Glaucoma

Glaucoma can be broadly described as an optic neuropathy or pathology of the optic nerve. Glaucoma is just one type of optic neuropathy, but one of the more common eye disorders that can lead to blindness. While glaucoma can be categorized many ways, we tend to classify it into two types: open and narrow angle. Open angle glaucoma is much more common than narrow angle. Narrow angle glaucoma usually presents as an attack with a sudden, dramatic increase in eye pressure. Open angle glaucoma tends to be much slower with a painless on-set that delays its diagnosis. Open angle glaucoma can take 10 to 20 years to go blind without treatment, while narrow angle glaucoma can result in blindness in days or weeks, rather than years.

Glaucoma can be thought of as a problem where the eye pressure is elevated to such an extent that damage occurs in the optic nerve. The optic nerve has over one million nerve fibers. The optic nerve is not made up of wire-like parts, but of parts more akin to nano-tubes. Their survival is partly based of the flow of nutrients inside the tubes (axoplasmic flow). Just as a garden hose, if bent has its flow stopped, so the flow is stopped in the nano-tubes if they're bent. The retinal nerve fibers make 90-degree bends to emerge from the eye as the optic nerve. At this bend, they're sensitive to the increased eye pressure from glaucoma. If the pressure is too great, their flow stops and they die. Tube death manifests itself as a loss of peripheral, and eventually central, vision.

The optic nerve, however, has a good deal of redundancy, meaning that is can withstand significant damage before a person becomes aware, or before a clinician can detect a problem. Current thinking suggests that a person needs to lose somewhere between 30 to 50% of their nerve fiber before the peripheral vision is affected (as measured by visual field testing; VF). Such difficulties with early diagnosis have led to the development of nerve fiber analysis (see the VF and OCT FAQs for details), which can help diagnosis glaucoma perhaps 3 to 5 years before visual field loss occurs.

While glaucoma can occur at any age, it appears more frequently after the 6th decade. In fact, age is probably the greatest risk for developing glaucoma. Other significant risk factors are increased eye pressure, family history (primary relative), diabetes, race, and some medications, such as steroids.

Normal eye pressures are 8 to 21 mm Hg. In glaucoma, eye pressures before treatment can vary a great deal. Eye pressures also vary with the time of day. Peak pressures are thought to be in the 3 AM to 7 AM time period. Some patients develop glaucoma even when eye pressures are in the normal range, making the diagnosis of glaucoma more difficult. Thus, to properly diagnosis glaucoma, the clinician must take into account many factors. It may require several visits and tests before your eye doctor can determine whether or not you have glaucoma. Despite several examinations and tests, it may still be impossible to definitively say if you have glaucoma; in that case you are considered to be a glaucoma suspect and must be closely followed.

Since pressures vary for many reasons, they represent short-term control of glaucoma. That is, pressures, which are normal at one time of day, may not be normal at other times. Since it only takes a few seconds to measure a pressure, and there are over 31 million seconds in a year, when pressures are measured it is truly only a short-term observation. New technologies that may supply telemetry to a smart phone, will give us continuous eye pressures. But until those devices are available, pressures at present only provide short-term data.

Long-term control is best followed by visual field and OCT tests. The relationship between eye pressures and these other tests is somewhat analogous to the relationship between blood sugar and Hb-A1C. Both measurements are important to understand the disease status. VF and OCT testing are each done on a yearly basis (more frequently if the glaucoma is changing). Pressure checks are made every 3 to 4 months.

Treatment is usually accomplished with eye drops. There are many types of eye drops for glaucoma (prostaglandins, beta-blockers, alpha-adrenergics, miotics, carbonic anhydrase inhibitors and various combinations). Treatment is designed to control (arrest) the disease: glaucoma is not cured. Besides eye drops, surgery is also used to control glaucoma. Surgery can be relatively innocuous, such as SLT used for initial treatment, or more serious and complex in the case of advanced glaucoma.

A Selective Laser Trabeculoplasty (SLT) can be used in most open angle glaucoma patients, often replacing one eye drop. The SLT is non-destructive and can be repeated if necessary. In perhaps 70 to 80% of patients, one treatment can last for up to 10 years, while 20% or so will need to have it repeated on a yearly basis, if they so choose. The selection of eye drops or SLT for treating glaucoma needs to take into account the patient's age, health problems, severity of glaucoma, eye structure, cost of medication, and life style.