Information for patients

Glaucoma and ocular hypertension

Background – intra-ocular pressure

The inside of your eye is filled with a clear fluid called aqueous humor in the front part of the eye and gel called vitreous humor in the back part. The clear fluid bathes the inside of the eye. The fluid is produced by a structure located behind the iris (the coloured part of your eye) and flows through the pupil into the front of the eye. The fluid then leaves the eye through a filter situated around the junction of the white of the eye and the cornea (clear membrane covering the front of the eye and through which you can see your iris). The pressure in the eye, which keeps the eye inflated and the eye's shape, is the result of fluid production (the tap if you like) and its escape through the filter (the plug-hole). The tap is rarely if ever malfunctions, but the plug can commonly become inefficient - "silted-up", or "closed-over" and in so doing the pressure in the eye can rise.

What is ocular hypertension – higher pressure but healthy eye

Ocular hypertension describes a condition of the eye(s) where the pressure within the eye is a bit higher than we would expect. It may merely be related to age and genes but sometimes it is a complication of other eye conditions too. Ocular hypertension causes no symptoms and does not affect or damage the eye or sight in any way

However, we know that ocular hypertension is a risk factor, in some people at least, for the development of glaucoma and as such people with ocular hypertension are usually monitored (by an eye doctor or their optometrist) for signs suggestive of glaucoma. Some people who have other risk factors may be prescribed eyedrops to lower their pressures to try to prevent the development of glaucoma. However, it needs to be stressed that not everyone with ocular hypertension will go on to develop glaucoma, even those in whom a decision to offer treatment is made.

Remember, having a slightly elevated eye pressure does not cause any symptoms and is only detected by attending your optometrist for regular eye tests - this is one of the reasons why patients are encouraged to see their optometrist on a 1-2 yearly basis.

What is glaucoma

The first thing to say about glaucoma is that it is not a single condition but a family of somewhat unrelated conditions, many of which cause no symptoms, but which tend to damage the eye in a similar manner – more about this later.

In a broad sense glaucoma is similar in many ways to ocular hypertension in that it is a condition of the eye(s) where the pressure within the eye is higher than we would expect. However, whilst and in spite of the fact that the vast majority of patients are unaware of any visual symptoms, irreversible damage to the optic nerve and its functions (vision – breadth of visual field and occasionally detail vision) is detectable. It should be stressed here that although glaucoma is a very important disease to detect and treat, for the vast majority of people it is a slow insidious process and most people will never experience an awareness of a problem with their vision.

The exact mechanisms by which the damage to the eye occurs remains uncertain but it is known that glaucoma causes the optic nerve, the nerve that takes sight information from the eye to the brain, to lose nerve fibres more quickly than is normal.

The fact that damage can be detected, that it is irreversible and progressive, and that the speed at which damage occurs can be controlled (returned towards normal) by reducing the pressure within the eye, means that many treatments have been developed (see later).

Types of glaucoma – the more usual varieties explained.

Open angle glaucomas:

These types of glaucoma are due to "silting-up" of the filter, which constitutes the drain / plug-hole for aqueous humor to escape from the eye.

Primary – this simply means that there is no obvious cause and is the most common type of glaucoma in Caucasian patients.

Pigment dispersion syndrome – a genetic condition which causes small particles of pigment to be released inside the eye which then silt-up and scar the filter

Pseudoexfoliation syndrome – a condition which causes small fibrils (fibres) of degenerative debris to be released inside the eye which can then silt-up and scar the filter

Steroid related – in some people the prolonged use of steroids, in any form, can cause the pressure in their eye to increase due to a reduction in the efficiency of the filter.

Angle closure glaucomas:

These types of glaucoma are due to closing over of the entrance to the filter (plug hole) which impedes the escape of aqueous humor from the eye.

Primary – this simply means that there is no obvious cause other than the overall shape of the inside of front of the eye (e.g. shallow anterior chamber) and is the most common type of glaucoma in some Oriental and Asian patients.

Secondary to cataract – a developing cataract, usually in an eye with an already predisposed (by its internal shape), can consume space in the eye at the expense of the aqueous humor's access to the filter.

Acute angle closure episodes – this represents an emergency. It occurs when access to the filter is suddenly and completely closed off. The result is a sudden (over a few hours) very significant and symptomatic rise in eye pressure. Patients typically present with a mix of the following symptoms; headache, eye-ache, poor vision, redness, tenderness, nausea, vomiting – symptoms which sometimes mean patients end up going to see the wrong type of doctor as a result. Patients at risk of acute angle closure have shallow front chambers in their eyes (detectable usually at routine sight tests), are usually quite elderly, often female and often longsighted. Should acute angle closure occur it needs immediate treatment (laser + intravenous medicines) otherwise profound visual loss may occur – patients should contact the emergency services immediately, day or night. Should an optometrist be concerned that the front of an eye is shallow and at risk of such an episode then a referral to an ophthalmologist will be made to decide if a preventative treatment, usually a laser iridotomy, is required.

Mixed mechanism glaucoma:
A term used to describe a form of glaucoma in which is caused by several different factors or mechanisms.

Other terms:
You may see glaucoma referred to as being Normal tension or Low tension. All this means is that despite the diagnosis of glaucoma that the pressures measured in the eyes tend to be lower than expected. The condition is glaucoma none the less and treatments are similar.

What causes / are the risk factors for glaucoma
Age – the older we become the more people develop glaucoma
Corneal thickness – we know that patients with thin corneas are at a greater risk of developing glaucoma
Intra-ocular pressure – the higher the intra-ocular pressures are, the greater the risk of developing damage and glaucoma
Family history and genes – a family history of glaucoma is important, a close family member with the disease significantly raises the risk - all patients over 40 year of age with a parent, sibling or child with glaucoma is entitled to free eye tests.
Short-sightedness (myopia) – may also be a risk factor for glaucoma
Race – black people are more likely to get glaucoma than Caucasians. Asian people are at a higher risk of developing angle closure glaucoma
Eye disease or damage - trauma or surgery and some types of eye disease, particularly those causing inflammation inside the eye, can result in elevated pressures and glaucoma.
Medical conditions – there is some weak / mixed evidence that may link diabetes, blood pressure and heart disease to glaucoma
Medications – some medications, e.g. long-term steroid use in some people can result in glaucoma.

How is glaucoma treated?
It is quite probable that if the diagnosis is uncertain or investigations are awaited, that no treatment may be required. Ocular hypertension may only require treatment if the pressure in the eye is high enough, or if other risk factors are present.
Should treatment be required there are many different options but all revolve around lowering the pressure inside the eye.
Eye-drops (the mainstay of treatments):
There are several mechanisms whereby an eyedrop can lower pressure in the eye. Some work by reducing the rate of aqueous humor production (turning the tap down), others encourage aqueous humor drainage via a variety of mechanisms (making the plug-hole work better) and some combination eye-drops do both. A simple description of some of the mechanisms of eyedrops is provided below but as with all medications you must read the product information leaflet provided.
Prostaglandin analogues – increase the flow of aqueous humor out of the eye. These are very effective drugs and are currently first line therapy. They have relatively few side effects but can make the eye red, alter the colour of the iris, causes eyelashes to grow longer and darker, and rarely they can affect vision. They by and large have no systemic side effects.
Beta-blockers – decrease production of the aqueous. These are also very effective drugs and were, prior to the development of prostaglandin analogues, first line therapy. They tend to be used to

support prostaglandin eye-drops, often as part of a combination eye-drop. Local side effects are few but beta-blockers can have systemic side effects in a few patients and are generally avoided in patients with chest diseases and some heart diseases.
Carbonic anhydrase inhibiters - decrease production of the aqueous humor. These are also useful drugs and some varieties can be given orally or intravenously if need be. Most however, are used to support the use of other eye-drops and often as part of a combination eye-drop. Local side effects are few but they may leave an unpleasant taste in the mouth and sting a little. Significant systemic side effects are rare when given as an eye-drop.
Adrenergic agents - decrease production of the aqueous. These drops are also useful and are often used to support other eye-drops. There main drawback is their continued effectiveness and the development of an allergy to the eye-drop in a significant number of people. They also appear to make some people feel tired and washed out.
Rho kinase inhibiters – these are newer agents that increase the flow of aqueous humor out of the eye and may be used in combination with other glaucoma drops. They are not currently in large scale usage and their future role in glaucoma management remains to be determined at this time (2020).

Laser
Lasers are used a lot these days in surgery and eye treatments. Whilst laser can be employed in an effort to reduce eye pressure (usually by increasing the flow of aqueous humor out of the eye) it is still not used very frequently despite growing evidence of its effectiveness.
SLT (ALT) – selective laser trabeculoplasty has now superseded argon laser trabeculoplasty (ALT) as an outpatient laser procedure suitable for some types of glaucoma. Its major benefits comes from the fact that it appears effective and that the treatment can be repeated. It does not work for all and does not necessarily mean that eye-drops will not be needed afterwards.
Laser iridotomy – this type of laser treatment tends to be performed as a preventative measure rather than as a treatment to reduce eye pressure, although in some cases it will also do the latter. It is usually used to prevent or treat **Acute angle closure episodes** as described above.
Other laser treatments – there are other treatments, such as diode laser cyclo-ablation, that may be required in a small number of patients.

Surgery
Occasionally operations may be performed in an effort to reduce the pressure in the eye. These operations are essentially operations that through a variety of mechanisms enhance the drainage of the aqueous humor out of the eye. They are specialist operations and are not without their drawbacks. They are best discussed with your surgeon if it is suggested that an operation should be considered.