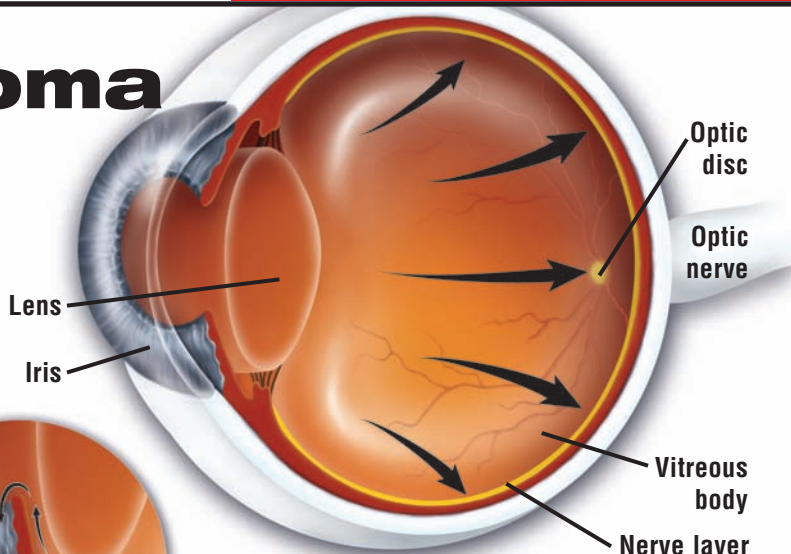


# Glaucoma

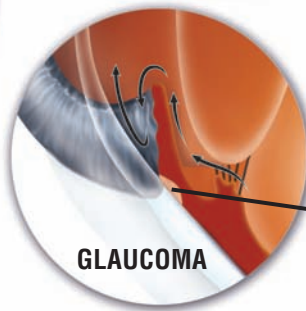


Fluid empties out a drain in front of eye

**NORMAL**

Nerve layer destroyed by increased pressure (large arrows)

## Damage to the Optic Nerve



Drain is blocked, fluid builds up, and pressure increases

**GLAUCOMA**

Glaucoma is a disease of the eye that causes damage to the optic nerve, the nerve bundle that brings images from the retina of the eye to the brain. When the optic nerve is damaged, the result is blind areas in a patient's side field of vision. Eventually, the only clear vision remains in the center of the visual field. If left untreated, optic nerve damage can result in blindness.

Glaucoma is almost always the result of an increase in pressure of the fluid in the eye, which causes the optic nerve to deteriorate. Normally, fluid in the eye is produced at the same rate as it drains out through the spongy drainage system located at the angle formed between the iris and the cornea. The most common form of glaucoma is known as open-angle glaucoma, which occurs with a fluid build-up when normal drainage is slower than fluid is produced. Open-angle glaucoma is painless, and visual changes are usually not noticed early in the disease since they develop so slowly. Eventually, blurred vision on the sides of the visual field develops and clear vision remains when looking straight ahead. If the optic nerve continues to be damaged, the central vision will become blurry and blindness results.

Closed-angle glaucoma (also called angle-closure glaucoma) is an uncommon form of glaucoma that is considered a medical emergency. This type of glaucoma occurs when the fluid in the eye is completely blocked and eye pressure rises very rapidly, leading to blindness—often within hours. Symptoms of closed-angle glaucoma are dramatic, including severe eye pain, blurred vision, halos around lights, and nausea.

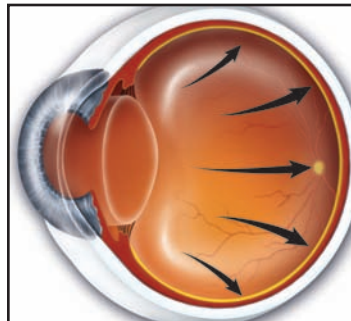
Glaucoma can result from another medical condition (secondary glaucoma) or have no known cause (primary glaucoma). There is no cure for glaucoma, and any damage to a patient's vision that has already occurred cannot be reversed. The goal of treatment is early diagnosis to prevent glaucoma from causing vision problems. If vision is already affected, treatment can control the glaucoma and prevent it from worsening.

Treatment for glaucoma includes eye drops, oral medications, laser therapy, and/or surgery. These treatments are all aimed at lowering the intraocular pressure by improving the fluid drainage from the eye, decreasing the production of fluid, or both. It is critical to continue treatment for a lifetime once glaucoma has been diagnosed and to have eye exams regularly as recommended by an eye doctor to prevent future vision damage.

## The Elderly Are More Prone to Glaucoma

Glaucoma is the result of damage to the optic nerve, usually because of a fluid build-up that increases the pressure in the eye. However, not everyone with increased eye pressure will develop glaucoma, and some patients with normal eye pressure can develop optic nerve damage.

Glaucoma can also occur when the pressure in the eye is normal; this condition is called *normal-tension* or *low-tension glaucoma*. This glaucoma is less common than those types caused by increased pressure in the eye, and it is not clear why the optic nerve suffers damage when the fluid pressure is not increased. Glaucoma can also be congenital, and early surgery on children born with glaucoma can often allow for the development of good vision.



*The goal of treatment is to lower intraocular pressure by improving the drainage of fluid and/or decreasing fluid production.*

**Intraocular Pressure: Glaucoma's Biggest Risk Factor:** The biggest risk factor for glaucoma is an increase in eye pressure. Age is also an important risk factor for glaucoma, with an increased risk in most people after age 60 and for African-Americans after age 40. African-Americans and Mexican-Americans are more to develop glaucoma and are more likely to become blind as a result. A family history of glaucoma makes it more likely a person will suffer from the condition in later years. Secondary glaucoma can be a result of eye injury, tumors, inflammation, eye surgery, or diseases such as hypertension, heart disease, low thyroid function, and diabetes. Even certain drugs can cause glaucoma, especially the long-term use of corticosteroids. In the case of closed-angle glaucoma, anything that allows the pupil to dilate (enlarge) can begin an attack. It is important to have regular eye exams and eye pressure measurements every two years after age 40 and every year after age 65, because slow increases in eye pressure and gradual damage to the optic nerve may go unnoticed. Eye exams should begin even earlier in African-Americans due to their higher risk of glaucoma.

**Diagnosis and Treatment:** The diagnosis of glaucoma is made by an eye doctor using tests such as tonometry, photography, visual field tests, and pachymetry. Tonometry measures eye pressure using a puff of air or a flat cone that presses on the eyeball to flatten it. The eye doctor can also take a photograph of the optic nerve or use an ophthalmoscope to see through the pupil and into the back of the eye. Visual field testing involves a screen with small objects that come into view from various parts of the visual field and are recognized by the patient when they appear. This test can determine if there are parts of the visual field that are not clear. Pachymetry is an ultrasonic measurement of the thickness of the cornea, which is important in determining whether eye pressure is being accurately assessed. A combination of these tests is used to diagnose increased eye pressure and early damage to the optic nerve. The goal of all glaucoma treatment is to lower the intraocular pressure.

Treatment for glaucoma includes eye drops, oral medications, laser therapy, and/or surgery. Eye drops that lower the production of fluid include beta-blockers (timolol, carteolol, and others), alpha-adrenergic drugs (apraclonidine, brimonidine), and carbonic anhydrase inhibitors (dorzolamide, brinzolamide). Each of these eye drops has systemic side effects, so they may not be best for everyone. Eye drops that increase the drainage of fluid in the eye include pilocarpine, epinephrine, and prostaglandin-like drugs such as bimatoprost, latanoprost, and others. These drugs also have their own set of side effects. Oral carbonic anhydrase inhibitors such as acetazolamide and methazolamide are used when eye drops are not able to lower eye pressure sufficiently. These drugs also have a variety of side effects.

Laser therapy works by increasing fluid drainage by shrinking part of the spongy filtering tissue, allowing the rest of the tissue to stretch and drain more easily. Another option is surgery, during which a hole in the spongy filter is created to help the fluid to flow out of the eye more easily. A small drainage tube may be inserted to maintain the drainage. Some doctors recommend vitamin supplements specially designed for eye health for their glaucoma patients.