressure following trabeculectomy. If it does not, then introducing viscoelastic or gas to the anterior chamber is your best option, with regular review as appropriate. Case reports exist of infection and mis-placed needles, but these are fortunately rare (hopefully because appropriate care has been taken by clinicians). Prophylactic topical antibiotics are used by most practitioners. Pre- and post-operative steroids remain a mainstay of therapy to prevent recurrent scarring.

Sub-conjunctival steroid and 5-fluorouracil (5FU) are the most common antiscarring preparations. Be extremely careful that the drugs do **not** enter the anterior chamber. If they do, wash out in theatre immediately. See page 75 for tips on administration of 5FU. Mitomycin C is being used more frequently, and interferon, sodium hyaluronate, and bevacizumab are amongst the many additional agents that have been reported, with varying success.

If needling is not appropriate or has failed, what subsequent procedure is required?

This depends on all the above factors and what is possible in your unit. Cyclodiode ciliary body ablation, repeat trabeculectomy at a second site, formal revision of the existing trabeculectomy, and drainage tube implantation are the most common options.

References

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MEDICAL TREATMENT

Medical treatment of open-angle glaucoma



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Most guidelines that exist for the treatment of primary open-angle glaucoma (POAG) – such the National Institute for Health and Clinical Excellence (NICE) guidelines (page 47) – recommend medicine as initial therapy, though laser treatment may also play a role.

None of these guidelines are based on research done in Africa, however, and there also is no evidence yet on the relative effectiveness of different glaucoma medications in African populations.

For medicines to be effective at controlling POAG, they must be used every day for the remainder of the patient's life.

This means the medicine must not only be clinically effective, it must also be available, of good quality, affordable, and well tolerated by the patient.

Keep the following in mind when choosing medical treatment for your patient.

- 1 **The cost:** can the patient afford the recommended medication in the long term?
- 2 **Availability:** will the drug(s) always be in stock, and what are the consequences to the patient of any stock-outs?
- 3 **Quality:** for drugs such as latanoprost, will the cold chain be maintained? Can the patient refrigerate the medicine? Can the patient recognise and avoid fake drugs?
- 4 **Discomfort:** is there any discomfort associated with the medicine that will discourage the patient from continuing with treatment?
- 5 **Follow-up:** will the patient be able to attend regular follow-up appointments?

If you have concerns about any of the above, it may be advisable to consider surgery to control intraocular pressure (IOP).

Ongoing monitoring is essential during medical treatment. The NICE guidelines suggest that surgery should be offered if two drugs (or one fixed-combination drug preparation) are not sufficient to control pressure and/or halt disease progression.

'Medicines must be used every day for the rest of the patient's life'

Choosing the right drugs

There are five main groups of glaucoma drugs, each acting in a different way to reduce IOP:

- **prostaglandin analogues** (bimatoprost, latanoprost, and travoprost) increase uveoscleral outflow
- **beta-blockers** consist of two main groups: selective (betaxolol) and non-selective (timolol, levobunolol), both of which decrease aqueous production
- **alpha-2 adrenergic agonists** (apraclonidine, brimonidine) decrease aqueous production and increase uveoscleral outflow
- **carbonic anhydrase inhibitors** decrease aqueous formation and can be applied topically (brinzolamide, dorzolamide), or systemically (acetazolamide, methazolamide)
- **parasympathomimetics** (pilocarpine, carbachol) increases aqueous outflow

Continues overleaf ➤



A selection of glaucoma drugs available in Nigeria

Fatima Kyari

through the trabecular meshwork by means of ciliary muscle contraction, and may open the drainage angle in angle-closure glaucoma by stimulating the iris sphincter muscle.

Generally, the recommended first-line drug will be one of the prostaglandin analogues (e.g., latanaprost). These drugs have an IOP lowering effect of 28–33%, require once a day dosing, and have limited local side effects. However, they are expensive and can be difficult to obtain.

Timolol, a beta-blocker, is cheaper and quite effective (an IOP lowering effect of 20–30%), but it has systemic side effects: it worsens obstructive pulmonary diseases, slows heart rate, and lowers blood pressure. Timolol 0.5% is no more effective than 0.25% is, but is much more likely to cause side effects.

If patients require more than one type of medication, use fixed combination drug preparations rather than two separate

bottles. There is no evidence that fixed combinations have better outcomes than using individual drugs. However, using fixed combinations is more convenient, reduces the amount of preservatives that enter the eye, and may make it more likely that patients will continue with their treatment (known as adherence or compliance).

It is not advisable to use two or more combinations in an eye. As mentioned before, if a single combination does not work, NICE guidelines recommend offering surgery to the patient.

Side effects

Each drug has different side effects, so prescribers and patients are advised to read inserted leaflets carefully.

- **Pregnant women** should avoid prostaglandin analogues (which can cause uterine contractions) and carbonic anhydrase inhibitors (which have teratogenic effects).

- **People with asthma** should avoid beta-blockers and parasympathomimetics (which can cause bronchospasm).
- **People with sickle-cell anaemia** and/or **kidney and liver disease** should avoid carbonic anhydrase inhibitors.
- People with **heart block** which is greater than first degree, and anyone with **chronic obstructive pulmonary disease** and **sinus brachycardia** should avoid beta-blockers.

Useful hints

- 1 Determine a target IOP before starting treatment. IOP with initial single-drug therapy should be reduced by at least 20% from baseline. IOP reduction of less than 10% should be considered as a non-response.
- 2 The treatment goal should include stable optic nerve and nerve fibre layer status, as well as stable visual fields.
- 3 Switching drugs within the prostaglandin analogue class may, upon occasion, provide greater lowering of IOP.
- 4 Pilocarpine is useful in pigmentary glaucoma (PG) and pseudoexfoliation glaucoma (PXG), as it reduces iris movements. It may therefore reduce deposition of exfoliation material or pigment in the trabecular meshwork.
- 5 Topical carbonic anhydrase inhibitors (CAIs) and systemic CAIs are poorly additive with respect to lowering IOP.
- 6 Numerous studies have demonstrated neuroprotection in experimental models of glaucoma or optic nerve injury, but good evidence demonstrating neuroprotection in clinical studies is lacking.
- 7 There is insufficient evidence for neuroprotection by alpha-2 adrenergic agonists in humans.

Patient's adherence to treatment may be encouraged and monitored by:

- Educating and counselling the patient
- Training personnel to teach patients and their carers
- Explaining the possible side effects of each drug
- Teaching the patient to record the drugs used and instilled (page 79)
- Checking the patient's drugs at each clinic visit
- Prescribing combination drug preparations, where available, rather than many single preparations
- Giving advice to patients on how to instil eyedrops, particularly if they have any physical impairments, including visual impairment.

Further reading

Kiage DO, Damji FK. Primary Open Angle Glaucoma: Setting Target Intraocular Pressure Range and Update on Use of Glaucoma Medications in East Africa. *E Afr J Ophthalmol.* 2008 May; 14(1): 60–71.

How to avoid fake glaucoma drugs: top tips

- Buy drugs from registered pharmacies
- Look out for the national drug administration/agency licensing number in your country.
- Check the manufacturing and expiry dates of drugs and be sure that these have not been altered on the packet.
- Many companies now have holograms of their logos on the packet, look for that.
- Some drug companies provide a means for patients to check the authenticity of their medicines. For example, many drug companies in Nigeria put a unique code or number on each box or bottle. Patients can SMS this free of charge to the phone number provided and the drug company will confirm whether the drug is registered and therefore genuine. This facility should be used where available
- Do not buy drugs from hawkers. Apart from raising doubts about the drug's authenticity, hawkers will not be able to store the drugs in the correct conditions. Poor storage, heat, and sunshine will decrease the potency.
- Never accept any drug package without a

company label from the manufacturer (some people peel off the label and write the dosage on the bottle to hide the identity of the medication).

- If not sure of your medication, bring it to the hospital for it to be checked and confirmed.
- Be careful with expensive imported brands from big, well-known drug companies; they are more likely to be fake than locally produced drugs from smaller companies
- Ideally, eye care facilities should stock genuine drugs in good quantities and at reasonable prices. This will help ensure that patients have access to the medicines they need from a trusted source.



It is vital to educate patients about fake drugs and how to avoid them. Fake drugs waste money and can cost patients their sight. NIGERIA

Fatima Kyari

Instilling your own eye drops

- If you have just been prescribed eye drops, make sure someone has shown you how to instil them. Do not leave the eye clinic until you know what to do. Make sure you have had time to practice under supervision.
- Keep this handout safe for future reference.
- Instilling your own eye drops is not easy at first, but your skill will develop as you practice. You will find a technique that works well for you but there are some points that are very important (shown in **bold**).
- If, after much practice, you are still struggling, ask a family member or carer to instil the eye drops for you.
- You may think it will help to use a mirror and some people may even advise this. In fact, the use of a mirror only complicates matters and can even create a dangerous technique. **Avoid the use of a mirror!**
- Eye drops are dispensed in various containers: a bottle (plastic or glass) with a removable dropper and combined cap; a plastic bottle with dropper attached and removable cap ; or a glass bottle with plastic pipette attachment and removable cap. Whatever type is given to you, **do not touch the part from which the drop falls.**
- Before instilling eye drops, **wash your hands thoroughly**, and afterwards too.

How to instil your own eye drops

- 1 Sit or lie down with your head supported.
As your skill develops you may eventually manage to instil your eye drops while standing.
- 2 Use your dominant hand to hold the bottle/dropper/pipette
- 3 With the index finger of your other hand, hold a clean piece of tissue or cotton wool, and **gently** pull down the lower eyelid to form a 'pocket'.
- 4 Hold the bottle/dropper/pipette between your thumb and forefinger, and place the 'heel' of your hand (where



Everybody develops their own technique that works for them

Heiko Philippin

- the wrist meets the hand) on your cheek. This will help to steady shaky hands.
- 5 Make sure there is a distance of about an inch (2.5 cm) between your eye and the end of the bottle/dropper/pipette. **Be careful – the tip must not touch any part of the eye or eyelids.**
 - 6 Look up or to the side. **Do not look directly at the bottle/dropper/pipette.**
 - 7 Squeeze the bottle/dropper/pipette – allow **one drop** to fall into the lid pocket.
 - 8 Slowly let go of the lower lid. **Gently** close your eyes; try not to shut them tightly as this will squeeze the drop out of your eye.
 - 9 Dab your closed eye with the tissue or cotton wool to remove any excess.
 - 10 Put gentle pressure on the inside corner of your eye and count to 60, very slowly. This prevents the medicine from draining out of your eye before it is absorbed.

A few more top tips

General

- Store eye drops in a cold place, if possible in a refrigerator. It easier to feel a cold drop going in; this will reassure you that your technique is good.
- If you struggle to hold a small bottle/dropper/pipette, wrap something like a folded piece of tissue around it
- Wait at least 5 minutes between inserting different types of eye drops.
- Instil eye drops first, then eye ointment (if prescribed).

Glaucoma patients

- Instil your drops at regular intervals throughout the day. This is vital in controlling the intraocular pressure.
- Create a form or 'tick sheet' you can fill in when you have taken your drops (see Table 1).
- It is important to learn to instil your own drops. Medication for glaucoma is usually needed for the long term.
- Practice makes perfect!

Table 1. Sample patient record of eye drops instilled, for someone who has to instil eye drops four times a day.

Medication	Eye (left eye, right eye, both eyes?)	Breakfast/sunrise	Lunch/midday	Evening/sunset	Bedtime