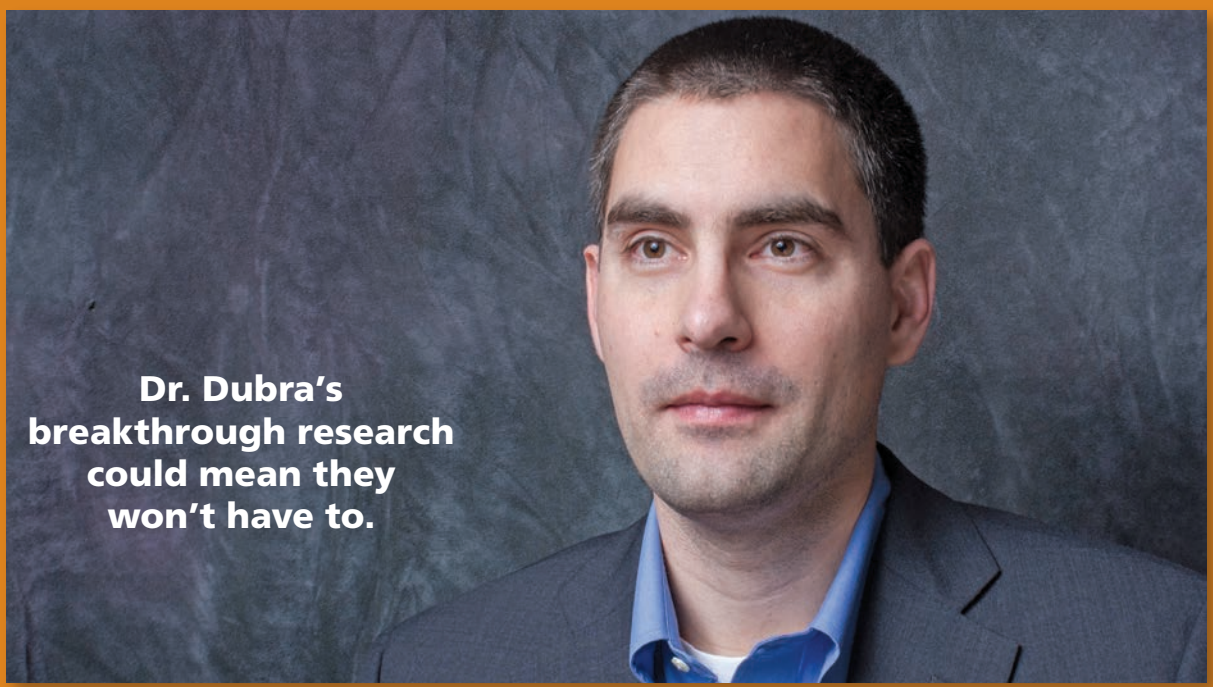
Understanding and Living with Glaucoma





GLAUCOMA
RESEARCH FOUNDATION

“I genuinely believe that a cure will be found in my lifetime.”

Amanda Eddy,
glaucoma patient and
Glaucoma Research Foundation donor



Amanda was diagnosed with glaucoma at three months old. Doctors saved Amanda’s vision and it has been stable for more than 35 years. Today, Amanda is married and is a successful jewelry designer in Austin, Texas.

Understanding and Living with Glaucoma

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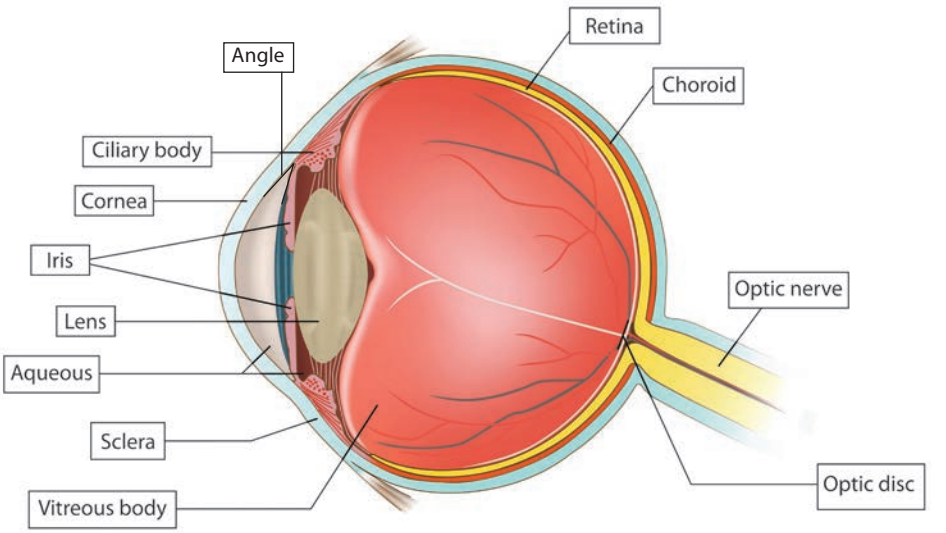
Understanding Glaucoma

What is Glaucoma?

Glaucoma is an eye disease that gradually steals your vision. Usually, glaucoma has no symptoms in its early stages. Without proper treatment, glaucoma can lead to blindness. The good news is that with regular eye exams, early detection, and treatment, you can preserve your sight. This guide will give you a complete introduction to the facts about glaucoma.

How the Eye Works

A tough white covering called the sclera protects the eye. A clear, delicate membrane called the conjunctiva covers the sclera. The cornea is the clear part of the eye's protective covering that allows in light. The iris is the colored part of the eye that contracts and expands so the pupil can let just the right amount of light into the eye. The lens focuses the light onto the the retina (lining the back of the eye). Nerve fibers in the retina carry images to the brain through the optic nerve.

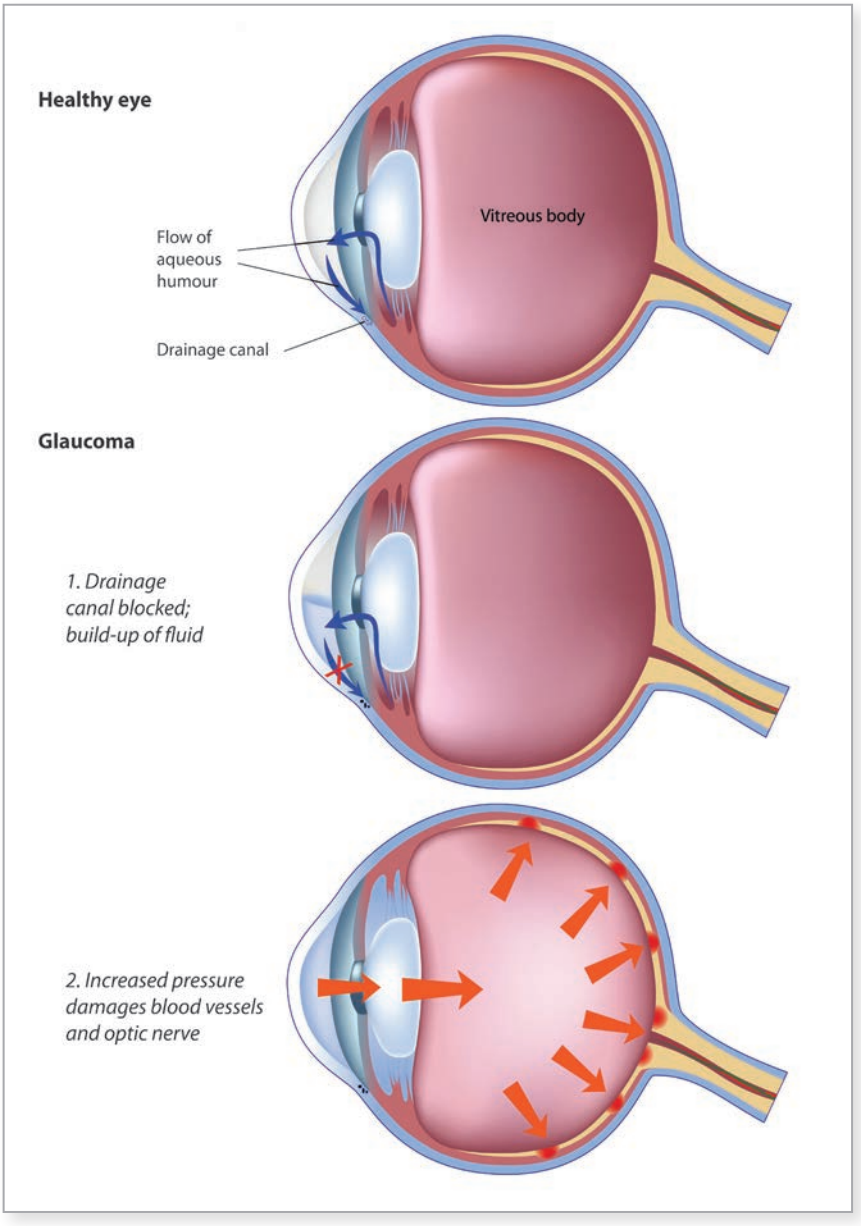


Healthy Eye Drainage

The front part of the eye is filled with a clear fluid (called intraocular fluid or aqueous humor) made by the ciliary body. The fluid flows out through the pupil. It is then absorbed into the bloodstream through the eye's drainage system, called the trabecular meshwork (a network of drainage canals). The trabecular meshwork is located in the angle, which is the space between the clear part of the eye (cornea) and the colored part (iris), close to their meeting point near the edge of the iris. Proper drainage helps keep eye pressure at a normal level. The production, flow, and drainage of this fluid is an active, continuous process that is needed for the health of the eye.

The inner pressure of the eye (intraocular pressure or IOP) is dependent on the balance between production and drainage of aqueous fluid in the eye. If your eye's drainage system is working properly, then fluid can drain freely out and prevent a buildup. Likewise, if your eye's fluid system is working properly, then the right amount of fluid can be produced. Your IOP can vary during the day, but normally stays within a manageable range.

Development of Glaucoma



Blocked drainage canals increase eye pressure, causing optic nerve damage.

The Eye with Glaucoma

In most types of glaucoma, the eye's drainage system becomes clogged so the intraocular fluid cannot drain. As the fluid builds up, it causes pressure to build inside the eye. High pressure damages the sensitive optic nerve and results in vision loss.

The Optic Disc

You have millions of nerve fibers that run from your retina to the optic nerve. These fibers meet at the optic disc. As fluid pressure within your eye increases, it damages these sensitive nerve fibers and they begin to die. As they die, the disc begins to hollow and develops a cupped or curved shape. If the pressure remains too high for too long, the extra pressure can damage the optic nerve and result in vision loss.

Intraocular Pressure

It was once thought that high intraocular pressure (IOP) was the main cause of this optic nerve damage. Although IOP is clearly a risk factor, we now know that other factors must also be involved because people with "normal" IOP can experience vision loss from glaucoma.

How Vision Loss Occurs

Glaucoma usually occurs in both eyes, but extra fluid pressure often starts to build up in one eye first. This damage may cause gradual visual changes and loss of sight. Often, peripheral (side) vision is affected first, so the change in your vision may be small enough that you may not notice it. With time, your central (direct) vision will also begin to be lost.

Who Gets Glaucoma?

Anyone. But those at higher risk to develop glaucoma include those who:

- Are over 60 years old
- Are of African, Asian, or Hispanic descent
- Have relatives with glaucoma
- Are very nearsighted (myopic) or far-sighted (hyperopic)
- Use steroid medications
- Have high eye pressure
- Have a thin central cornea
- Have had an eye injury

When Should You Get Your Eyes Checked for Glaucoma?

Early detection, through regular and complete eye exams, is the key to protecting your vision from damage caused by glaucoma. It is important to have your eyes examined regularly. Your eyes should be tested:

- Before age 40, every two to four years
- From age 40 to age 54, every one to three years
- From age 55 to 64, every one to two years
- After age 65, every six to 12 months



Are There Symptoms?

In the most common form of glaucoma, buildup of fluid pressure happens very slowly. Often, there are no uncomfortable or painful symptoms.

In less common kinds of glaucoma, symptoms can be more severe. These symptoms can include:

- Hazy vision
- Eye and head pain
- Nausea or vomiting
- The appearance of rainbow-colored circles around bright lights
- Sudden sight loss

Glaucoma affects people of all ages, from babies to older adults. Although everyone is at risk for glaucoma, those at higher risk include people over age 60, relatives of people with glaucoma, people of African, Asia, or Hispanic descent, people who use steroids, and people who have elevated eye pressure or have had an eye injury.

Sight loss resulting from glaucoma cannot be reversed. However, early detection and careful, lifelong treatment with medication or surgery can maintain vision.

Different Types of Glaucoma

There are several types of glaucoma. The two main types are open-angle and angle-closure.

Open-Angle Glaucoma

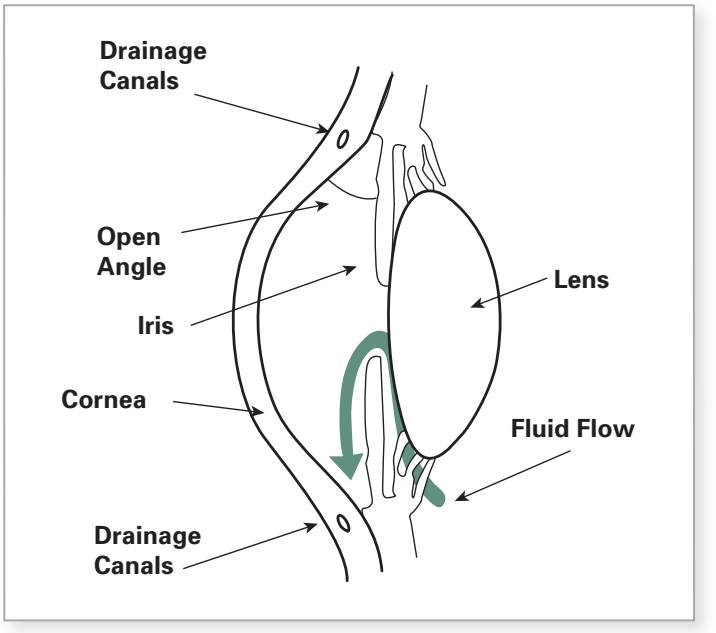
Open-angle glaucoma, the most common form of glaucoma, accounting for at least 90% of all glaucoma cases:

- Is caused by the slow clogging of the drainage canals, resulting in increased eye pressure
- Has a wide and open angle between the iris and cornea
- Develops slowly and is a lifelong condition

There are no early warning signs of open-angle glaucoma. It develops slowly and sometimes without noticeable sight loss for many years. Most people who have open-angle glaucoma feel fine and do not notice a change in their vision. That is why regular eye exams are so important.

With early detection, open-angle glaucoma usually responds well to medication.

However, it will be very important that you carefully follow your medication regimen to continually preserve healthy eye pressure and prevent vision loss.



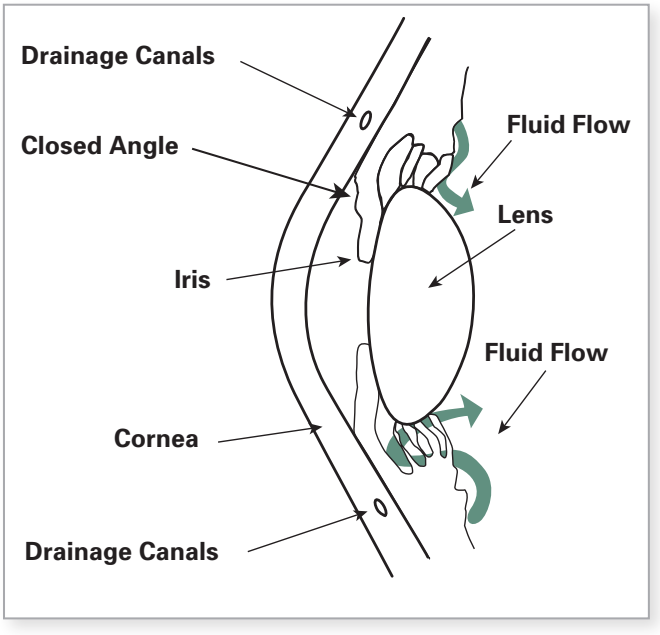
Open-angle is the most common type of glaucoma.

Angle-Closure Glaucoma

The other main type of glaucoma is called angle-closure (or narrow angle) glaucoma. In this type of glaucoma, the angle is closed in many or most areas, causing increased eye pressure, which leads to optic nerve damage, and possible vision loss. This rise in eye pressure may occur suddenly (an acute attack of angle closure) or gradually. There are also early stages of the disease in which the angle is closed but the eye pressure may or may not be high and the optic nerve is not affected yet.

In acute angle-closure, the intraocular pressure rises very quickly, causing symptoms such as eye pain, blurry vision, redness, rainbow colored rings (or haloes) around lights, and nausea and/or vomiting. An acute attack of angle-closure glaucoma can cause permanent vision damage and requires immediate medical attention. The gradual form of angle-closure (chronic angle-closure glaucoma) usually has no symptoms and may not be apparent in the earlier stages without an eye examination.

Treatment of angle-closure glaucoma, and eyes at risk for this disease, usually involves a laser procedure (laser peripheral iridotomy) to create a small opening in the outer edge of the iris. Other treatments are similar to open-angle glaucoma and include medications to lower eye pressure and incisional surgery.



An acute attack of angle-closure glaucoma needs immediate treatment.

Other Types of Glaucoma

Most of the other types of glaucoma are variations of open-angle or angle-closure types. These types can occur in one or both of your eyes.

Secondary Glaucoma

Can occur as the result of an eye injury, inflammation, tumor, in advanced cases of cataract or diabetes or by certain drugs such as steroids. This form of glaucoma may be mild or severe. The type of treatment will depend on whether it is open-angle or angle-closure glaucoma.

Pigmentary Glaucoma

Is a form of secondary open-angle glaucoma, occurring when the pigment granules that are in the back of the iris (the colored part of the eye) break into the clear fluid produced inside the eye. These tiny pigment granules flow toward the drainage canals in the eye and slowly clog them, causing eye pressure to rise. Treatment usually includes medications, laser surgery, or filtering surgery.

Normal-tension Glaucoma (NTG)

Is also called low-tension or normal-pressure glaucoma. In this type of glaucoma, the optic nerve is damaged even though the intraocular pressure (IOP) is not very high. The cause is unknown. People at higher risk for normal tension glaucoma have a family history of normal-tension glaucoma or are of Japanese ancestry.



Asians are at higher risk for normal-tension glaucoma.

Congenital Glaucoma

Occurs in babies when there's incorrect or incomplete development of the eye's drainage canals during the prenatal period. This is a rare condition that may be inherited.



Congenital glaucoma can often be corrected with surgery.

Exfoliative Glaucoma

Occurs when a flaky, dandruff-like material peels off the outer layer of the lens within the eye. The material collects in the angle between the cornea and iris and can clog the drainage system of the eye, causing eye pressure to rise. It is also called pseudoexfoliative glaucoma.

Neovascular Glaucoma

The abnormal formation of new blood vessels on the iris and over the eye's drainage channels can cause this form of glaucoma. Neovascular glaucoma is always associated with other abnormalities, most often diabetes. It never occurs on its own. The new blood vessels block the eye's fluid from exiting through the trabecular meshwork (the eye's drainage canals), causing an increase in eye pressure.

Uveitic Glaucoma

Uveitis is swelling and inflammation of the uvea, the middle layer of the eye. The uvea provides most of the blood supply to the retina. Increased eye pressure in uveitis can result from the inflammatory process itself or the medication (steroids) used to treat it.

Traumatic Glaucoma

Injury to the eye may cause traumatic glaucoma. This form of open-angle glaucoma can occur immediately after the injury or develop years later. It can be caused by blunt injuries that bruise the eye (called blunt trauma) or by injuries that penetrate the eye.

Detecting Glaucoma

How is Glaucoma Diagnosed?

To be safe and accurate, five factors should be checked before making a glaucoma diagnosis:

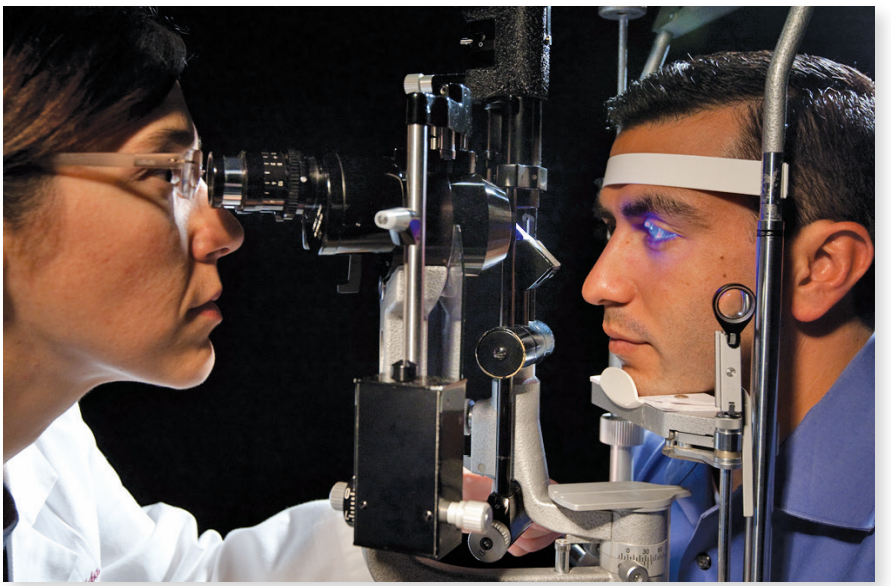
1. The inner eye pressure (intraocular pressure or IOP) [tonometry]
2. The shape and color of the optic nerve (ophthalmoscopy or dilated eye exam)
3. The field of vision (perimetry test)
4. The angle in the eye where the iris meets the cornea (gonioscopy)
5. Thickness of the cornea (pachymetry).

What to Expect During Glaucoma Examinations

Tonometry

During tonometry, eye drops are used to numb the eye. Then a doctor or technician uses a device called a tonometer to measure the inner pressure of the eye.

A small amount of pressure is applied to the eye by a tiny device. The average range for eye pressure is 12–22 mm Hg ("mm Hg" refers to millimeters of mercury, a scale used to record eye pressure). The level of eye pressure at which glaucoma develops is not the same for everyone and some people can get glaucoma even if their pressures are within the average range of 12–22 mm Hg.



Checking the eye pressure.

Ophthalmoscopy

This diagnostic procedure helps the doctor examine your optic nerve for glaucoma damage. Eye drops are used to dilate the pupil so that the doctor can see through your eye with a special lens in order to examine the shape and color of the optic nerve.

An optic nerve that is cupped or not a healthy pink color is cause for concern.

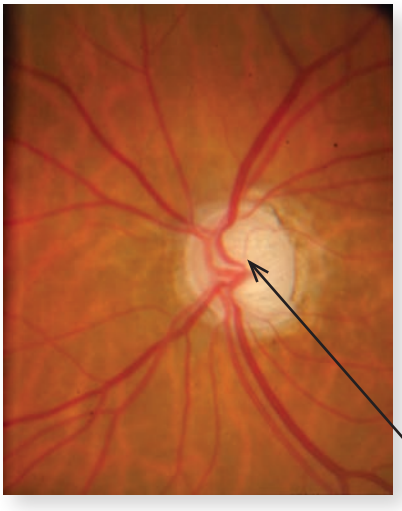
Additional ophthalmoscopy technologies your doctor may use include:

- Confocal scanning laser ophthalmoscopy, a special laser that produces a three-dimensional high-resolution image of the optic nerve. This test provides clinicians with measurements of nerve fiber damage (or loss).
- Scanning laser polarimetry uses laser light to measure the thickness of the nerve fiber layer.
- Optical Coherence Tomography (OCT) measures the reflection of laser light much like an ultrasound measures the reflection of sound, and can directly measure the thickness of the nerve fiber layer and create a three-dimensional representation of the optic nerve.

By imaging your optic nerve over time during multiple visits to your eye doctor, these technologies can help detect progressive loss of optic nerve fibers.



Healthy optic nerve.



Damaged optic nerve in an eye with glaucoma.

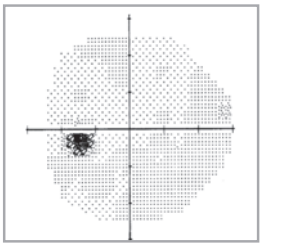
Perimetry

Perimetry (or a visual field test) produces a map of your field of vision. This test will help a doctor determine whether your vision has been affected by glaucoma.

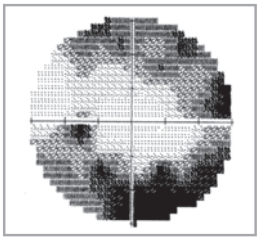
Do not be concerned if there is a delay in seeing the light as it moves in or around your blind spot. This is perfectly normal and does not necessarily mean that your field of vision is damaged.

Try to relax, blink normally, and respond as accurately as possible during the test. Your test performance may be worse if you are tired or having a bad day.

Your doctor may want you to repeat the test to see if the results are the same the next time you take it. After glaucoma has been diagnosed, visual field tests are usually done one to two times a year to check for any changes in your vision.



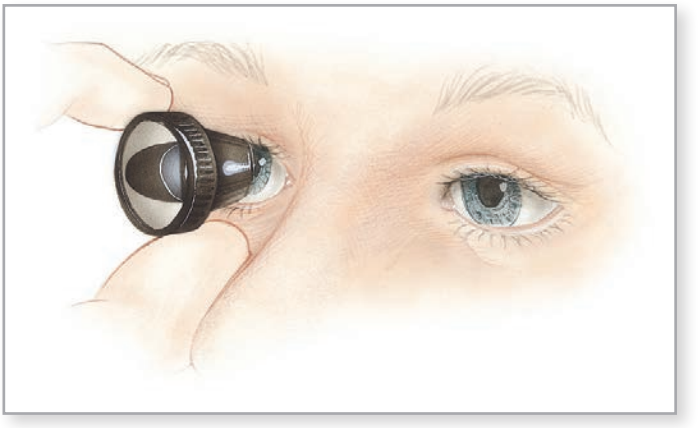
Visual field within normal limits



Visual field outside normal limits

Gonioscopy

Gonioscopy is a diagnostic exam that helps determine whether the angle where the iris meets the cornea is open and wide or narrow and closed. During the exam, eye drops are used to numb the eye and a special hand-held contact lens is gently placed on the eye for a few moments.



Gonioscopy uses a contact lens to see the angle between the iris and cornea.

Pachymetry

Pachymetry measures the thickness of the cornea—the clear window at the front of the eye. Corneal thickness has the potential to influence eye pressure readings. If a cornea is thicker than average, pressure readings with a tonometer may be higher. This gives your eye doctor additional information for your glaucoma diagnosis.

Why are There so Many Diagnostic Exams?

Diagnosing glaucoma is not always easy. The most important concern is protecting your sight. Doctors look at many factors before you and he or she make decisions about treatment. If your condition is particularly difficult to diagnose or treat, you may be referred to a glaucoma specialist. A second opinion is always wise if you or your doctor become concerned about your diagnosis or your progress.

Is There a Cure?

With early diagnosis and proper medication and treatment, glaucoma can be controlled. However, sight loss resulting from glaucoma cannot be restored. At the present time, there is no cure. Once detected, glaucoma usually requires ongoing, long-term care. Keeping your eye pressure under control is very important. You must follow your treatment plan carefully to help control your eye pressure. This will protect the optic nerve and prevent sight loss.

Many people think that glaucoma has been cured when high eye pressure is lowered to safe levels with medication or surgery. In fact, the glaucoma is only being controlled, not cured. Regular checkups are still needed even after medications or surgeries have controlled the eye pressure.



A pachymeter measures corneal thickness.

Treating Glaucoma

Glaucoma is treated by lowering intraocular pressure and this can be achieved with medications, laser treatment, incisional surgery, or a combination of these.

Glaucoma Medications

Glaucoma is typically treated with the use of medications that either help the fluid drain better or decrease the amount of fluid made by the eye. In most cases, medication can safely control eye pressure for many years. Experts agree that your eye pressure must remain under constant control to prevent your glaucoma from growing worse. That's why it is especially important that you take your prescribed medication on schedule every day.

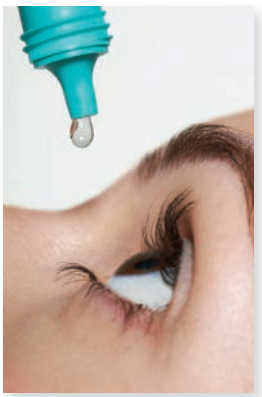
What About Side Effects?

Most medications have some side effects. Usually, side effects lessen after a few weeks. However, you should ask your doctor about any physical or emotional changes that occur when taking glaucoma medications. Make sure that you tell all of your doctors (including your family physician) about any glaucoma medications you are taking and any side effects you are feeling.

In particular, older people with glaucoma should look for changes in behavior or mobility that may be a side effect of medications. If the side effects are very uncomfortable or last a while, your doctor can prescribe another medication.

If Your Doctor Changes Medications

Changing medications does not necessarily mean that the glaucoma is getting worse. In fact, it is normal for your medication prescriptions to change over time. As your body begins to develop a tolerance for your medication, it will slowly lose its effectiveness and may need to be replaced by a stronger version of the same drug or a different medication. Doctors can often return to previously used medications after your body has had a chance to "forget" the old medication.



Eye drops are often the first choice for treating glaucoma.

Medication programs can also change to include new drugs that are more effective or more comfortable for you to use. Researchers are working to find glaucoma medications with fewer side effects and medications that can be taken less often.

The Importance of Following Your Medication Regimen

You may hear your doctor talk about the importance of your compliance with your medication regimen. Compliance simply refers to a patient's ability to follow their prescribed plan for taking medications. Much of your eye health is up to you. Medications only work as long as they are taken in the prescribed method.

Tips to help you stay on track:

- **Make a schedule.** Write down the name and dosage, and number of times your medication(s) should be taken each day. Post your medication schedule in a place where you will see it often such as on the refrigerator door or above your desk at work. You may find color-coding your medications will help you better identify them.
- **If you forget** to use your eye drops, put them in as soon as you remember instead of waiting until the next scheduled time. Then get back on your regular schedule for the next time. Always check with your doctor if you are not sure about any part of your eye drop routine. To be certain, you may want to demonstrate how you put in your eye drops for your doctor.
- **Always check with your doctor** and/or pharmacist when taking more than three drugs of any kind, including vitamins and natural remedies, for assurance that your medications are not interacting in a negative manner.



Your compliance is important to keep glaucoma under control.

Tips on Using Medications

- Schedule medications around daily routines like waking and mealtimes.
- Remember that twice a day means every 12 hours, for example, 7 am and 7 pm.
- Keep your medications in a visible place at home and take them with you when you go out.
- Keep eye drops out of the reach of children and out of direct sunlight.
- Tell your doctor if your medications are causing reactions or if you are having any difficulty using them. It may be possible to change your medication program.
- It is easiest to put eye drops in the eye if you are sitting with your head tilted back or lying on your back.

How to Use Eye Drops

Before using eyedrops, wash your hands. Sit down and tilt your head back, or lie down and look at the ceiling. Then follow these steps:



1) Make a pocket in your lower lid pulling down with your index finger.



2) Look up. Squeeze one drop into the pocket in your lower lid. Don't blink, wipe your eye, or touch the tip of the bottle to your eye or face.



3) Close your eye. Keep closed for 2-3 minutes without blinking.

Optional: Press the inside corner of the eye (to stop the drop from draining into your throat).

Repeat steps 1 through 3 for each eye and each kind of drop you use. Wait 3 to 5 minutes between drops.

Trouble-shooting eye drops:

- Follow your doctor's instructions for using your drops.
- Tell your doctor about any other drugs you're taking (including everyday products like vitamins and aspirin) and about any allergies.
- If using two or more kinds of drops at the same time, wait five minutes before putting the next drop in the eye to make sure the first drop has had time to work.
- If your hands are shaking, try approaching your eye from the side so you can rest your hand on your face to help steady your hand.
- If you're having trouble getting the drop into your eye, lie down flat, face up with your eye closed. Place the drop outside of the lid in the corner of your eye near the nose. As you open your eye, the drop will roll in.
- If you're not sure the drop actually got into your eye, put in another. The eyelid can hold only about one drop, so any excess will run out of the eye. It's better to have excess runoff than to not have enough medication in your eye.
- If you're having trouble holding onto the bottle, try wrapping something (like a paper towel) around the bottle to make it wider.
- Some manufacturers of glaucoma eye drop medications make helpful devices that can assist you in putting the drops in your eye. If you continue to have trouble despite the above suggestions, ask your eye doctor if such a device might be useful to you.



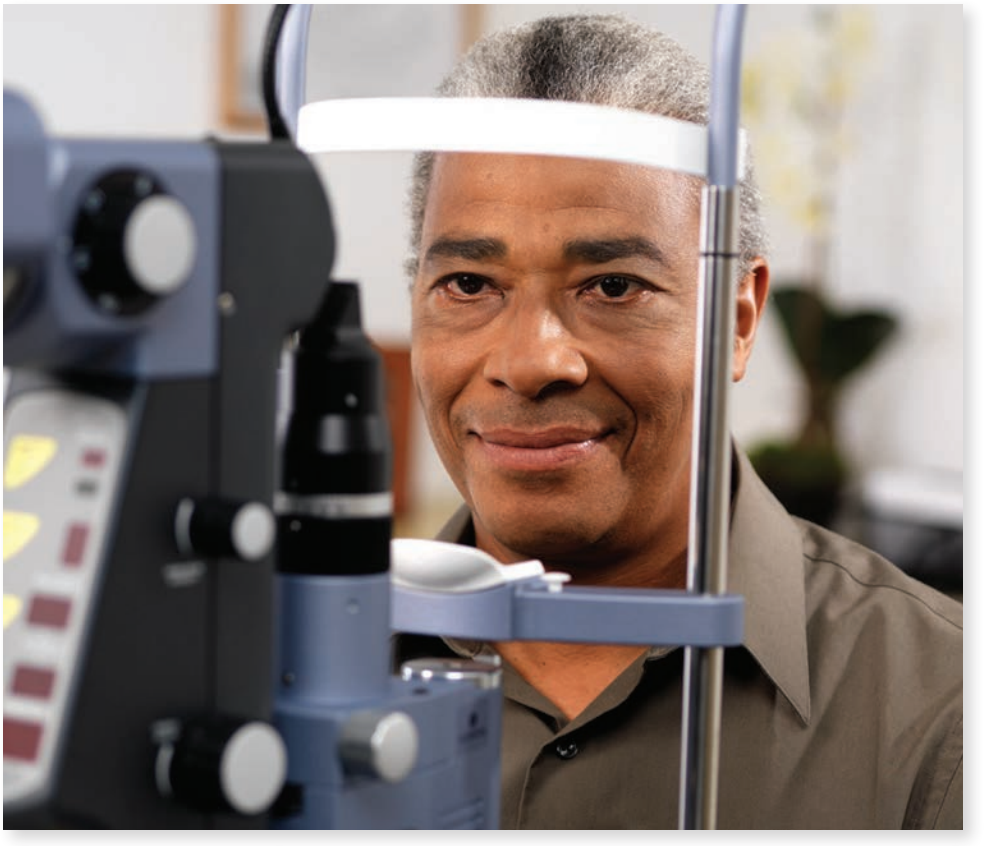
Make sure the dropper stays clean.

Laser Treatment

There are several types of laser surgery used to treat glaucoma. The type of laser surgery will depend on the form of glaucoma and how severe it is. Laser surgeries are performed in an outpatient setting in your doctor's office or in a hospital clinic.

In laser surgery, special eye drops are used to numb your eye. Then your doctor, using a microscope, focuses the light beam on exactly the right place in your eye.

Laser surgery is the main initial treatment method for angle-closure glaucoma, which results in widening of the angle for most patients. In cases of open-angle glaucoma, laser surgery can be used as a primary or an adjunct treatment with medications.



Laser surgery may reduce the need for pressure-lowering eye drops.



SLT treatment uses very low levels of laser energy to improve drainage of fluid out of the eye.

What to Expect

- Special eye drops are used to numb your eye. Then your doctor uses a special type of lens to visualize the treatment area.
- Using a microscope, your doctor focuses the laser light beam on exactly the right place in your eye.
- During laser surgery, you will see a bright light—like a camera flash—and you may feel a faint tingling sensation.
- The laser light beam passes harmlessly through the outer covering of your eye and treats only where it is focused.
- Afterward, your eye may be slightly irritated and slightly blurred, and your doctor may tell you to take it easy for a day or so.
- Although laser surgery may not permanently control your eye pressure, it can often delay the need for incisional surgery.

Types of Laser Treatment

Selective Laser Trabeculoplasty (SLT)

- Used for open-angle glaucoma.
- Uses very low levels of laser energy and improves drainage of fluid out of the eye.
- Treats specific cells and leaves the mesh-like drainage canals surrounding the iris intact. For this reason, SLT may often be safely repeated.
- May be used as initial treatment or as an adjunct to pressure-lowering eye drops.

Argon Laser Trabeculoplasty (ALT)

- Used for open-angle glaucoma.
- Laser beam is aimed at the fluid drainage channels helping the drainage system work better.
- Treatment cannot be repeated due to the risk of scar formation in the drainage canals.
- SLT may be effective for those who have been treated unsuccessfully with ALT.

Laser Peripheral Iridotomy (LPI)

- Used for angle-closure glaucoma and eyes at risk for this condition.
- Procedure makes an opening in the iris, helping the fluid to drain.

Laser Cyclophotocoagulation

- Laser is used to treat the ciliary process to decrease the amount of fluid produced.



Laser surgery helps to lower pressure in the eye.

Incisional Surgery

Incisional surgery is done in a hospital or surgery center and uses conventional but tiny instruments, along with a microscope. It is successful with any type of glaucoma. Incisional surgery is usually considered when the maximum amount of medication is not controlling your eye pressure or when you cannot tolerate the side effects of the medication. Incisional surgery is the main treatment for congenital glaucoma, because it may be the only way that incorrectly formed drainage canals can be opened.

What to Expect

- Before surgery begins, a local anesthetic, along with a medication to help you relax, is given to prevent you from feeling any discomfort during the procedure.
- During surgery, the doctor looks through a microscope that is placed several inches above your eye.
- A tiny opening is made in the sclera (the white part of the eye) with a small surgical instrument. This procedure is called a trabeculectomy. This new opening allows the intraocular fluid to bypass the clogged drainage canals and flow out of this new, artificial drainage canal. Special medications (antifibrotics) may be given to prevent scarring of the artificial drainage canal. The Ex-Press mini glaucoma shunt may be used with conventional trabeculectomy techniques to standardize the operation and perhaps reduce the chances of the eye pressure getting too low in the immediate post-operative period, which is occasionally a problem with conventional approaches.
- Another procedure uses an artificial drainage device (aqueous shunt) or implant to lower intraocular pressure. Several different kinds of these devices are in use.
- Surgery does require some recovery time, which will vary according to your age, job, and other personal factors. Most people can move around and return to their normal activities soon after going home from the hospital, though you may have to wear an eye patch to protect your eye.
- For at least a week after glaucoma surgery, it is advisable to keep water out of the eye. It is also good to take a break from driving, reading, bending, and strenuous exercise.
- Glaucoma surgery may have to be repeated, especially if excessive scarring cannot be prevented or after long periods of time.

Alternative Surgical Treatments — Minimally Invasive Glaucoma Surgery (MIGS)

Seeking to reduce complications associated with conventional glaucoma surgery, alternative surgical options have been developed.

In MIGS procedures, unlike conventional glaucoma surgery, there is minimal manipulation of the sclera (the white outer layer of the eye) and the conjunctiva (the membrane that covers the front of the eye and lines the inside of the eyelids). While these procedures reduce the incidence of complications, some degree of effectiveness is also traded for the increased safety.

- Trabecular Surgery—The trabecular meshwork can be removed or bypassed.
- Totally internal or suprachoroidal shunts—Using tiny tubes with very small internal openings, the front of the eye is connected to the suprachoroidal space between the retina and the wall of the eye to augment the drainage of fluid from the eye.
- Miniaturized versions of trabeculectomy—Using tiny, microscopic-sized tubes that can be inserted into the eye and drain fluid from inside the eye to underneath the conjunctiva, these devices are designed to make the trabeculectomy operation safer.

These new approaches to glaucoma surgery show promise for better safety. As with all new procedures, time and follow-up studies are required to see which surgical procedures will remain useful for helping glaucoma patients long-term.



MIGS procedures promise improved safety.

Living With Glaucoma

If Your Vision Begins To Change

Some people with glaucoma have "low vision." Low vision means there may be problems doing daily, routine things even if using glasses or contact lenses. With glaucoma, this can include loss of contrast sensitivity (the ability to see shades of the same color), problems with glare, light sensitivity, and reduced visual acuity (the ability to see fine details). A variety of products and resources are available to help people who have low vision. Examples include magnifiers, colored lenses, and computer text enlargers. If you have low vision concerns, help is available. Discuss your concerns with your doctor.

Working With Your Doctor

As a newly diagnosed person with glaucoma, you may need to have your eye pressure checked every week or month until it is under control. Even when your eye pressure is at a safe level, you may need to see your doctor several times a year for checkups.

It is important that your doctor listens and responds to your concerns and questions, is willing to explain your treatment options, and is available for calls and checkups. If you do not feel confident and comfortable with your doctor, remember, you always have the right to seek a second opinion.



A good relationship with your eye doctor is important.

What You Can Do to Manage Your Glaucoma

Know and Keep Track of Your Medications

Some medications may cause you to experience strong side effects. Be sure to tell your doctor about any side effects you experience once you have started your medication. The intensity of your side effects may mean you need a different type of medication.

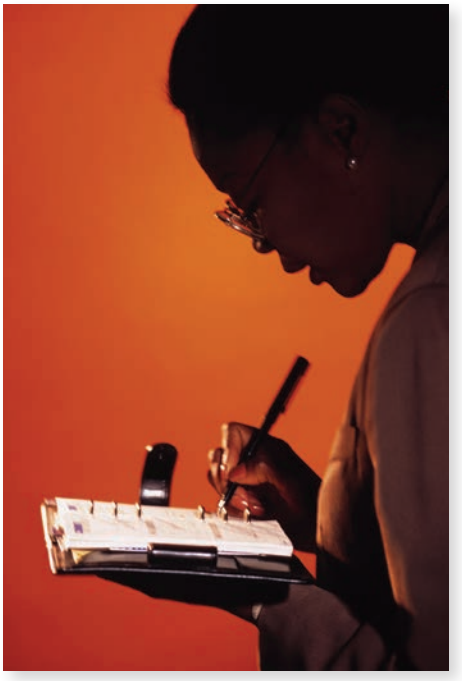


Make your medications part of your daily routine.

- Make your medications part of your daily routine, perhaps by taking them when you get up, at mealtimes, and/ or at bedtime. Use an alarm watch or a smartphone to remind you of when to take your medication.
- Get an extra supply of medication in case you misplace a bottle of eye drops or pills. Take an extra prescription along with you on trips away from home.
- Find out about possible side effects. But remember, if your side effects are severe, the medication may not be right for you. Talk to your doctor about any side effects..
- It's important that you tell everyone on your healthcare team—including your family doctor and any other specialists—that you have glaucoma and what medications you are taking. This will help them in prescribing treatments that won't interfere with your glaucoma medications. Be especially careful about using any medication that contains steroid.
- Let your doctor know if, for any reason, your medications are not working for you, or if your daily routine has changed. Your doctor may be able to solve such problems by changing the type or timing of your medications.
- Report any changes to your doctor.

Stay Organized

- Keep a record of each medication you are taking. Write down the name, the dosage, and the number of times it should be taken each day. Keep it in your purse or wallet, or place it where you will see it every day.
- Schedule your next checkup before you leave the doctor's office, and put your appointment on your calendar.
- Go for a checkup before you go on a long trip or start a long-term, demanding project.
- Write down any questions you have about your eyes, vision, or medications before you see your doctor. During your checkup, bring this list of questions, and write down your doctor's answers.



Keep a record of your medications.

Your Lifestyle Counts

- Try to keep your eyes clean and free of irritants. Women might want to be careful about eye cosmetics, by using non-allergenic brands and by replacing them often.
- Don't rub your eyes, even though some glaucoma medications might make them feel itchy or blurry.
- If you have had eye surgery, it's a good idea to wear goggles when swimming and protective glasses when doing yard work or when playing contact sports.
- Take care of the rest of your body. Keeping in good general health is just as important as taking care of your eyes.



- Eating healthy foods, getting enough exercise, not smoking, not ingesting too much caffeine, and staying at a healthy weight are important. Be sure to check with your doctor before you start any strenuous exercise program.
- Space out your fluid intake. This will help prevent fluid retention.
- Lower your salt intake to prevent fluid retention.



Reduce stress in your life, and make time for relaxation.

Your Feelings Are Important

Glaucoma has another side—the emotional and psychological aspects of having a chronic, sight-threatening health condition. When you are first diagnosed with glaucoma you may experience worry, fear, helplessness, depression, or lethargy. Take the time to learn about the disease and you'll find that there are many steps you can take to help manage glaucoma. Even if you lose some of your vision, you can work with low vision rehabilitation counselors to learn how to continue leading an active life.

As a glaucoma patient, you have the chance to teach your friends and relatives about this disease. Many people are unaware of the importance of eye checkups and do not know that individuals with glaucoma may have no symptoms. You can help protect their eye health by encouraging them to have their eye pressure and optic nerves checked regularly.

We are limited only by what we think we can or cannot do. You can continue with what you were doing before glaucoma was diagnosed. You can make new plans and start new ventures. And you can trust the eye care community to keep looking for better treatment methods for glaucoma. Take good care of yourself and your eyes, and get on with enjoying your life.

Patient Notes

A Guide to Glaucoma Medications

Alpha Agonist

MANUFACTURER	PRODUCT NAME	GENERIC NAME
Alcon Laboratories, Inc.	Iopidine®	Apraclonidine HCl 0.5%, 1%
Allergan, Inc.	Alphagan® P	Brimonidine tartrate 0.1%, 0.15%

ACTION: Decreases the production of intraocular fluid. Also increases drainage of intraocular fluid.

NOTES: Side effects can include burning or stinging upon instillation of the eye drop, fatigue, headache, drowsiness, dry mouth, and dry nose.

Beta Blockers

MANUFACTURER	PRODUCT NAME	GENERIC NAME
Akorn Inc.	Betimol®	Timolol hemihydrate 0.25%, 0.5%
	Timolol Maleate USP	Timolol maleate 0.5%
Alcon Laboratories, Inc.	Betoptic® S	Betaxolol HCl 0.25%, 0.5%
Allergan, Inc.	Betagan®	Levobunolol HCl 0.25%, 0.5%
Bausch & Lomb, Inc.	Istalol®	Timolol maleate ophthalmic solution 0.5%
	OptiPranolol®	Metipranolol 0.3%
	Timoptic in Ocudose (PF)	Timolol Maleate Ophthalmic Solution 0.25%, 0.5% in Ocudose dispenser
	Timoptic-XE®	Timolol maleate ophthalmic gel forming solution 0.25%, 0.5%

ACTION: Decreases production of intraocular fluid

NOTES: Side effects can include low blood pressure, reduced pulse rate, and fatigue. Beta blockers can also cause a shortness of breath in people who have a history of asthma or other respiratory disorders. Additionally, beta blockers can change cardiac activity by decreasing the amount of blood the heart pumps out, which may reduce the pulse rate and/or slow down the heart's response rate during exercise. Rare side effects include reduced libido and depression. "PF" indicates "Preservative-Free Medication."

Carbonic Anhydrase Inhibitor (CAI)

MANUFACTURER	PRODUCT NAME	GENERIC NAME
Alcon Laboratories, Inc.	Azopt™	Brinzolamide ophthalmic suspension 1%
Fera Pharmaceuticals	Neptazane®	Methazolamide
Merck & Co., Inc.	Trusopt®	Dorzolamide HCl 2%
Teva	Diamox® Sequels®	Acetazolamide

ACTION: Decreases production of intraocular fluid

NOTES: Side effects of Diamox Sequels can include tingling or loss of strength of the hands and feet, upset stomach, memory problems, depression, kidney stones, and frequent urination. Side effects of Azopt and Trusopt include stinging, burning, and other eye discomfort.

Cholinergic (Miotic)

MANUFACTURER	PRODUCT NAME	GENERIC NAME
Alcon Laboratories, Inc.	Isopto® Carbachol	Carbachol 0.75%, 1.5%, 3%
	Isopto® Carpine	Pilocarpine HCl 1%, 2%, 4%
	Pilopine HS® Gel	Pilocarpine HCl gel 4%
Bausch & Lomb, Inc.	Pilocarpine HCl Ophthalmic Solution USP	Pilocarpine HCl 1%, 2%, 4%

ACTION: Increases drainage of intraocular fluid

NOTES: Many people who use these medications complain of dim vision, especially at night or in a darkened area such as movie theaters. This is due to constriction of the pupil. Miotics increase drainage of intraocular fluid by making the pupil size smaller and thereby increasing the flow of intraocular fluid from the eye.

Prostaglandin Analogs

MANUFACTURER	PRODUCT NAME	GENERIC NAME
Akorn Inc.	Zioptan™	Tafluprost ophthalmic solution 0.0015%
Alcon Laboratories, Inc.	Travatan® Z	Travaprost 0.004%
Allergan	Lumigan®	Bimatoprost 0.01%, 0.03%
Bausch & Lomb, Inc.	Vyzulta™	Latanoprostene bunod 0.024%
Pfizer	Xalatan®	Latanoprost 0.005%

ACTION: Increases drainage of intraocular fluid

NOTES: Side effects can include eye color change, darkening of eyelid skin, eyelash growth, droopy eyelids, sunken eyes, stinging, eye redness, and itching.

Rho Kinase Inhibitors

MANUFACTURER	PRODUCT NAME	GENERIC NAME
Aerie Pharmaceuticals, Inc.	Rhopressa®	Netarsudil 0.02%

ACTION: Increases drainage of intraocular fluid

NOTES: Side effects can include eye redness, corneal deposits, stinging, and small bleeds on the white of the eye.

Combined Drugs

MANUFACTURER	PRODUCT NAME	GENERIC NAME
Akorn Inc.	Cosopt® Cosopt PF	Dorzolomide HCl & Timolol Maleate
Alcon Laboratories, Inc	Simbrinza®	Brinzolamide & Brimonidine tartrate 1%/0.2%
Allergan, Inc.	Combigan™	Brimonidine tartrate & Timolol Maleate ophthalmic solution 0.2%/0.5%

ACTION: Decreases production of intraocular fluid

NOTES: Combigan™ is a combination of beta blocker and alpha agonist–side effects include symptoms of both. Cosopt® is a combination of beta blocker and carbonic anhydrase inhibitor—side effects include burning and/or stinging of the eyes and changes in sense of taste. "PF" indicates "Preservative-Free Medication."

Glossary

Angle-Closure Glaucoma: A type of glaucoma in which the angle is closed in many or most areas, causing increased eye pressure, which leads to optic nerve damage, and possible vision loss. This rise in eye pressure may occur suddenly (an acute attack of angle closure) or gradually.

Aqueous Humor: The fluid filling the front part of the eye.

Bleb: A bubble in the eye tissue that lays over the new drainage opening created during surgery.

Central Vision: What is seen when you look straight ahead or when you read.

Ciliary Body: Tissues located around the lens of the eye that supply fluid to nourish the eye.

Congenital Glaucoma: A rare form of glaucoma that occurs in babies and young children. This condition can be inherited. It is usually the result of incorrect or incomplete development of the eye's drainage canals during the prenatal period.

Conjunctiva: A thin, clear membrane that lines the inner surface of the eyelids and the outer surface of the eyeball, except for the cornea.

Cornea: The clear part of the eye located in front of the iris. Part of the eye's protective covering.

Drainage Canals: Small openings around the outer edge of the iris. These canals provide the final pathway for fluid to leave the inside of the eye. Sometimes referred to as the trabecular meshwork or Schlemm's canal.

Gonioscopy: In this diagnostic procedure a contact lens that contains a mirror is gently placed on the eye. The mirror lets the doctor look sideways into the eye to check whether the angle where the iris meets the cornea is open or closed. This helps the doctor decide whether open-angle or angle-closure glaucoma is present.

Heidelberg Retina Tomograph (HRT): A special laser that produces a three-dimensional high-resolution image of the optic nerve.

Intraocular Pressure (IOP): The inner pressure of the eye. Normal intraocular pressure usually ranges from 12-22 mm Hg, although people with relatively low pressures can still have glaucoma (see normal-tension glaucoma).

Iris: The colored part of the eye that can expand or contract to allow just the right amount of light to enter the eye.

Laser Surgery: A type of surgery in which a tiny beam of light energy is used to modify tissues in the eye. There are three common forms of laser surgery for glaucoma.

Laser Peripheral Iridotomy: Creates a new drainage hole in the iris, allowing the iris to fall away from the outflow channel so fluid can drain out of the eye.

Laser Trabeculoplasty: In this procedure, the laser is aimed toward the normal drainage channels of the eye, in an attempt to open those channels so fluid can leave the eye more efficiently.

Laser Cyclophotocoagulation: This laser procedure is usually used in people who have severe glaucoma and are not responding to standard glaucoma surgery. The laser is used to partially destroy the tissues that make the fluid in the eye.

Lens: Located behind the iris, this helps light focus onto the retina.

Microsurgery: Surgery performed with a microscope in which a surgical instrument is used to make a tiny, new opening in the sclera so that intraocular fluid can drain out of the inside of the eye.

mm Hg: An abbreviation for "millimeters of mercury," which is a scale for recording intraocular pressure.

Nerve Fiber Analyzer (GDx): Uses laser light to measure the thickness of the nerve fiber layer.

Normal-Tension Glaucoma: Also called low-tension glaucoma. A rare form of glaucoma in which intraocular pressure stays within the normal range (12-22 mm Hg), but damage still occurs to the optic nerve and visual fields.

(Primary) Open-Angle Glaucoma: The most common form of glaucoma in the western world. This form of glaucoma usually develops very slowly as the eye's drainage canals gradually become clogged. There are no early warning signs for open-angle glaucoma, which is why it is often called the "sneak thief of sight."

Ophthalmoscopy: An exam used to look at the inside of the eye, especially the optic nerve. A device with a small light on the end is held up to the inside of the eye in a darkened room. This device lights up and magnifies the eye, so that the shape and color of the optic nerve can be seen.

Optical Coherence Tomography (OCT): Measures the reflection of infrared light off eye tissues to produce an image of the retina and optic nerve.

Optic Nerve: The nerve in the back of the eye that carries visual images to the brain.

Perimetry: Also known as the visual field test. A test that produces a map of the complete visual field, to check whether there is damage to any area of vision.

Peripheral Vision: The top, sides, and bottom areas of vision. These are usually the first areas of vision affected by glaucoma.

Pupil: The opening that controls how much light enters the inner part of the eye.

Retina: The part of the eye that carries images to the brain through the optic nerve.

Sclera: The tough, white, protective outer covering of the eye.

Secondary Open-Angle Glaucoma A form of glaucoma that can occur as the result of an eye injury, inflammation, or tumor. Includes forms such as pigmentary glaucoma and steroid-induced glaucoma.

Tonometry: The use of a device to measure the pressure in the eye. There are two types of tonometry:
Air Puff: This is the only type of tonometry that does not touch the surface of the eye. The patient sits facing the instrument, and a warm puff of air is directed at the eye.
Applanation: The patient's eye is first treated with numbing drops and a stain called fluorescein. The tonometer is then placed gently on the cornea, and a very small amount of pressure is applied to the cornea. The patient may sit in front of the tonometer or a hand-held tonometer may be used.

Trabecular Meshwork: The formal name of the mesh-like drainage canals surrounding the iris.

How Glaucoma Research Foundation Is Speeding The Cure

Glaucoma is the leading cause of preventable blindness. Founded in 1978 in San Francisco, Glaucoma Research Foundation (GRF) works to prevent vision loss from glaucoma by investing in innovative research, education, and support with the ultimate goal of finding a cure.

Leading the Way In Glaucoma Research

The Collaborative Normal Tension Glaucoma Study, funded by GRF, was the first controlled clinical trial to establish that lowering eye pressure preserves vision. Now, another major collaborative effort, Catalyst for a Cure, is redefining how glaucoma research is conducted and speeding the process of discovery. The Catalyst for a Cure research consortium brings together scientific investigators from university laboratories who are working to understand the genetic and neurologic development of the eye and find ways to intervene to stop glaucoma's progression.

In addition, GRF invests in Shaffer Grants—individual study grants awarded to researchers with promising new ideas to bring to the field of glaucoma which might otherwise be overlooked or go unexplored.

The Glaucoma Research Foundation, a 501(c)(3) non-profit organization, receives no government funds and is almost entirely supported through donations from private individuals—often patients like you.

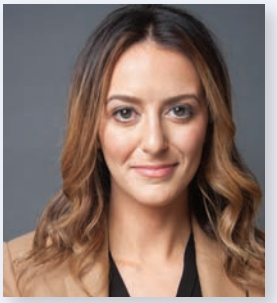
To make a secure donation online, please visit www.glaucoma.org/donate.

GRF Mission

Cure glaucoma and restore vision through innovative research.

Pictured On The Cover:

"Glaucoma Research Foundation is dedicated to improving the lives of glaucoma patients and funding research to find a cure."
– Amanda Eddy



"In my laboratory, we have a sense of urgency to focus on work that is truly going to help people affected by glaucoma."
– Alfredo Dubra, PhD
Associate Professor of Ophthalmology, Stanford University School of Medicine, and principal investigator in Glaucoma Research Foundation's Catalyst for a Cure Biomarker Initiative.



Understanding and Living with Glaucoma

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Glaucoma Research Foundation is a national, non-profit tax-exempt organization dedicated to funding innovative research to find a cure for glaucoma. GRF's education and outreach programs include the free newsletter *Gleams*, the comprehensive website **www.glaucoma.org**, patient education brochures on glaucoma, and this guide for people with glaucoma and their families.

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