



Diseases and Conditions

Glaucoma

By Mayo Clinic Staff

Glaucoma is a group of eye conditions that damage the optic nerve, which is vital to good vision. This damage is often caused by an abnormally high pressure in your eye.

Glaucoma is one of the leading causes of blindness in the United States. It can occur at any age but is more common in older adults.

The most common form of glaucoma has no warning signs. The effect is so gradual that you may not notice a change in vision until the condition is at an advanced stage.

Vision loss due to glaucoma can't be recovered. So it's important to have regular eye exams that include measurements of your eye pressure. If glaucoma is recognized early, vision loss can be slowed or prevented. If you have the condition, you'll generally need treatment for the rest of your life.

The signs and symptoms of glaucoma vary depending on the type and stage of your condition. For example:

Open-angle glaucoma

- Patchy blind spots in your side (peripheral) or central vision, frequently in both eyes
- Tunnel vision in the advanced stages

Acute angle-closure glaucoma

- Severe headache
- Eye pain
- Nausea and vomiting
- Blurred vision
- Halos around lights
- Eye redness

If left untreated, glaucoma will eventually cause blindness. Even with treatment, about 15 percent of people with glaucoma become blind in at least one eye within 20 years.

When to see a doctor

Seek immediate medical care

Promptly go to an emergency room or an eye doctor's (ophthalmologist's) office if you experience some of the symptoms of acute angle-closure glaucoma, such as severe headache, eye pain and blurred vision.

Schedule eye exams

Open-angle glaucoma gives few warning signs until permanent damage has already occurred. Regular eye exams are the key to detecting glaucoma early enough to successfully slow or prevent vision loss.

The American Academy of Ophthalmology recommends glaucoma screening:

- Every four years beginning at age 40 if you don't have any glaucoma risk factors
- Every two years if you're at high risk or over 65

Glaucoma is the result of damage to the optic nerve. As this nerve gradually deteriorates, blind spots develop in your visual field. For reasons that doctors don't fully understand, this nerve damage is usually related to increased pressure in the eye.

Elevated eye pressure is due to a buildup of a fluid (aqueous humor) that flows throughout your eye. This fluid normally drains into the front of the eye (anterior chamber) through tissue (trabecular meshwork) at the angle where the iris and cornea meet. When fluid is overproduced or the drainage system doesn't work properly, the fluid can't flow out at its normal rate and pressure builds up.

Glaucoma tends to run in families. In some people, scientists have identified genes related to high eye pressure and optic nerve damage.

The types of glaucoma include the following:

Open-angle glaucoma

Open-angle glaucoma is the most common form of the disease. The drainage angle formed by the cornea and iris remains open, but the trabecular meshwork is partially blocked. This causes pressure in the eye to gradually increase. This pressure damages the optic nerve. It happens so slowly that you may lose vision before you're even aware of a problem.

Angle-closure glaucoma

Angle-closure glaucoma, also called closed-angle glaucoma, occurs when the iris bulges forward to narrow or block the drainage angle formed by the cornea and iris. As a result, fluid can't circulate through the eye and pressure increases. Some people have narrow drainage angles, putting them at increased risk of angle-closure glaucoma.

Angle-closure glaucoma may occur suddenly (acute angle-closure glaucoma) or gradually (chronic angle-closure glaucoma). Acute angle glaucoma is a medical emergency. It can be triggered by sudden dilation of your pupils.

Normal-tension glaucoma

In normal-tension glaucoma, your optic nerve becomes damaged even though your eye pressure is within the normal range. No one knows the exact reason for this. You may have a sensitive optic nerve, or you may have less blood being supplied to your optic nerve. This limited blood flow could be caused by atherosclerosis — the buildup of fatty deposits (plaques) in the arteries — or other conditions that impair circulation.

Glaucoma in children

It's possible for infants and children to have glaucoma. It may be present from birth or developed in the first few years of life. The optic nerve damage may be caused by drainage blockages or an underlying medical condition.

Pigmentary glaucoma

In pigmentary glaucoma, pigment granules from your iris build up in the drainage channels, slowing or blocking fluid exiting your eye. Activities such as jogging sometimes stir up the pigment granules, depositing them on the trabecular meshwork and causing intermittent pressure elevations.

Because chronic forms of glaucoma can destroy vision before any signs or symptoms are apparent, be aware of these risk factors:

- Having high internal eye pressure (intraocular pressure)
- Being over age 60
- Being black or Hispanic
- Having a family history of the condition
- Having certain medical conditions, such as diabetes, heart disease, high blood pressure and sickle cell anemia
- Having certain eye conditions, such as nearsightedness
- Having had an eye injury or certain types of eye surgery
- Early estrogen deficiency, such as can occur after removal of both ovaries (bilateral oophorectomy) before age 43
- Taking corticosteroid medications, especially eyedrops, for a long time

Glaucoma usually doesn't cause any noticeable symptoms until it has caused permanent damage. Ask your primary care doctor how often you need to see an eye doctor (ophthalmologist) for a comprehensive eye exam and follow that schedule.

If you have any new eye symptoms or vision problems, make an appointment with your ophthalmologist or ask your doctor for a referral.

Here's some information to help you get ready for your appointment.

What you can do

Before your appointment make a list of:

- Symptoms you've been having, and for how long
- All medications, supplements and vitamins you take, including the doses
- Any eye problems you've had in the past, such as vision changes or eye discomfort
- Questions to ask your doctor

Some basic questions to ask your doctor include:

- Do I have signs of glaucoma?
- What tests do I need to confirm a diagnosis?
- What treatment approach do you recommend?
- What are the alternatives to the primary approach you're suggesting?
- Do I need to follow any activity restrictions?
- What other self-care measures might help me?
- What is the long-term outlook in my case?
- How often do I need to return for follow-up visits?
- Do I need to see an additional specialist?
- I have these other health conditions. How can I best manage them together?

What to expect from your doctor

A doctor who sees you for possible glaucoma is likely to ask you a number of questions, such as:

- Have you had any eye discomfort or vision problems?
- Do you have any other signs or symptoms that concern you?
- Do you have any family history of glaucoma or other eye problems?
- What eye screening tests have you had and when?
- Have you been diagnosed with any other medical conditions?
- Are you using any eyedrops?
- Are you using any vitamins or supplements?

Your doctor will review your medical history and conduct a comprehensive eye examination. He or she may perform several tests, including:

- Measuring intraocular pressure (tonometry)
- Testing for optic nerve damage
- Checking for areas of vision loss (visual field test)
- Measuring corneal thickness (pachymetry)
- Inspecting the drainage angle (gonioscopy)

The damage caused by glaucoma can't be reversed. But treatment and regular checkups can help slow or prevent vision loss, especially if you catch the disease in its early stage.

The goal of glaucoma treatment is to lower pressure in your eye (intraocular pressure). Depending on your situation, your options may include eyedrops, laser treatment or surgery.

Eyedrops

Glaucoma treatment often starts with prescription eyedrops. These can help decrease eye pressure by improving how fluid drains from your eye or by decreasing the amount of fluid your eye makes.

Prescription eyedrop medications include:

- **Prostaglandins.** These increase the outflow of the fluid in your eye (aqueous humor) and reduce pressure in your eye. Examples include latanoprost (Xalatan) and bimatoprost (Lumigan). Possible side effects include mild reddening and stinging of the eyes, darkening of the iris, changes in the pigment of the eyelashes or eyelid skin, and blurred vision.
- **Beta blockers.** These reduce the production of fluid in your eye, thereby lowering the pressure in your eye (intraocular pressure). Examples include timolol (Betimol, Timoptic) and betaxolol (Betoptic). Possible side effects include difficulty breathing, slowed heart rate, lower blood pressure, impotence and fatigue.
- **Alpha-adrenergic agonists.** These reduce the production of aqueous humor and increase outflow of the fluid in your eye. Examples include apraclonidine (Iopidine) and brimonidine (Alphagan). Possible side effects include an irregular heart rate; high blood pressure; fatigue; red, itchy or swollen eyes; and dry mouth.
- **Carbonic anhydrase inhibitors.** Rarely used for glaucoma, these drugs may reduce the production of fluid in your eye. Examples include dorzolamide (Trusopt) and brinzolamide (Azopt). Possible side effects include a metallic taste, frequent urination, and tingling in the fingers and toes.
- **Miotic or cholinergic agents.** These increase the outflow of fluid from your eye. An example is pilocarpine (Isopto Carpine). Side effects include smaller pupils, possible blurred or dim vision, and nearsightedness.

Oral medications

If eyedrops alone don't bring your eye pressure down to the desired level, your doctor may also prescribe an oral medication, usually a carbonic anhydrase inhibitor. Possible side effects include frequent urination, tingling in the fingers and toes, depression, stomach upset, and kidney stones.

Surgery and other therapies

Other treatment options include laser therapy and various surgical procedures. Possible complications include pain, redness, infection, inflammation, bleeding, abnormally high or low eye pressure, and loss of vision. Some types of eye surgery may speed the development of cataracts.

You'll need to see your doctor for follow-up exams. And you may eventually need to undergo additional procedures if your eye pressure begins to rise or other changes occur in your eye.

The following techniques are intended to improve the drainage of fluid within the eye, lowering pressure:

- **Laser therapy.** Laser trabeculoplasty (truh-BEK-u-low-plas-tee) is an option for people with open-angle glaucoma. It's done in your doctor's office. He or she uses a laser beam to open clogged channels in the trabecular meshwork. It may take a few weeks before the full effect of this procedure becomes apparent.
- **Filtering surgery.** With a surgical procedure called a trabeculectomy (truh-bek-u-LEK-tuh-me), your surgeon creates an opening in the white of the eye (sclera) and removes part of the trabecular meshwork.
- **Drainage tubes.** In this procedure, your eye surgeon inserts a small tube in your eye.
- **Electrocautery.** Your doctor may suggest a minimally invasive procedure to remove tissue from the trabecular meshwork using a small electrocautery device called a Trabectome.

Treating acute angle-closure glaucoma

Acute angle-closure glaucoma is a medical emergency. If you're diagnosed with this condition, you'll need urgent treatment to reduce the pressure in your eye. This generally will require both medication and laser or other surgical procedures.

You may have a procedure called a laser peripheral iridotomy in which the doctor creates a small hole in your iris using a laser. This allows fluid (aqueous humor) to flow through it, relieving eye pressure.

Emerging therapies

Researchers are evaluating the effectiveness of new drugs, drug delivery methods, surgical procedures and devices (iStent, others).

These tips may help you control high eye pressure or promote eye health.

- **Eat a healthy diet.** Eating a healthy diet can help you maintain your health, but it won't prevent glaucoma from worsening. Several vitamins and nutrients are important to eye health, including those found in dark, leafy greens and fish high in omega-3 fatty acids.
- **Exercise safely.** Regular exercise may reduce eye pressure in open-angle glaucoma. Talk to your doctor about an appropriate exercise program.
- **Limit your caffeine.** Drinking beverages with large amounts of caffeine may increase your eye pressure.
- **Sip fluids frequently.** Drink only moderate amounts of fluids at any given time during the course of a day. Drinking a quart or more of any liquid within a short time may temporarily increase eye pressure.
- **Sleep with your head elevated.** Using a wedge pillow that keeps your head slightly raised, about 20 degrees, has been shown to reduce intraocular eye pressure while you sleep.
- **Take prescribed medicine.** Using your eyedrops or other medications as prescribed can help you get the best possible result from your treatment. Be sure to use the drops exactly as prescribed. Otherwise, your optic nerve damage could get even worse.

Because some of the eyedrops are absorbed into your bloodstream, you may experience some side effects unrelated to your eyes. To minimize this absorption, close your eyes for one to two minutes after putting the drops in. Or press lightly at the corner of your eye near your nose to close the tear duct for one or two minutes. Wipe off any unused drops from your eyelid.

Some alternative medicine approaches may help your overall health but none are effective glaucoma remedies. Talk with your doctor about their possible benefits and risks.

- **Herbal remedies.** A number of herbal supplements, such as bilberry and ginkgo, have been advertised as glaucoma remedies. But further study is needed to prove their effectiveness. Don't use herbal supplements in place of proven therapies.
- **Relaxation techniques.** Stress may trigger an attack of acute angle-closure glaucoma. If you're at risk of this condition, find healthy ways to cope with stress. Meditation and other techniques may help.
- **Marijuana.** Research shows that marijuana lowers eye pressure in people with glaucoma, but only for three to four hours. Other, standard treatments are more effective. The American Academy of Ophthalmology doesn't recommend marijuana for treating glaucoma.

When you receive a diagnosis of glaucoma, you're facing lifelong treatment, regular checkups and the possibility of progressive vision loss.

Meeting and talking with other people with glaucoma can be very helpful, and many support groups exist. Check with hospitals and eye care centers in your area to find local groups and meeting times. Several online resources, including support groups, are available.

You may not be able to prevent glaucoma. But these self-care steps can help you detect it early, limit vision loss or slow its progress.

- **Get regular eye care.** Regular comprehensive eye exams can help detect glaucoma in its early stages before irreversible damage occurs. As a general rule, have comprehensive eye exams every four years beginning at age 40 and every two years from age 65. You may need more frequent screening if you're at high risk of glaucoma. Ask your doctor to recommend the right screening schedule for you.
- **Know your family's eye health history.** Glaucoma tends to run in families. If you're at increased risk, you may need more frequent screening.
- **Exercise safely.** Regular, moderate exercise may help prevent glaucoma by reducing eye pressure. Talk with your doctor about an appropriate exercise program.
- **Take prescribed eyedrops regularly.** Glaucoma eyedrops can significantly reduce the risk that high eye pressure will progress to glaucoma. To be effective, eyedrops prescribed by your doctor need to be used regularly even if you have no symptoms.
- **Wear eye protection.** Serious eye injuries can lead to glaucoma. Wear eye protection when using power tools or playing high-speed racket sports on enclosed courts.

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