



Ophthalmology • Refractive Surgery
Laser, Cataract & Implant Surgery

GLAUCOMA

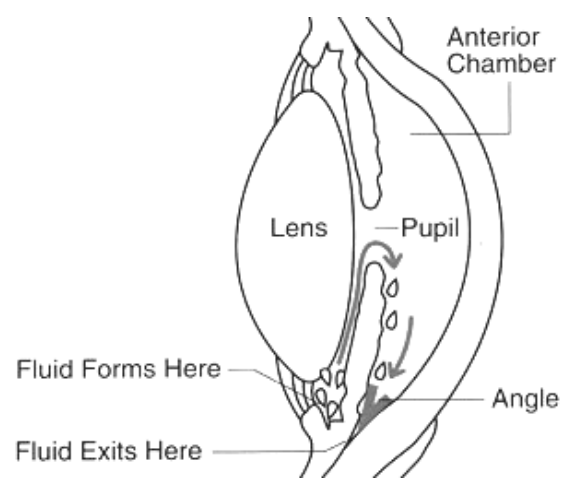
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Definition of Glaucoma:

Glaucoma 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 you 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 disease that causes progressive optic nerve and loss of visual field (peripheral vision).



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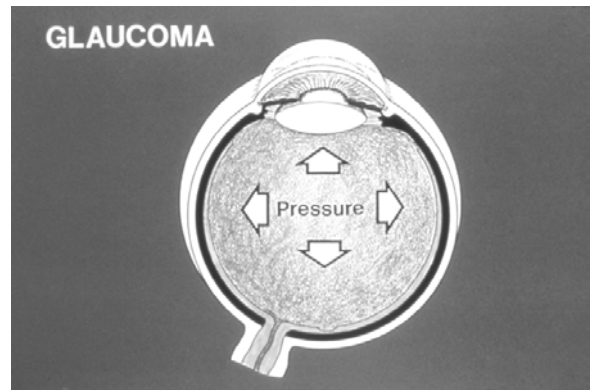
Diagnosing Glaucoma:

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

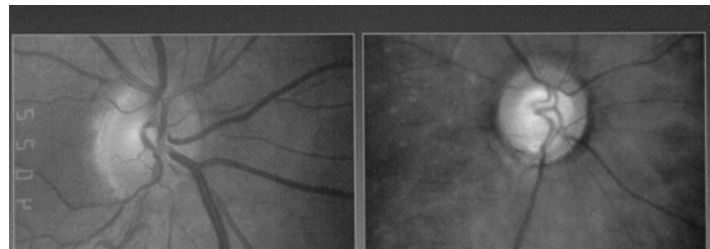
In either classification of glaucoma, there are three main things the doctor will do to make the diagnosis. First, and most commonly known to many patients is taking the intraocular pressure. This is done with the aide of a tonometer, which measures the pressure inside the eye using most commonly one 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 handheld or attached to the doctor’s microscope used for examining the eye. Typically, a normal pressure reading is between 10 and 21 mmHg (millimeters of Mercury). If someone’s pressure is higher than 21mmHg, they may be suspect for glaucoma. It is important to note, that even though the pressure is for example 25mmHg, 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 is examining 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 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.



Normal Optic Nerve

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 trauma to the eye.

If someone presents to his/her doctor's office with risk factors and suspicious pressures or optic nerves, there would be greater suspicion for glaucoma, and the doctor would recommend additional tests critical to diagnosing glaucoma, the visual field and nerve fiber analysis.

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 were 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 she sees 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 or 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

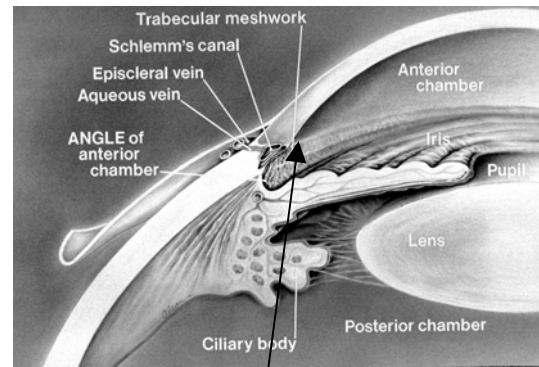
When glaucoma is diagnosed or if a suspicion of closed angles is present, the doctor may wish to perform another test to actually view the angle structures to tell if the drainage angle is open or closed. This test is called gonioscopy. The gonioscopy lens is placed on a numbed eye and viewed with the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

Types of Glaucoma:

As described above there are two main classes of glaucoma, open and closed angle. These often present very differently and are treated differently.

Open Angle Glaucoma

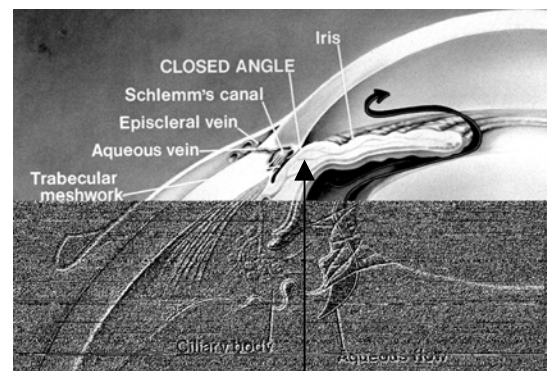
In open angle glaucoma, a patient usually presents without complaints. The intraocular pressure may or may not be elevated, but there is a definable visual field defect present. Gonioscopy and optic nerve evaluation may or may not be normal as well. In fact, the patient may have fairly advanced visual 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 exam and not just “the glaucoma test” that most patients often refer to in screening exams.



Normal open angle

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, headache, 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 the movie theaters. 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.



Note: angle is closed

Glaucoma Treatment:

Oral Medication Treatment of Glaucoma

Glaucoma treatment is always evolving. Traditionally, if a patient needs 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 for Glaucoma

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 lower 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 described above. 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 regular basis.

Surgical Treatment for Glaucoma

As previously mentioned, there are also some surgical options available. 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.

Glaucoma Prevention:

As with any condition, the sooner you make the diagnosis and gain control of the condition, the better the long-term prognosis. Unfortunately, there is nothing to prevent glaucoma, but there are things one can do to put it off or lessen the risk. Monitoring one's general health and eliminating high-risk behaviors is always beneficial. For example, if someone is a smoker and has other high-risk characteristics, they should quit smoking. If someone is diabetic or hypertensive, better control can mean their eyes may be more resistant to change. If someone has high risks or has not had their eyes checked, close monitoring might enable the doctor to catch a condition earlier. Every patient over 40 years old with any of the risk factors described above should have their eyes checked every year. Over the age of 60, yearly exams are often recommended even if the patient does not have any complaints, or risk factors. By not ignoring symptoms or risk factors and following their doctor's recommendations, patients can often help themselves to avoid unnecessary visual loss