

Patient Information

Glaucoma Monitoring & Tests

What is Glaucoma?

- Glaucoma comprises **of** a group of eye diseases in which the pressure inside the eye (the intra-ocular pressure) causes damage to the nerve at the back of the eye (the optic nerve). This can result in a progressive loss of peripheral side vision (the visual field) and ultimately can cause complete blindness. In the majority of cases the intra-ocular pressure is raised. In some eyes, however, the pressure may be within normal limits, but damage still occurs because of weaknesses of the optic nerve.

What causes pressure within the eye?

Fluid (aqueous humour) is produced inside the eye by a layer of cells on the muscle (the ciliary body) that moves the lens in the eye. The fluid is needed to provide nutrients to the front of the eye (especially the cornea and lens that have no blood vessels), to remove waste products from these structures and to create a pressure within the eye to maintain its shape and allow it to function correctly. The aqueous fluid drains mainly through a structure called the trabecular meshwork that lies in the angle where the cornea meets the iris. The normal pressure in the eye is between 12 and 21 millimeters of mercury (mmHg). If for any reason the outflow of aqueous fluid is obstructed the pressure can rise and glaucoma may occur.

Types of Glaucoma

There are two main types of glaucoma:

- Open-Angle - where this angle is open (Vast majority)
- Narrow-Angle - where the angle between the peripheral cornea and iris becomes closed

Both types may occur either spontaneously (primary glaucoma) or as a result of another eye condition (secondary glaucoma).

Open-angle Glaucoma

Open-Angle glaucoma is more common and affects 2% of adults over 40. It is more frequent with increasing age (affecting 10% of those over 75), in African races, in those who are very shortsighted, in those with diabetes, in those with family history and in those on long term steroid use.

Its exact cause is unknown. Although the drainage angle is open and appears normal to examination, an increased resistance to aqueous outflow at the trabecular meshwork has been found. This resistance to drainage causes the pressure to rise, resulting in damage to the optic nerve, possibly by direct mechanical compression or a reduction of its blood supply.

Open-angle glaucoma is typically a chronic, insidious disease, affecting both eyes. Damage to the optic nerve causes a slow loss of peripheral (side) vision. The danger of this condition is that the eye seems

perfectly normal and the loss of vision is so gradual and painless that people are often unaware of its presence until damage is extensive and permanent. The early loss in the field of vision in glaucoma is typically in the shape of an arc a little above or below the centre. If untreated the field loss progresses until most of the peripheral side vision is lost and only a small central "tunnel" of vision remains. Eventually, with progression, this too can be lost causing complete blindness.

As it tends to run in families and most patients have few or no symptoms, it is important to have eye pressure checked regularly, especially if there is a family history of glaucoma.

The detection of chronic open-angle glaucoma

The optic nerve is usually examined using biomicroscopy (slitlamp). With the patient's head in a head rest the optic nerve will be viewed using the light and a lens held near to the eye. The pupils may need to be widened (dilated with eye drops) to obtain a clear view and therefore it is advised **not to drive to this appointment**. In glaucoma the optic nerve is often abnormal on examination, with a characteristic "cupping" or excavation of its surface where nerve fibres have been damaged or lost.

Narrow angle/narrow angle glaucoma (NAG)

Is usually examined in a similar way although the patient may have some symptoms; colour haloes, headache or brow ache in low light (at

evening/dusks). Such patients are at risk of acute pressure rise in the eye leading to more severe symptoms of acute pain, acute red and watery eye, nausea and vomiting, reduced vision. This is indeed an eye emergency and needs to be checked urgently (eye emergency clinic or emergency department, preferably at an eye hospital). Delay might lead to irreversible damage to your sight and eye.

Measurement of IOP

Measurement of the pressure within the eye is called **tonometry**. It can be performed in a number of ways, all of which are painless and do not harm the eye. "Air-Puff" tonometry is a method often used by opticians. It is a method that is easy to use but can over-estimate the pressure. The most accurate and widely practiced system and the one preferred by most ophthalmologists, is Goldmann applanation tonometry (the Gold standard). In this technique, the eye is anaesthetized with eye-drops and then a yellow/orange dye is used to temporarily stain the tears. With the patient's head placed in a rest, a blue light is shone on the eye. A small, round, flat prism is then advanced towards the eye and used to painlessly flatten the cornea; the degree of flattening is correlated to the eye pressure.

Examination of the drainage angle (Gonioscopy)

This is performed by anaesthetizing the eye with drops and placing a contact lens on the eye which allows your Ophthalmologist to directly

see in the angle between the cornea and iris. To assess and see if it is open or closed and to examine the trabecular meshwork where the aqueous fluid drains out of the eye. This procedure is called 'Gonioscopy' and takes just a few minutes.

Central corneal thickness measurements (corneal pachymetry)

This is performed by anaesthetizing the eye with drops and placing a small ultrasonic probe on the centre of the cornea for a few seconds. Such measurements can help the Ophthalmologist verify the accuracy of the intraocular pressure values obtained by tonometry. If the cornea is thicker than usual (520-540 microns) the pressure can be overestimated i.e. measured as falsely high. Similarly if the cornea is thin the pressure can be underestimated.

Additional tests that can be useful in the management of the glaucoma patient

All day measurements of intraocular pressure (phasing)

Intraocular pressure can vary by as much as 6mm Hg (and more in the glaucoma patient) during the day. Typically (but not always) measurements are higher in the early morning. It may be necessary

therefore to assess the pressure every 2 hours over a 12 to 24 hour period. This is called phasing and is useful if pressures are border line or if glaucoma is progressing despite normal pressure measurements in the clinic.

Visual Field test examination

Examination of the field of vision is called perimetry. It is needed to detect and quantify defects (scotoma) in the field of vision at an early stage and monitor any progression. Many instruments have been developed for examining visual fields; the two most commonly used are Humphrey's visual fields (HVF) and Goldmann visual fields (GVF). Patients are usually asked to place their head in a rest and watch a target in the middle of a bowl-shaped screen. While watching the target, testing one eye at a time, a series of lights are presented on the screen and the patient is asked to indicate, by pressing a buzzer, which ones he/she can see. From these responses the field of vision and any defects caused by glaucoma can be mapped out.

3-dimensional scanning of the optic nerve (Heidelberg Retinal Tomography, Optical Coherence Tomography)

A quick and painless scan can be performed of the optic nerve using various specialized scanning systems including Heidelberg Retinal Tomography (HRT) and Optical Coherence Tomography (OCT). This

can produce a high accurate 3-D image of the optic nerve and retinal nerve fibres and can be a useful monitoring tool in selected patients.

For further information

The information in this booklet is provided for information only. The information found is NOT a substitute for professional medical advice or care by a qualified doctor or other health care professional. ALWAYS check with your doctor if you have any concerns about your condition or treatment. This is only indicative and general information for the procedure. Individual experiences may vary and all the points may not apply to all patients at all times. Please discuss your individual circumstances with your eye doctor.

If you require any further assistance or are concerned, do not hesitate in contacting the Eye Department. **Tel: 01384 456111 ext 3625**

Courtesy:

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Julia is an important and valuable member of Mr Raj's Glaucoma team at Russells Hall Hospital. This document has been produced by Julia (with minor modification by Mr. Raj) and is aimed to help all our Glaucoma patients.

