

Glaucoma

What is Glaucoma?

Glaucoma is a group of several diseases that can damage the eye's optic nerve and result in vision loss and, without treatment, blindness. This group of diseases damages the retinal nerve fiber layer (NFL), one of the ten layers of the retina. With the progression of glaucoma there is a characteristic damage to these fibers, which are also known as retinal ganglion cells.

The retinal nerve fibers come together to form the optic nerve, which is a bundle of more than 1 million nerve fibers connecting the retina to the brain. A healthy optic nerve is crucial for good vision.

Glaucoma is a multifactorial, progressive, neurodegenerative disorder. It is characterized by the death of retinal ganglion cells, optic nerve atrophy, and loss of neurons in the brain. In primary open-angle glaucoma, which is the most common form of glaucoma in the United States, intraocular pressure (IOP) is the biggest risk factor for both the development and progression of glaucoma. The IOP is the only risk factor glaucoma specialists can influence. However, other factors contribute to glaucoma's onset and progression that unfortunately cannot be modified. These risk factors are listed below.

Facts About Glaucoma:

- Approximately three million Americans have glaucoma. Almost half of these people are not aware that they have the disease.
- 800,000 Americans are legally blind from glaucoma.
- Glaucoma causes a loss of some of the nerve fiber layer in the retina of the eye.
- There is no cure for glaucoma. However, glaucoma can be managed with medicine (eye drops) to prevent or reduce further vision loss.
- Once vision is lost it cannot be recovered. Therefore, it is crucial to prevent loss by diagnosing and treating glaucoma as early as possible.
- The following are risk factors for glaucoma:
 1. High intraocular pressure
 2. Family history of glaucoma
 3. Age over 40
 4. Hispanic or African-American
 5. Diabetes
 6. High Myopia (nearsightedness)
 7. Previous eye injury
 8. Corneal thickness below average (thin corneas)

In the front of the eye is a space called the anterior chamber. A clear fluid flows continuously in and out of this chamber and nourishes tissues inside the eye. The fluid is drained from the chamber at the area where the cornea and iris meet, called the angle. When the fluid reaches the angle, it flows through a drain called the trabecular meshwork and leaves the eye.

Sometimes the fluid passes too slowly through the trabecular meshwork. As the fluid builds up, the pressure inside the eye rises to a level that may damage the optic nerve. When the optic nerve is damaged from increased pressure, open-angle glaucoma and vision loss may result. That's why controlling pressure inside the eye is important. However, elevated eye pressure alone does not mean you have glaucoma, but it does mean you are at risk for glaucoma. A person has glaucoma only if the optic nerve or retinal nerve tissue shows signs of damage.

Not every person with increased eye pressure will develop glaucoma. Some eyes can tolerate elevated pressure better than others. Whether you develop glaucoma depends on the level of pressure your optic nerve can tolerate before it becomes damaged. This level is different for each person. This is why a dilated eye exam and special testing of the optic nerve is so important. In contrast, glaucoma can develop even without increased eye pressure. This form of glaucoma is called low-tension or normal-tension glaucoma.

Early on, open-angle glaucoma has no symptoms. It causes no pain and vision remains normal. As glaucoma remains untreated, damage to the optic nerve continues, resulting in loss of peripheral (side) vision. Without treatment, people with glaucoma will slowly lose their peripheral (side) vision and eventually even the central visual field. Given enough time, untreated glaucoma can result in total blindness.

What are the signs and symptoms of glaucoma?

In open angle glaucoma, there are NO signs or symptoms until the late stage of the disease when it is too late. This is why it is so important to have your eyes checked if you have any of the risk factors listed above, and why you should always make follow up appointments if your eye doctor mentions being concerned about glaucoma. If you are diagnosed with glaucoma, it is crucial that you continue your drops as prescribed even though you have no symptoms. Glaucoma progresses painlessly and can result in blindness.

What tests are done for glaucoma?

Glaucoma is detected through a comprehensive eye exam and a series of special tests, including visual field testing, pachymetry, dilated eye exam, tonometry and nerve fiber layer analysis (optical coherence tomography, OCT, or Heidelberg retinal tomography, HRT).

Visual field testing. This test measures your central and peripheral vision area. It determines if you have reduced sensitivity in certain areas within your visual field as well as noting any lost visual field areas called scotomas. While this test is useful and still the most used test in diagnosing glaucoma it is not as accurate in diagnosing early glaucoma—before there are visual field defects. Ideally glaucoma is diagnosed before there is irreversible visual field loss.

Nerve Fiber Layer Analysis: OCT and HRT: An OCT (optical coherence tomography) or HRT (Heidelberg retinal tomography) scan is essential in diagnosing and monitoring glaucoma. These tests, which are painless and take as little as five minutes, monitor subtle loss of the nerve fiber layer. By analyzing any change in your eye's nerve fiber layer, your ophthalmologist is able to determine when you need a change in treatment before nerve fiber layer damage results in reduced vision. This testing is crucial in monitoring glaucoma and your response to treatment.

Dilated eye exam: Drops are placed in your eyes to widen, or dilate, the pupils. Your eye doctor uses a special magnifying lens to examine your retina and optic nerve for signs of damage and other eye problems. The appearance of your optic nerve is often the first sign your doctor will see that alerts him/her that you may have glaucoma.

Tonometry: An instrument called a tonometer measures the pressure inside the eye. There are several different methods to test the intraocular pressure or IOP.

Pachymetry: A numbing drop is applied to your eye. Your eye care professional uses an instrument to measure the thickness of your cornea. A major national study, the Ocular Hypertension and Treatment Study (OHTS) concluded that thinner than average corneas are a risk factor for glaucoma. The thickness of your cornea also factors into the IOP measurement, as thinner corneas tend to measure a lower than actual IOP and thicker corneas measure higher. Your doctor will use the information gathered from your pachymetry to better evaluate what your pressure readings mean.

What are the treatments for glaucoma?

There is no cure for glaucoma. Vision lost from the disease is permanent and cannot be restored. That is why immediate treatment for early stage, open-angle glaucoma is so important. Early treatment can delay progression of the disease and prevent vision loss. Glaucoma treatments include several different medications in the form of eye drops, oral medicines, laser trabeculoplasty, surgery, or a combination of any of these. While these treatments can preserve remaining vision, it is important to understand that they do not improve sight already lost from glaucoma.

Glaucoma Almost Always Gets Worse

Glaucoma is a progressive disease and much of the treatment is based on the rate of progression of the disease. Unfortunately, no matter how well the disease is treated, no matter how good the glaucoma specialist, no matter how good the medicine, glaucoma usually gets worse. The goal is to maintain functional vision for the patient's lifetime.

Treatment with Medicine/Eye Drops

Eye drops are the most common treatment for glaucoma. Some medicines work by causing the eye to make less fluid. Others lower pressure by helping fluid drain more effectively from the eye. Glaucoma medicines are instilled anywhere from one to three times a day. Because glaucoma has no symptoms, people may be tempted to stop taking, or may forget to take, their medicine. You need to use the medications your doctor prescribes until he/she tells you

otherwise. Consistent, daily use is very important. Make sure your doctor or someone in their office shows you how to put the drops into your eye.

What are the side effects of eye drops?

Most people have no problems with their glaucoma drops. However, some may cause headaches or other side effects such as stinging, burning, and redness in the eyes. If you have problems with a medicine, tell your ophthalmologist. Treatment with a different dose or a new drug may be possible. It is also important that you tell your eye care professional about other medical problems and any other medicines you are taking before you begin glaucoma treatment.

When is glaucoma surgery necessary? What are the options?

If medications do not adequately control the intraocular pressure or the damage to the eye from glaucoma, glaucoma surgery will be recommended. There are several options in glaucoma surgery including argon or selective laser trabeculoplasty (ALT or SLT), and incisional surgeries including trabeculectomy or a valve placement.

Trabeculectomy Conventional glaucoma surgery, Trabeculectomy makes a new opening in the eye just above the cornea for the fluid to leave the eye. Your eye doctor may suggest this treatment if other treatments have failed to adequately control the intraocular eye pressure. Trabeculectomy surgery often is performed after medicines and laser surgeries have failed to control the eye pressure. Trabeculectomy surgery is usually performed in an outpatient surgery center or hospital. Before the surgery, you will be given medicine to help you relax. Your eye surgeon will make small injections around the eye to numb it. A small piece of tissue is removed to create a new channel for the fluid to drain from the eye. For several weeks after the surgery, you must put drops in the eye to fight infection and inflammation. These drops will be different from those you may have been using before surgery. As with laser surgery, trabeculectomy glaucoma surgery is performed on one eye at a time. Usually the operations are four to six weeks apart.

Trabeculectomy surgery is about 60 to 80 percent effective at lowering eye pressure. If the new drainage opening narrows, a second operation may be needed. Trabeculectomy surgery works best if you have not had previous eye surgery, such as a cataract operation. In some instances, your vision may not be as good as it was before trabeculectomy surgery. There are potentially many side effects, including cataract, problems with the cornea, and inflammation or infection inside the eye, which can be vision threatening. The buildup of fluid in the back of the eye may cause some patients to see shadows in their vision. If you have any of these problems, tell your doctor so a treatment plan can be developed.

Argon Laser Trabeculoplasty (ALT)

Selective Laser Trabeculoplasty (SLT) Argon Laser Trabeculoplasty

Argon Laser Trabeculoplasty is a type of glaucoma surgery that helps aqueous fluid drain out of the eye to lower the intraocular pressure. Your ophthalmologist may suggest this surgery at any time. In most cases glaucoma eye drops will still be needed after this procedure but hopefully in

lesser amounts. Before the surgery, numbing drops will be applied to your eye. As you sit facing the laser machine, your doctor will hold a special lens to your eye. A high-intensity beam of light is aimed at the lens and reflected onto the trabecular meshwork inside your eye. You may see flashes of bright green or red light. The laser makes several evenly spaced thermal burns that stretch the drainage holes in the trabecular meshwork. This allows the aqueous fluid to drain better.

Like any surgery, laser surgery can cause side effects, such as inflammation. Your doctor will prescribe anti-inflammatory drops and/or antibiotic drops for any soreness or inflammation inside the eye. You need to make several follow-up visits to have your eye pressure monitored. If you have glaucoma in both eyes, only one eye will be treated at a time. Laser treatments for each eye will be scheduled several days to several weeks apart.

iStent

What are the other types of glaucoma?

Normal - Low Tension Glaucoma

In **low-tension** or **normal-tension glaucoma**, optic nerve damage and narrowed side vision occur in people with normal eye pressure. Lowering eye pressure at least 30 percent through medicines slows the disease in some people. Glaucoma may worsen in others despite low pressures. A comprehensive medical history by a glaucoma specialist is important in identifying other potential risk factors, such as low blood pressure, that may contribute to low-tension glaucoma especially while sleeping. If no risk factors are identified, the treatment options for low-tension glaucoma are the same as for open-angle glaucoma.

Angle-closure Glaucoma

In angle-closure glaucoma, the fluid at the front of the eye cannot reach the angle and leave the eye. The angle gets blocked by part of the iris. People with this type of glaucoma have a sudden increase in eye pressure. Symptoms include severe pain and nausea, as well as redness of the eye and blurred vision. If you have these symptoms, you need to seek treatment immediately. This is a medical emergency. If your doctor is unavailable, go to the nearest hospital or clinic. Without treatment to improve the flow of fluid, the eye can become blind in as few as one or two days. Usually, prompt laser surgery and medicines can clear the blockage and protect sight.