

Glaucoma

Glaucoma is an eye disease that is one of the leading causes of blindness in this country. Essentially, glaucoma is a disease of the optic nerve. The optic nerve is responsible for carrying image information from the retina in the back of the eye to the visual centers in the brain. This information is processed in the brain into what we would perceive as things we are seeing. Glaucoma typically interferes with this system by damaging the optic nerve in the area of the optic disc or where the optic nerve is visualized by your eye doctor when he looks into your eyes. This may cause a progressive visual loss to your peripheral vision, eventually leading to central vision loss and blindness. This process is usually very slow progressing over many years; although there are certain types of glaucoma where visual damage occurs very quickly. Glaucoma is not always a disease of elevated intraocular pressure, since many glaucoma patients may have normal or low pressure. Glaucoma is a disease that causes progressive optic nerve damage and loss of visual field (peripheral vision).

Diagnosing Glaucoma:

Often the diagnosis of glaucoma is dependent on the type of glaucoma. There are two main types of glaucoma, open angle and angle closure. The angle is referring to the drainage area where the clear protective lining of the front chamber of the eye, the cornea, and the iris (the colored portion of the eye) join. If this area is closed or narrow, one could develop angle closure glaucoma. If this area is physically open and the individual has glaucoma, it is termed open angle.

Intraocular Pressure:

In either classification of glaucoma, there are three main things the doctor will do to make the diagnosis. First, and most commonly known to many patients is taking the intraocular pressure. This is done with the aid of a tonometer, which measures the pressure inside the eye using one of two methods: contact and non-contact. The non-contact tonometer is more commonly called the 'air puff' test. It is a good screening device, but if glaucoma is suspected, doctors will generally use the next device to make sure of the reading. This is the applanation tonometer or Goldmann type. This necessitates the use of an eye drop to numb the front surface of the eye before contact is made. This instrument can be hand held or attached to the doctor's microscope used for examining eyes. Typically, a normal pressure reading is between 10 and 21 mmHg (millimeters of Mercury). If someone's pressure is higher than 21 mmHg, they may be suspect for glaucoma. It is important to note, that even though the pressure is higher than 21, the patient may not have glaucoma. Additional tests are required to confirm the diagnosis.

Dilated Eye Exam:

The second test typically done during a glaucoma evaluation is to examine the optic nerve. The optic nerve enters the back of the eye and forms a visible portion called the optic disc. The disc can be viewed by looking inside the eye with a variety of different lights and instruments. The doctor will exam the nerve disc for evidence of damage. In glaucoma, typically the nerve will exhibit an enlarged cupping. The cupping is the centrally excavated area of the nerve when viewed from the inside of the

eye. The average healthy nerve has anywhere from 0 to 30% of its surface area cupped or excavated. If someone has a larger cupping or has cupping that is significantly different between the two eyes or is suspicious in its shape, that person may be a suspect for glaucoma.

Risk Factors for Glaucoma:

There are other risk factors for development of glaucoma. These include:

- High myopia (nearsightedness)
- Family history of glaucoma
- Vascular disease (like diabetes and high blood pressure)
- Age
- African ancestry
- Use of certain medications (like steroids) and a history of eye trauma

Visual Field Testing:

The visual field (automated perimetry) will help make the diagnosis by determining if there is indeed damage to the optic nerve. In open angle glaucoma, the early stages produce a slow deterioration of the peripheral vision. Most patients cannot recognize this change until significant portions of their vision are destroyed. The visual field test, however, can find subtle defects in the periphery of the vision making early detection possible. The test itself resembles a simple video game where the patient directs his/her gaze at a target and is directed to press a button when they see small lights off to the side of the target. The computer will vary the size and intensity of the peripheral light stimuli to test how sensitive that area of the patient's vision is. Additionally, the program will try to trick the patient by not shining a light or giving a much brighter stimulus to test for the patient's reliability. The computer will then map out the findings for analysis by the doctor. Glaucoma has certain characteristic defects that can be detected this way, and therefore be diagnosed. Other neurologic conditions may be diagnosed by the visual field, but those field defects have different characteristics than glaucoma.

Nerve Fiber Analysis:

This test is one of the more recent advances in evaluating and quantifying the amount of nerve fibers that exit the optic nerve. It has been found that 20-40% of the nerve can have damage before showing defects on the visual field.

Gonioscopy:

When glaucoma is diagnosed or if a suspicion of closed angles is present, the doctor may wish to perform another test to actually view the angle structures to tell if the drainage angle is open or closed. This test is called gonioscopy. The gonioscopy lens is placed on a numbed eye and viewed with the biomicroscope enabling the doctor to view the structure of the angle.

Open Angle Glaucoma:

In open angle glaucoma, a patient usually presents without complaints. The intraocular pressure may or may not be elevated, but there is a definable visual field defect present. Gonioscopy and optic nerve evaluation may or may not be normal as well. In fact, the patient may have fairly advanced visual field defects with only minimal observable changes to the optic nerve. Patients usually do not complain of pain or other visual change. Over 90% of patients with glaucoma have this type. An important subcategory of open angle glaucoma is normal tension glaucoma. This often presents in people who are older and may have some sort of vascular disease such as hypertension. These patients present with statistically normal pressures but with visual field and optic nerve defects consistent with glaucoma. This illustrates why it is so important to have a thorough eye exam and not just 'the glaucoma test' that most patients refer to screening exams.

Angle Closure Glaucoma:

In angle closure glaucoma the drainage angle becomes blocked from a variety of causes. When this occurs, there is a rapid rise in pressure to very high levels above normal. Unlike open angle glaucoma, this can be associated with pain (often severe), blurred vision, headaches, haloes and glare around lights and even extreme nausea. In addition, unlike open angle disease, if not treated rapidly, blindness can result. A subclass of angle closure glaucoma is chronic angle closure glaucoma. In the chronic form, more commonly occurring in patients of Asian and African descent, there may be episodes of incomplete blockage of the angle. This results in similar symptoms as angle closure but are less severe and short lived. Often the cause of this chronic condition is the anatomy of that patient's drainage angle resulting in intermittent blockages often when the pupil is dilated. This most often occurs during nighttime or times when the patient is in low light such as in a movie theater. The attack can actually resolve as the patient goes to a well-lit area and the pupil constricts. These patients should also seek urgent care to rule out a complete closure and find out whether treatment is urgently needed or not.

Glaucoma Treatment:

Oral Medication Treatment: Glaucoma treatment is always evolving. Traditionally, if a patient needed treatment urgently, a combination of drops used for chronic conditions are utilized and may be added to oral medications if the patient is not responding. The oral medications include pills and liquids that are taken by mouth that act to drain fluid from the body resulting in a quick lowering of pressure. The pills are called diuretics or 'water pills.' These pills do have several side effects including numbness and tingling of fingers and toes, fatigue, kidney stones, bleeding and intestinal upset. If the angle closure patient is stabilized with drops and oral medications, they may still need an additional more permanent treatment with a laser or other surgical correction to help widen the drainage angle.

Topical Medical Treatment: Fortunately, oral medications are not usually needed for chronic conditions. In the chronic open angle patient, the first line of treatment is usually an eye drop. These eye drops help to either lessen the fluid being produced in the eye or increase the fluid draining from the eye and thereby lowering the pressure. Recently, research has been done to help find a new class of drops that do not treat glaucoma by lowering the pressure but by making the optic nerve more resistant to

damage. This is a new category of treatment called neuroprotection. Some of the existing drops have also been shown to serve this function as well. This is especially important in the normal tension glaucoma patient. Unfortunately, while the additional medications (eye drops) give us more choices of treatment, there are still some potential side effects to them. These range from benign symptoms such as mild stinging and red eyes to more severe blurred vision, headaches, and general systemic changes such as shortness of breath, change in heart rate, and changes in eye color and retinal edema. It is therefore very important that when on any of these medications, either oral or topical (drops), the patient is monitored regularly for any changes or problems. Unfortunately, there is no medical cure for glaucoma. At best, we control the disease effectively. This usually means the glaucoma patient must be prepared to take some form of medication on a regular basis.

Surgical Treatment for Glaucoma:

There are also some surgical options available for the treatment of glaucoma. The most common procedures are laser treatments. In one procedure (iridotomy) a small opening is made in the iris allowing fluid to pass more easily from the back of the eye to the front, lessening the risk of future angle closures. For open angle patients, it may be necessary to have better pressure by performing a laser treatment (trabeculoplasty) to the drainage angle itself. This allows easier fluid drainage from the eye, thereby lowering pressures. There are still more invasive surgical procedures that actually create alternative fluid drainage sites from the eye. Given their increased risks, these last more invasive procedures are usually only performed if all other options have been exhausted.