GLAUCOMA 

Glaucoma causes damage to the optic nerve, resulting in visual field loss. It is usually associated with raised intraocular pressure (IOP) — ie, >21mmHg. Raised IOP usually occurs when aqueous humour does not drain from the eye correctly.

There are several types of glaucoma — the two main types that affect adults are chronic open-angle and acute closed-angle. Chronic open-angle glaucoma (COAG) is the most common, affecting an estimated 300,000 people in England. It occurs when the flow of aqueous humour out of the eye is chronically obstructed rather than acutely blocked. Some of these patients have normal tension glaucoma, where loss of vision occurs despite a normal IOP.

Patients with raised IOP but no optic disc damage or loss of vision are diagnosed with ocular hypertension (OHT). Such patients have normal tension glaucoma, where loss of vision occurs despite a normal IOP.

In 2009 the National Institute for Health and Clinical Excellence issued guidelines on testing and diagnosing COAG and OHT.

The pathogenesis of glaucoma is poorly understood and current treatment, which can be surgical or pharmacological, or involve the use of a laser, aims to lower IOP by at least 20% (or to a level below 18mmHg). However, this is not guaranteed to halt progression of the disease.

Medicines used to treat COAG reduce the production of aqueous humour, facilitate its outflow, or do both. Treatment of acute closed-angle glaucoma is different and beyond the scope of this article.

Prostaglandin analogues

Latanoprost, tafluprost and travoprost are the three prostaglandin analogues (PGAs) licensed in the UK to treat COAG and OHT. Also licensed for this purpose is bimatoprost, a prostamide analogue. All are given as drops into the affected eyes.

PGAs’ mechanism of action is unclear but they are known to increase uveoscleral outflow, thereby reducing IOP by 25–30%. Once-daily dosing is effective and reduces IOP during the night and the daytime. Surprisingly, twice-daily dosing produces less satisfactory control of IOP. PGAs are well tolerated by patients, have few contraindications and have not been linked with the development of tolerance.

SIDE EFFECTS

PGAs cause a darkening of the iris in 5–20% of patients. This usually occurs after several months of treatment but can develop as early as four weeks after treatment begins. Those with mixed-colour irises are most likely to be affected.

All PGAs can cause conjunctival hyperaemia (red eye due to excess blood in the conjunctiva) which can worry patients and lead to non-compliance with treatment. PGAs can also cause hypertrichosis of the eyelashes (abnormally prolific growth), although in other circumstances this can be exploited: bimatoprost has been launched in the US for treating eyelash hypotrichosis.

PGAs are contraindicated for patients with uveitis and those with risk factors for the development of cystoid macular oedema. They should be used with caution for patients infected with herpes simplex virus.

PRODUCTS

Latanoprost was the first PGA to be licensed in the UK for ocular use and is available in once-daily and twice-daily preparations. Betaxolol is less effective than timolol in lowering IOP but exhibits relative specificity for beta1 receptors so causes fewer pulmonary side effects. Nonetheless, the use of topical beta-blockers, irrespective of their cardioselectivity, is not recommended by respiratory physicians for patients with pulmonary disease.

Carteolol is reported to cause less irritation than timolol but can produce corneal anaesthesia (which can inhibit the blink reflex). Levobunolol is as effective as timolol with the advantage of licensed once-daily dosing. Betaxolol, levobunolol, metipranolol and timolol are available as preservative-free formulations. Metipranolol is rarely used and its higher strengths have been
discontinued because of an association with anterior uveitis.

Timolol/PGA combinations are available for patients who do not achieve the desired IOP using monotherapy. These include Xalacom (timolol with latanoprost), Ganfort (with bimatoprost) and Duo-Trav (with travoprost). Since benzalkonium chloride can cause toxic conjunctivitis, combination products offer reduced exposure to this preservative (one drop per day, compared with three drops if the products are administered separately).

**Side effects** Although administered topically, enough beta-blocker can enter the general circulation to cause side effects such as wheezing, dyspnoea, bronchospasm, bradycardia and hypotension. However, systemic absorption can be reduced by the patient blocking the lacrimal punctum with the finger for one minute (in practice he or she could be advised to count slowly to 12).

**Alpha agonists** Brimonidine is a highly selective alpha2-adrenoceptor agonist. It reduces aqueous humour production and increases its outflow via the uveoscleral pathway. It is less effective at lowering IOP than timolol. It is licensed as effective at lowering IOP than latanoprost via the uveoscleral pathway. It is less effective than systemic CAIs (eg, acetazolamide) but causes fewer side effects. Dorzolamide causes more ocular irritation than brinzolamide, probably because its formulation has a lower pH. Each can cause a bitter taste in the mouth. Combination products Cosopt (dorzolamide/timolol) and Azarga (brinzolamide/timolol) are available.

Acetazolamide is mainly used for short-term treatment (eg, perioperatively to prevent IOP spikes) or to treat closed-angle glaucoma.

**Treatment strategies** Although there is no standard approach, and decisions are based on patients’ needs, treating COAG and OHT follows a general strategy. To promote compliance, patients should be prescribed the simplest possible regimen and healthcare professionals should ensure they are provided with a good understanding of the importance of treatment and instructions for how to administer eye drops correctly.

NICE suggests that for early or moderate COAG, the treatment of choice is a PGA. If the target IOP is not achieved, treatment should be changed to achieve this. (NICE says that more than one medicine might be required but does not provide specific advice on which medicine to choose.)

In practice, if the target IOP is not achieved another PGA (usually bimatoprost unless this has been used first) or a PGA/beta-blocker combination is prescribed. If the target IOP is still not met, a PGA and a beta-blocker/CAI combination would be used. Next, brimonidine can be added or can replace the CAI, although surgical intervention would be encouraged at this stage (or earlier in the case of advanced COAG).

For patients with OHT, NICE recommends either a beta-blocker or a PGA depending on measurements of IOP and central corneal thickness. Pharmacists should ensure patients understand why their treatment is prescribed, provide information on the medicine supplied and check that patients can administer eye drops correctly. Pharmacists can also offer advice on compliance aids, for example, devices which can be placed over the eye to direct the dose and those to assist with opening dropper bottles.

**References**


