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PRIMARY eye care

Eye pressure and glaucoma; the relationship is not simple

The eye is an amazing organ.

Made from soft, but strong tissues the eye maintains its shape so that it can focus light accurately. The mechanism for this is pressure from the clear fluid (the aqueous) pumped into the eye from the bloodstream and drained back to the blood against resistance. The eye's pressure is kept higher than air pressure, but lower than blood pressure and a firm shape is maintained.

Any time there is a problem with the drainage of the aqueous the eye is at risk of damage. If the drainage system of the eye gets blocked, the fluid pressure within the inner eye is increased and can cause damage to the optic nerve.

Glaucoma is the name given to a group of eye diseases in which the optic nerve at the back of the eye is slowly destroyed. In most people this damage is due to an increased pressure inside the eye as a result of blockage of the circulation of aqueous, or its drainage. In other patients the damage may be caused by poor blood supply to the vital optic nerve fibres, a weakness in the structure of the nerve, and/or a problem in the health of the nerve fibres themselves.

Although anyone can get glaucoma, people have a higher risk if they have:

- a family history of glaucoma
- diabetes
- migraine
- short sightedness (myopia)
- eye injuries
- blood pressure
- past or present use of cortisone drugs

People with any of these risk factors should see the optometrist for an eye examination by the age of 35. Everyone over the age of 40 should have regular optometric eye examinations to check for eye pressure problems and other threats to eye health.

In checking for glaucoma the optometrist will normally include:

- eye pressure check using tonometry;
- optic nerve check with an ophthalmoscope;
- check of anterior chamber depth, and the grading of anterior angle by gonioscopy
- visual field assessment (if needed) to test the sensitivity of peripheral vision, where glaucoma strikes first

Tonometry has two forms, contact and non-contact. The 'air-puff' is a non-contact measure. Some people think they haven't been tested for glaucoma unless they have been 'puffed' in the eye. Others believe that such non-contact tonometry is not good enough.

Contact Applanation Tonometry (CAT) provides an estimate of intraocular pressure (IOP) by measuring the force required to flatten the cornea over a fixed area. It is generally recognized as the gold standard for IOP measurement and gives very accurate results. The slitlamp mounted Goldmann Tonometer and the hand-held Perkins are two of the more common instruments used for CAT.

There is some risk of corneal trauma with CAT as the topical ocular anesthetics used can soften the corneal epithelium. There is also a risk of the patient causing damage to the surface of their eye by rubbing the desensitized cornea. In addition, some patients find contact tonometry a reasonably threatening experience as you are placing a relatively large object onto their eye and there is a small risk of anaphylactic shock resulting from the instillation of anesthetic.

Non Contact Tonometry (NCT or the 'air-puff') directs a collimated beam of light onto the corneal vertex. Prior to the air pulse, little or none of the light is reflected back to the detector. As the air pulse causes a gradual reduction in corneal curvature, increasing amounts of corneal reflected light is detected. The time interval required to flatten the cornea is computed and converted to a pressure reading.

NCT is more vulnerable to variations such as errors on alignment, and as the IOP measurement is taken in a millisecond, no account is taken of normal variation of IOP with arterial pulse. Some patients find the noise of the tonometer and the physical puff of air on the eye a daunting experience but with NCT no corneal contact occurs, and anesthesia is not required.

" Three people in every hundred over the age of 35 have vision threatened by glaucoma. "

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To puff or not to puff?

While it is true that non-contact tonometry is not as accurate as contact applanation tonometry, this needs to be put in perspective.

High intra-ocular pressure is a risk factor with glaucoma. Generally, it appears the non-contact method tends to give a slightly higher IOP reading than the CAT. This tendency to err towards overestimating pressure together with the advantage of no corneal contact makes NCT extremely useful as a screening tool.

If an NCT does give a reading considered to be high, then the optometrist will often repeat IOP measurements using a contact tonometer (Perkins or Goldmann).

Measurement of IOP in a patient already diagnosed and treated for glaucoma is more critical. In these cases IOP is used as one of the key measures of the control that medication is having on the aqueous production or outflow. It is generally considered that IOP should be monitored with Contact Applantaion Tonometry.

Although IOP is an important indicator for glaucoma, patients can have pressures well within the 'normal' range and still have glaucoma. This means the optometrist cannot rely on tonometry alone and the careful assessment of other relevant ocular functions and structures is important.

The Optic Disc

Optic disc architecture is important, for example monitoring changes in disc cupping, appearance of notches or thinning of the neural rim. Although this is usually done by ophthalmoscopy and or dilated fundus examination, the use of non-mydriatic retinal photography to record these structures for future comparison is becoming more common.

The Anterior Chamber

Assessment of anterior chamber depth, and the grading of the anterior angle by gonioscopy provides important diagnostic information.

Visual Fields

The optometrist can monitor for visual field changes. Computerized field screening has given the ability to monitor threshold changes more accurately, and look for characteristic glaucoma defects such as an arcuate scotoma, nasal step or a blindspot extension.

Although glaucoma can be treated, treatment cannot restore sight that has been lost; it can only arrest or slow down the damage process. That is why early detection is so important.