

Eye Care 99

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Diagnosis of Glaucoma



To Chi-ho
The Hong Kong Polytechnic
University
Hong Kong, China

The definition of glaucoma is a group of eye diseases that have certain common features; essentially when the intraocular pressure (IOP) is too high, damage to the optic nerve and visual field loss occurs.

Patients with open angle glaucoma will often only notice a visual problem at a late stage of the disease. Peripheral vision is normally affected first, although

the defects may extend to central vision over time.

Classification of glaucoma is as follows:

- Congenital — found at an early age, with clinical signs of buphthalmos, high IOP, tearing, and blepharospasm.
- Closed angle — the anterior angle of the eye is closed and the IOP increases, leading to optic nerve and retinal damage. Signs and symptoms include eye pain, tearing, corneal oedema, halos, raised IOP, fixed and semidilated pupil, cup/disc ratio anomaly, visual field defect, and anterior angle anomaly.
- Open angle — the anterior angle is open and typical glaucomatous changes occur (high IOP, high cup/disc ratio, visual field defects). Open angle glaucoma has no symptoms to alert patients, and there are no preventive measures. It is often detected only at a late stage of disease. It is the leading

cause of blindness in the world.

Although the exact reason why glaucoma occurs is uncertain, it is thought to be due to a combination of high IOP and a defect in the retinal blood supply, particularly to the optic nerve head. A raised IOP will damage the retinal nerve fibres.

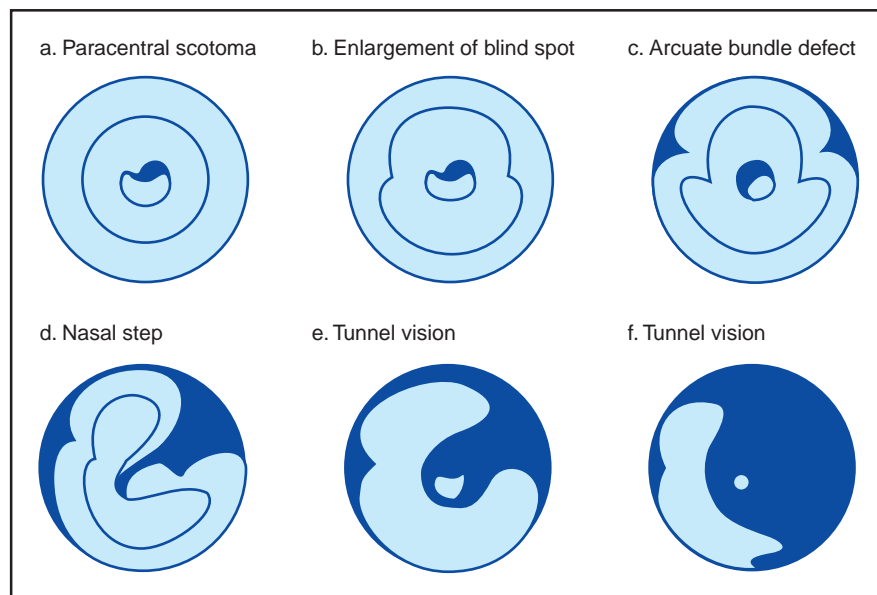
Diagnostic techniques for open angle glaucoma include ophthalmoscopy, IOP measurement, anterior angle assessment, and visual field analysis. Due to diurnal variations in IOP, repeated measurements at different times are necessary. Although visual field analysis (figure 1) is considered to be the most definitive functional test for glaucoma, it is only able to show glaucoma at the stage of 40 to 60% ganglion cell death.⁵ More advanced techniques include nerve fibre layer analysis and ocular blood flow.

In conclusion, history of severe recurrent eye pain, eye watering, and seeing halos may indicate glaucoma, in conjunction with other risk factors such as age, positive family history, other medications, and race. Further examination is recommended for these patients, and annual eye checks are advisable for everyone older than 40 years.

Glaucoma Statistics

- Glaucoma accounts for 6% of all eye diseases in Hong Kong¹
- Glaucoma accounts for 14% of untreatable blindness/low vision in China²
- In developed countries such as the USA and Europe, glaucoma is the second or third leading cause of blindness³
- An estimated 67 million people worldwide will have glaucoma in the year 2000. At least 50% will not know they have glaucoma because this disease usually has no symptoms.⁴

Figure 1. Schematic representation of visual field defects.



References

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Glaucoma Management



Vincent Lee
Hong Kong Adventist
Hospital
Hong Kong, China

The most important point to consider in the management of glaucoma is the diagnosis. For example, whether the glaucoma is open or narrow/closed angle, whether it is infantile, primary, or secondary, and the severity of the glaucoma (magnitude of IOP increase, degree of nerve damage). The pattern of treatment for open angle glaucoma starts with medical therapy, followed possibly by laser trabeculoplasty if there is no improvement, then surgery if required, and finally cyclodestructive therapy.

Open Angle Glaucoma

The main aim of glaucoma treatment is to lower IOP by suppression of aqueous production, enhanced aqueous outflow,

Case History — Steroid-induced Glaucoma

A 44-year-old man presented for a routine eye check. The patient had no complaints, although his medical history revealed that he had been prescribed eye drops for a red left eye 3 months previously. The eye drops were prescribed by his regular physician to treat 'inflammation' of the left eye.

IOP in the left eye was 42 mm Hg and 17 mm Hg in the right eye. The cup/disc ratio was 0.8/3D diopters and 0.3/1-2 diopters in the left and right eyes, respectively. Visual field analysis showed an arcuate bundle defect with a nasal step. Nerve fibre analysis confirmed the presence of glaucoma, which was diagnosed as 'steroid-induced' caused by prolonged use of steroid eye drops.

It is necessary to ensure that all patients understand the risk of steroid eye drops misuse, which may be irreversible blindness in a worst case scenario.

or reduction of vitreous volume (figure 2). While the target IOP may be different for each patient, the following 3 goals are a guide for lowering IOP:

- 20-25% reduction of IOP
- reduction of IOP to the point of no further visual field defects
- reduction of IOP to 10 mm Hg or below in the presence of a severely damaged optic nerve.

Aqueous Suppressants

Aqueous suppressants include β -blockers, carbonic anhydrase inhibitors, and α_2 -agonists.

β -Blockers may be non-selective, selective or have intrinsic α -agonist activity. These agents are generally well tolerated and effective, although they may be dangerous for patients with obstructive airways disease, bradycardia, atrio-ventricular block, or congestive heart failure. In addition β -blockers may potentiate heart failure if taken in combination with calcium channel blockers.

There are differences between various β -blockers, for example, β_1 selective agents have fewer systemic side effects, but are also less effective at lowering

IOP. Carteolol affects the body's lipid profile to a lesser extent than some of the other agents in this class. Timoptol-XE has the advantage of once-daily administration.

Oral acetazolamide is a powerful carbonic anhydrase inhibitor, which lowers IOP effectively. However, this agent has many side effects including dysesthesia, loss of appetite, fatigue, and gastrointestinal upset. Topical dorzolamide has fewer systemic side

Figure 2. Strategies to lower intraocular pressure.

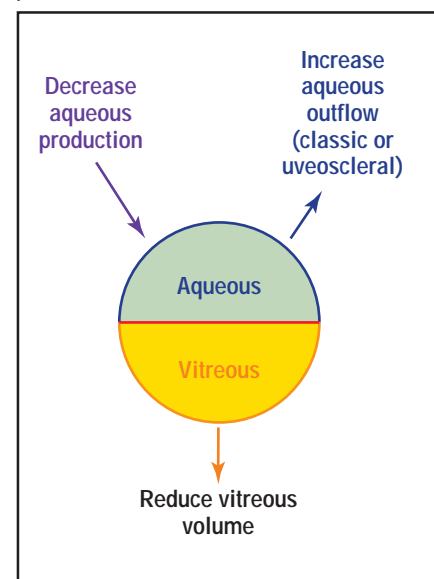


Table 1. Sequence of medical therapy for open angle glaucoma

- β -Blocker or latanoprost
- β -Blocker plus latanoprost
- β -Blocker plus latanoprost plus a carbonic anhydrase inhibitor or alphagan
- β -Blocker plus latanoprost plus carbonic anhydrase inhibitors plus alphagan
- Trial of pilocarpine

effects, although it is less effective than acetazolamide.

Brimonidine is a moderately effective α_2 -agonist, although it may sometimes cause dry mouth and drowsiness. The latter often necessitates treatment withdrawal.

Aqueous Outflow Enhancement

Agents that enhance aqueous outflow act via 1 of 2 pathways:

- canalicular outflow enhancement via the trabecular meshwork
- uveoscleral outflow enhancement.

Pilocarpine acts on canalicular outflow. This agent is effective but has many ocular side effects, including stinging, aching, myopic shift, and dimming of vision.

Agents that act on uveoscleral outflow include epinephrine compounds that have now been marginalised by newer agents, and prostaglandin analogues such as latanoprost, which are highly effective with few side effects.

Vitreous Volume Reduction

A hyperosmotic agent such as mannitol or glycerol may be used to draw water out of the vitreous. This action produces a temporary reduction of IOP until long-term treatment may be started, and is useful for conditions such as acute

angle closure glaucoma or prior to surgery for a damaged optic nerve.

The recommended sequence for medical treatment is shown in table 1. If drug therapy does not lower the IOP sufficiently, laser or surgery should be considered.

Laser and Surgical Therapy

Laser trabeculoplasty for open angle glaucoma is a temporary measure, which has not yet been conclusively shown to be beneficial for Chinese patients. If this treatment is not successful, surgery should be performed.

Trabeculectomy (filtration) is the most physiologic approach to surgery, whereby the aqueous is made to drain through the sclera into the subconjunctival space. 5-Fluorouracil or mitomycin-C may be used as adjunctive therapy. If the patient has a high tendency for scarring, a glaucoma drainage implant may be necessary.

Cyclodestructive Procedures

Cyclodestructive procedures involve destruction of the ciliary body by cryotherapy or transcleral diode cyclophotocoagulation. The endpoint is difficult to control with this type of procedure and it should be reserved for patients with a poor prognosis.

Narrow Angle Glaucoma

Narrow angle glaucoma is relatively simple to treat when patients present at an early stage. The treatment of choice is peripheral iridectomy performed by laser or surgery. When the angle is stabilised, treatment should be the same as that for chronic open angle glaucoma.

Infantile Glaucoma

The major abnormality in infantile glaucoma is an immature or undeveloped trabecular meshwork. The treatment of choice is surgery, either goniotomy or trabeculotomy.

Secondary Glaucoma

A classic example of a secondary glaucoma is neovascular glaucoma arising from either central retinal vein occlusion or proliferative diabetic retinopathy. The principles of treatment are medical therapy to lower the IOP, control of any inflammation and treatment of the underlying cause.

In the Future

Researchers are investigating new concepts for glaucoma treatment. One hypothesis is that betoptic-S and alphagan may be neuroprotective, although this has not yet been proved. NMDA-antagonists may reduce glutamate-induced excitotoxicity, and neurotrophic growth factors may have a role in the future. Vasogenic factors are also being investigated since some people have benefited from calcium channel blockers.

