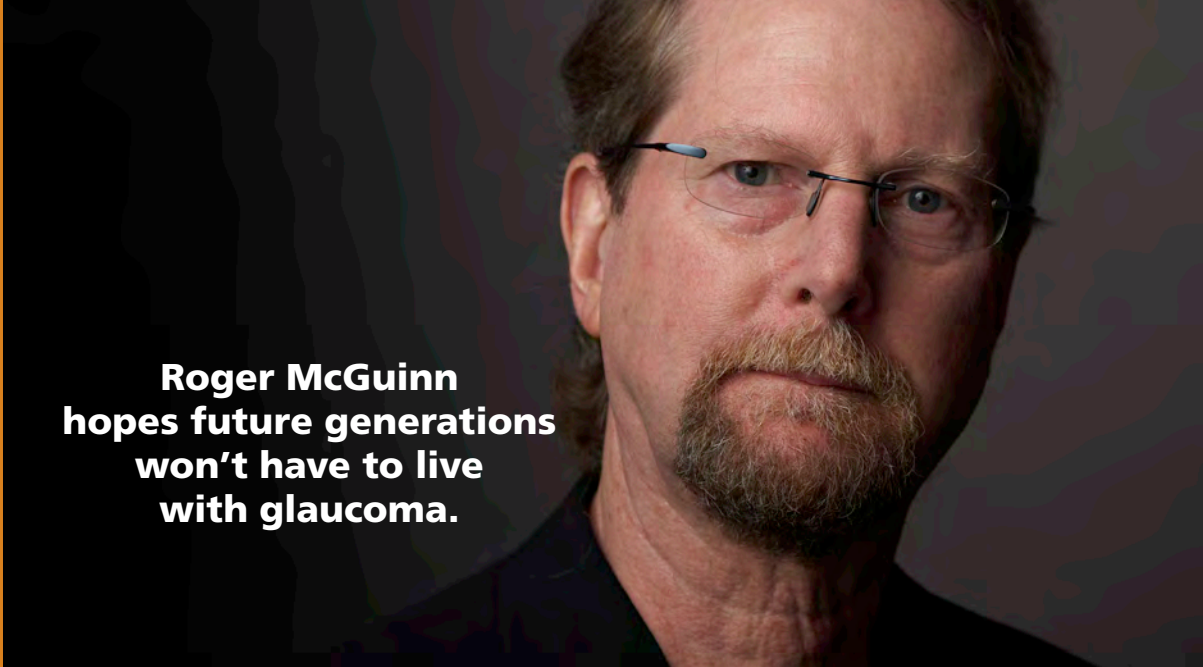
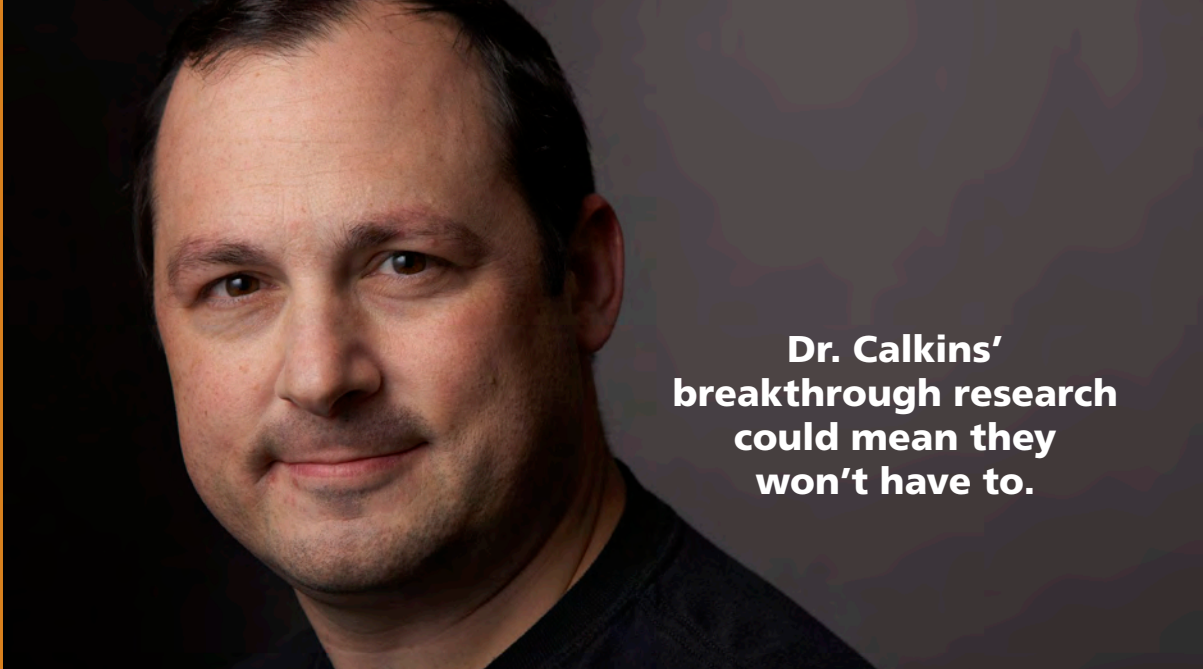


Understanding And Living With Glaucoma

A portrait of Roger McGuinn, a man with glasses and a goatee, looking directly at the camera.

**Roger McGuinn
hopes future generations
won't have to live
with glaucoma.**

A portrait of Dr. Calkins, a man with short dark hair, looking slightly to the side.

**Dr. Calkins'
breakthrough research
could mean they
won't have to.**

GLAUCOMA
RESEARCH FOUNDATION

Supported by an educational grant from The Allergan Foundation.

“My wish for the future is that nobody should have to live with the fear of losing their eyesight.”

Roger McGuinn



Roger McGuinn

Co-founder of folk-rock group The Byrds and member of the Rock and Roll Hall of Fame, singer-guitarist Roger McGuinn serves on the Glaucoma Research Foundation’s Honorary Advisory Board.

Understanding And Living With Glaucoma

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Understanding Glaucoma

What Is Glaucoma?

Glaucoma is an eye disease that gradually steals your vision. Often, glaucoma has no symptoms and can suddenly result in vision loss. 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.

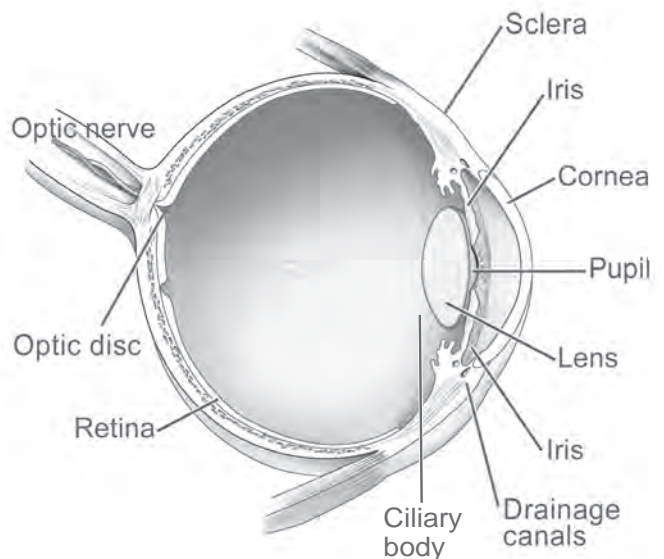
How The Eye Works

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 to the lens. The lens focuses the light onto the retina (inside the lining of the eye). Nerve fibers in the retina carry images to the brain through the optic nerve.

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 (a meshwork of drainage canals around the outer 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) depends on the amount of 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.



Who Gets Glaucoma?

Anyone. But those at higher risk to develop glaucoma are:

- Over 60 years old
- People of African descent
- Relatives of glaucoma patients
- Hispanics in older age groups
- Very nearsighted (myopic)
- People with diabetes
- Extensive users of steroids
- People with thin central cornea

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

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 pushes the optic nerve into 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 then sight loss. 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.

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 descent, people with diabetes, people with extensive use of steroids, and people who have elevated eye pressure.

Researchers and doctors are still not sure why the eye's drainage canals stop working correctly. We do know that glaucoma is not caused by too much reading, reading in low light, diet, wearing contact lenses, or other normal activities. We also know that glaucoma is not contagious, is not life-threatening, and rarely leads to blindness if found early and treated correctly.

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
- Has symptoms and damage that are not noticed.

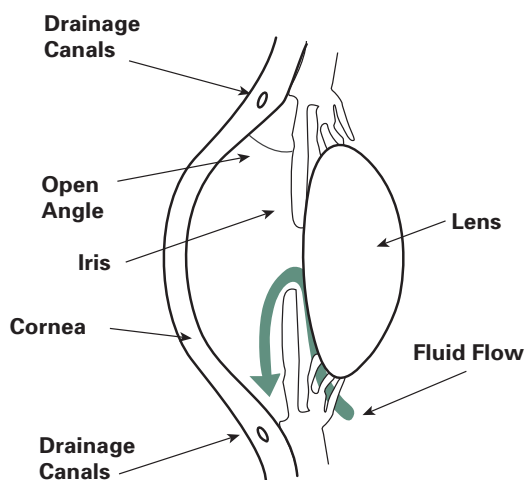
“Open-angle” means that the angle where the iris meets the cornea is as wide and open as it should be. Open-angle glaucoma is also called primary or chronic glaucoma. This type of glaucoma happens when the eye’s drainage canals

become clogged over time. The inner eye pressure (also called intraocular pressure or IOP) rises because the right amount of fluid cannot drain out of the eye.

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 a healthy eye pressure and prevent vision loss.



Angle-Closure Glaucoma

Angle-closure glaucoma, a less common form of glaucoma:

- Is caused by blocked drainage canals, resulting in a sudden rise in intraocular pressure
- Has a closed or narrow angle between the iris and cornea
- Develops very quickly
- Has symptoms and damage that are usually very noticeable
- Demands immediate medical attention.

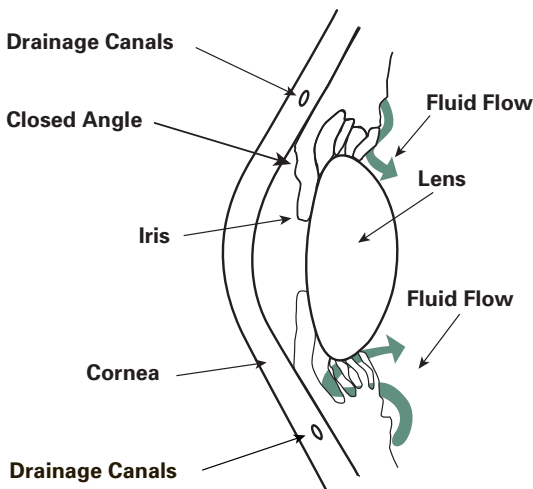
The other main type of glaucoma is called angle-closure glaucoma. It is also called acute glaucoma or narrow-angle glaucoma. This type is much more rare and is very different from open-angle glaucoma. Unlike open-angle glaucoma, angle-closure glaucoma is a result of the angle between the iris and cornea closing. The outer edge of the iris bunches up over the drainage canals, when the pupil enlarges too much or too quickly. This structural problem only occurs in a small percentage of eyes.

The closed angle prevents fluid from reaching the drainage canals. As a result, the intraocular pressure rises very quickly. This causes a painful attack in the eye.

The eye may appear red. You may have a headache, feel nauseous, feel intense eye pain, see rainbows around lights at night, or have blurred vision. If you have any of these symptoms, you should seek immediate medical attention to prevent serious eye damage.

Treatment of angle-closure glaucoma usually involves either laser or conventional surgery to remove a small portion of the bunched-up outer edge of the iris.

Surgery helps unblock the drainage canals so that the extra fluid can drain. If you have angle-closure glaucoma in one eye, doctors may go ahead and treat the other eye as a safety measure. In general, surgery for angle-closure glaucoma is successful and long lasting. Regular checkups are still important though, because a chronic form of glaucoma could still occur.



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.

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 this form of glaucoma have a family history of normal tension glaucoma, are of Japanese ancestry, or have a history of systemic heart disease such as irregular heart rhythm.

Pigmentary Glaucoma

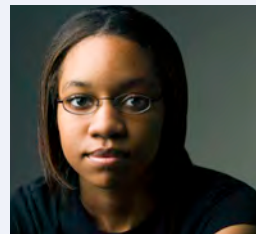
- Is a form of secondary open-angle glaucoma, occurring when the pigment granules that are in the back of the iris (the colored part of the eye) break into the clear fluid produced inside the eye. These tiny pigment granules flow toward the drainage canals in the eye and slowly clog them, causing eye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

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. When uncomplicated, microsurgery can often correct the structural defects. Other cases are treated with medication and surgery.

Michelle McMillan

Michelle, diagnosed with glaucoma at 17, is a graduate of Spelman College. She's entering a Master's program in Public Administration to pursue her interest in the rights of children in foster care.



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 complete 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

Regular glaucoma checkups should include two routine, painless eye exams—tonometry and ophthalmoscopy. If the pressure in the eye is not in the normal range, or if the optic nerve looks unusual, then one or two special glaucoma exams will be done. These two diagnostic exams are called perimetry and gonioscopy.

Tonometry

Tonometry measures the pressure within your eye. During tonometry, eye drops are used to numb the eye. Then a doctor or technician uses a tool called a tonometer to measure



the inner pressure of the eye.

A small amount of pressure is applied to the eye by a tiny tool or by a warm puff of air. The range for normal pressure is 12-22 mm Hg (“mm Hg” refers to millimeters of mercury, a scale used to record eye pressure). Most glaucoma cases are diagnosed with pressure exceeding 20mm Hg. However, some people can have

glaucoma at pressures between 12 -22mm Hg. Remember, eye pressure is unique to each person.

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 to examine the shape and color of the optic nerve.

The doctor will then use a small tool with a light on the end to light and magnify the optic nerve.

A nerve that is cupped or not a healthy pink color is cause for concern. If your intraocular pressure is not within the normal range or if the optic nerve looks unusual, your doctor may ask you to have one or two more special glaucoma exams: perimetry and gonioscopy. You may want to ask your doctor about the following new ophthalmoscopy technologies. All three tests deliver more precise imaging of the optic nerve, helping the doctor to see the presence of glaucoma even before it has begun to affect your eye.

The Heidelberg Retina Tomograph (HRT) is 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).

The Nerve Fiber Analyzer (GDx) uses laser light to measure the thickness of the nerve fiber layer. When thinning, this layer gives important clues to physicians about the presence of glaucoma. Optical Coherence Tomography (OCT), which measures the reflection of laser light much like an ultrasound measures the reflection of sound, can directly measure the thickness of the nerve fiber layer and create a three dimensional representation of the optic nerve.

Damaged Optic Nerve

A photo of the optic nerve in an eye with glaucoma. The tissues are pushed back by increased pressure and eventually die. The cupped center becomes pale in contrast to the healthy tissue around the rim.



Cupped Disk

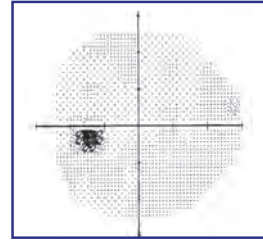
Perimetry

Perimetry is a visual field test that produces a map of your complete field of vision. This test will help a doctor determine whether your vision has been affected by glaucoma.

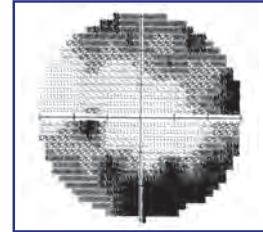
Do not be concerned if there is a delay in seeing the light as it moves in or around your blind spot. This is perfectly normal and does not necessarily mean that your field of vision is damaged.

Try to relax 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

This diagnostic exam 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. A hand-held contact lens is gently placed on the eye. This contact lens has a mirror that shows the doctor if the angle between the iris and cornea is closed and blocked (a possible sign of angle-closure or acute glaucoma) or wide and open (a possible sign of open-angle, chronic glaucoma).

Pachymetry



Pachymetry measures the thickness of the cornea—the clear window at the front of the eye. A probe called a pachymeter is gently placed on the front of the eye (the cornea) to measure its thickness. Pachymetry can be a useful technique. We have long known that corneal thickness has the potential to influence eye

pressure readings. When Hans Goldmann developed his Goldmann applanation tonometer, he knew corneal thickness affected the measurements he read. If a cornea is thicker than average, pressure readings with a Goldmann tonometer may be higher. Only recently, however, have doctors realized how much variation in corneal thickness is found in their patients.

The need for pachymetry is ultimately decided by your eye care doctor. It is recommended for those who are glaucoma suspects or who are already receiving treatment for glaucoma.

There are different kinds of pachymeters. As with tonometry, eye care doctors and their properly trained staff know how to use pachymeters. Along with pachymetry, techniques to help determine the condition of the eye with glaucoma may include visual field examination, optic nerve evaluation, tonometry, and sometimes gonioscopy. Although pachymetry helps the eye care doctor understand eye pressure readings, it is only one factor to be considered in glaucoma management. Careful evaluation of the optic nerve, for example, continues to be essential to diagnosis and treatment.

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.

Why does my eye pressure change from one appointment to the next?

Eye pressure can vary hourly, daily, and weekly. Many factors can affect the up and down changes in a person's intraocular pressure. These daily changes are normal and should not affect your glaucoma on a long-term basis.

Treating Glaucoma

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.

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. Your compliance is extremely important to keeping your glaucoma under control and preventing vision loss. If you do not take your medication properly, or at all, it is likely you will experience your glaucoma and symptoms growing slowly worse. Or, you may not notice a problem until it is too late. 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.

Glaucoma Medications

- Work by increasing fluid drainage or decreasing fluid production
- Come in two major forms: eye drops and pills
- Are used in many different concentrations: 0.25%, 0.5%, 1%, 2%, 4%
- May have side effects

Tips On Using Medications

- Schedule medications around daily routines such as waking, mealtimes, and bedtime.
- Remember that four times a day means four times in 24 hours, such as 6 am, noon, 6 pm, and bedtime. Twice a day means every 12 hours, for example, at 7 am and 7 pm or at 10 am and 10 pm.
- Keep your medications in a visible place at home and carry them with you when you are away from home. Remember to keep all medications, including eye drops, out of the reach of children. Also, keep bottles out of direct sunlight.
- If using two or more kinds of drops at the same time, wait five minutes before putting the next drop in the eye.
- If you're supposed to take half of a glaucoma pill, cut it with a single edged razor blade or a plastic pill cutter, available at most large pharmacies. The pill may crumble if cut with a knife.
- If you forget to use your eye drops on schedule, put the drop in when you remember. Do not wait until the next scheduled time. Then get right back on your regular schedule.
- Tell your doctor or pharmacist if your medications are causing reactions, or if you are having any difficulty using them. It may be possible to change your medication program.

Tips For Putting In Eye Drops



1. Start by tilting your head backward, either by sitting, standing, or lying down. With your index finger placed on the soft spot just below the lower lid, gently pull down to form a pocket.
2. Let a drop fall into the pocket.
3. Slowly let go of the lower lid. Close your eyes, but try not to shut them tight or squint. This may push the drops out of your eye.
4. Gently press on the inside corner of your closed eyes with your index finger and thumb for two to three minutes. This will help keep any drops from getting into your system and keep them in your eye where they are needed.
5. Blot around your eyes to remove any excess.

Eye drops: minimize side effects, maximize results.

You should always:

- Use your drops the way your doctor tells you to use them.
- Be sure your doctor knows about any other drugs you may be taking (including natural products like vitamins and aspirin) and about any allergies you may have.
- Wash your hands before putting in your eye drops.
- Be careful not to let the tip of the dropper touch your eye.
- Make sure the dropper stays clean. Do not lay it down.
- If you are putting in more than one drop or more than one type of eye drop, wait five minutes before putting the next drop in. This will keep the first drop from being washed out by the second before it has had time to work.

More Helpful Tips

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 shaky hands are still a problem, you might try using a 1 or 2-pound wrist weight (you can get these at any sporting goods store). The extra weight around the wrist of the hand you're using can decrease mild shaking.

If You Are Having Trouble Getting The Drop In Your Eye

- Try this: Lie down flat, face up. Close your eye. 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. Then close the eye again. Don't blink. Keep the eye closed for a few minutes.
- If you are still not sure the drop actually got in your eye, put in another drop. The eyelids can hold only about one drop, so any excess will just run out of the eye. It is better to have excess run out than to not have enough medication in your eye.

If You Are Having Trouble Holding Onto The Bottle

- Try wrapping something (like a paper towel) around the bottle. You can use anything that will make the bottle wider. This may be helpful for anyone with limitations on their grip, such as those with arthritis.

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 for you.

Glaucoma Surgery

Surgery is another way to treat glaucoma. In general, any kind of surgery carries some risk, so your doctor may try to exhaust other treatment methods first. However, modern glaucoma surgery is successful for many patients. Surgery is the main treatment method for angle-closure glaucoma and congenital glaucoma, because it may be the only way that the blocked or incorrectly formed drainage canals can be opened.

In cases of chronic glaucoma, 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.

Laser Surgery



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. Lasers produce a focused beam of light that can make a very small burn or opening in your eye tissue, depending on the strength of the light beam. Laser surgeries

are performed in an outpatient setting in your doctor's office or in a hospital clinic.

What To Expect

- 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.
- The light beam passes harmlessly through the outer covering of your eye and makes an opening only where it is focused.
- During laser surgery, you will see a bright light—like a camera flash—and you may feel a faint tingling sensation.
- Afterward, your eye may be slightly irritated, and your doctor may tell you to take it easy for a day or so.
- Your eye pressure must be checked often after laser surgery, and your pressure may not go down to a safe level for many weeks.
- Although laser surgery may not permanently control your eye pressure, it can often delay the need for microsurgery.

Types Of Laser Surgery

Laser Peripheral Iridotomy (LPI)

- Used for acute angle-closure glaucoma where the iris in the eye blocks the fluid drains
- Procedure makes an opening in the iris, helping the fluid drain

Argon Laser Trabeculoplasty (ALT)

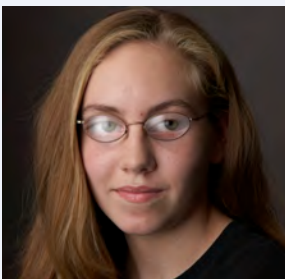
- Used for primary open-angle glaucoma
- Laser beam is aimed at the fluid drainage channels helping the drainage system work

Selective Laser Trabeculoplasty (SLT)

- Uses a laser that works at very low levels
- Treats specific cells and leaves the mesh-like drainage canals surrounding the iris intact. For this reason, SLT may be safely repeated.
- May be an alternative for those who have been treated unsuccessfully with traditional laser surgery or with pressure-lowering eye drops

Laser Cyclophotocoagulation

- Used for those with very severe glaucoma damage that is not being managed by standard glaucoma surgery
- Laser is used to treat the ciliary process to decrease the amount of fluid produced



"I love to bike ride, dance and go horseback riding. I even hope to be a teacher someday. Glaucoma has not stopped me, and it never will."

Danielle Fiarito, 14

Diagnosed with glaucoma at age 4

Microsurgery

Microsurgery is also called “filtering surgery” or conventional surgery. It is used in cases of chronic and secondary glaucoma.

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.
- In chronic glaucoma, a small piece of the iris is often removed first to prevent any future problem with acute glaucoma.
- A tiny opening is made in the sclera (the white part of the eye) with a small surgical tool. This procedure is called a trabeculectomy or a sclerostomy. This new opening allows the intraocular fluid to bypass the clogged drainage canals and flow out of this new, artificial drainage canal.
- The tissue over the opening rises to form a little blister called a bleb on the clear conjunctiva. The bleb will be a slightly different color than the white area around it. Doctors look for the bleb to make sure that fluid is draining out of the new opening.
- Normally this is same-day outpatient surgery.



Microsurgery 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 microsurgery, 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.

Any surgery carries the risk of complications, though glaucoma surgery is typically successful. Sometimes the new drainage canal will start to close and may cause an increase in pressure. This happens because the body is trying to heal the new opening in the eye as if it were an injury. Special medications (antifibrotics) may be given during or after the surgery to help prevent this from happening. If necessary, glaucoma surgery can be done several times in the same eye without substantial risk.

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.

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 working relationship
with your eye doctor facilitates
effective treatment.”**



Andrew Iwach, MD

Associate Clinical Professor of
Ophthalmology, University of
California at San Francisco.

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, perhaps by taking them when you get up, at mealtimes, and/or at bedtime. Use an alarm watch to remind you of when to take your medication.
- If you forget to take your prescribed medication, take your medication when you remember, then get back on your regular schedule.
- 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. This will take some of the mystery out of your medication routine. 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 cortisone.
- 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, especially eye irritation, watering, blurring or scratchiness, unusual discharge in the corner of your eye, temporarily cloudy vision, continual headaches, flashes of light or floating objects in the field of vision, or rainbows around lights at night.

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. This reminder can help you remember how often to use your medications.
- 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.

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.
- Try to reduce the day-to-day stress in your life. Be sure to make time for fun and 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.

Don't hesitate to share your feelings with your loved ones. Once they understand what you are feeling, it will be easier for them to be supportive of you, and help you meet any special needs you may have. You may also want to talk with other people who have glaucoma—sharing ideas and feelings about living with a chronic health condition can be useful and comforting.

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.



Glaucoma Medications Manufacturers

Akorn, Inc.
1925 West Field Court, Suite 300
Lake Forest, IL 60045
Toll Free: (800) 932-5676
Website: www.akorn.com
Medication: Timolol Maleate

Alcon Laboratories, Inc.
P.O. Box 19534
Fort Worth, TX 76134
Toll Free: (800) 757-9195
Website: www.alcon.com
Medications: Azopt™, Betoptic S®,
lopidine®, Timolol Maleate Gel,
Timolol Maleate solution, Travatan® Z,
Isopto® Carpine, Pilopine HS®,
Isopto® Carbachol

Allergan, Inc.
P.O. Box 19534
Irvine, CA 92623
Toll-Free: (800) 433-8871
Website: www.allergan.com
Medications: Alphagan® P, Combigan™,
Betagan®, Lumigan®

Barr Pharmaceuticals, Inc.
225 Summit Avenue
Montvale, NJ 07645
Toll Free: (800) 222-0190
Website: www.barrproductguide.com
Medication: Diamox®

Bausch & Lomb, Inc.
8500 Hidden River Parkway
Tampa, FL 33637
Toll Free: (800) 323-0000
Website: www.bausch.com
Medications: OptiPranolol®,
Pilocarpine, Timolol Maleate

Ista Pharmaceuticals, Inc.
15295 Alton Parkway
Irvine, CA 92618
Toll Free: (877) 788-2020
Website: www.istavision.com
Medication: Istalol®

Merck & Co., Inc.
One Merck Drive, P.O. Box 100
Whitehouse Station, NJ 08889
Toll Free: (800) 444-2080
Website: www.merck.com
Medications: Cosopt®, Timoptic®,
Timoptic XE®, Trusopt®

Pfizer, Inc.
235 East 42nd St
New York, NY 10017
Toll Free: (800) 879-3477
Website: www.pfizer.com
Medication: Xalatan®

VISTAKON Pharmaceuticals, LLC
7500 Centurion Parkway
Jacksonville, FL 32256
Toll-Free: (800) 523-6225
www.vistakonpharmaceutical.com
Medication: Betimol®

A note about generic medications:

A few of the glaucoma medications are available in generic forms. If you are interested, you should ask your doctor if the medication(s) you are using would be available generically and if so, whether switching to that generic would be right for you.

A Guide To Glaucoma Medications

Adrenergic

MANUFACTURER
Allergan, Inc.

GENERIC NAME
Dipivefrin HCl 0.1%

ACTION Increases drainage of intraocular fluid

NOTES Allergic reactions to these drops are frequent. Blurred vision can also occur. Vision can also be decreased in people who have had cataracts removed. Headaches and burning of the eyes are common side effects. Cardiac side effects include rapid heart rate or fluctuations in heart rhythm.

Alpha Agonist

MANUFACTURER
Alcon Laboratories, Inc.

PRODUCT NAME
Iopidine®

GENERIC NAME
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
Akorn Inc.

PRODUCT NAME
Timolol Maleate USP

GENERIC NAME
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.

OptiPranolol®

Metipranolol 0.3%

ISTA Pharmaceuticals, Inc.

Istalol®

Timolol maleate
ophthalmic solution 0.5%

VISTAKON, Inc.

Betimol®

Timolol hemihydrate
0.25%, 0.5%

Merck & Co., Inc.

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.

Combined Drugs

MANUFACTURER	PRODUCT NAME	GENERIC NAME
Allergan, Inc.	Combigan™	Brimonidine tartrate & Timolol Maleate ophthalmic solution 0.2%/0.5%.
Merck & Co., Inc.	Cosopt®	Dorzolomide HCl & Timolol Maleate.

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.

Carbonic Anhydrase Inhibitor (CAI)

MANUFACTURER	PRODUCT NAME	GENERIC NAME
Alcon Laboratories, Inc.	Azopt™	Brinzolamide ophthalmic suspension 1%
Merck & Co., Inc.	Trusopt®	Dorzolamide HCl 2%
Duramed Inc.	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® Carpine	Pilocarpine HCl 1%, 2%, 4%, 6%, 8%
	Isopto® Carbachol	Carbachol 0.75%, 1.5%, 3%
	Pilopine HS® Gel	Pilocarpine HCl gel 4%
Bausch & Lomb, Inc. Ophthalmic	Pilocarpine HCl Ophthalmic Solution USP	Pilocarpine HCl Solution USP 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
Alcon Laboratories, Inc.	Travatan® Z	Travaprost 0.004%
Allergan	Lumigan®	Bitmatoprost 0.01%, 0.03%
Pfizer	Xalatan®	Latanoprost 0.005%

ACTION Increases drainage of intraocular fluid

NOTES Side effects can include a gradual change in eye color, darkening of eyelid skin, gradual growth of eyelashes, stinging, blurred vision, eye redness, itching and burning.

Glossary

Angle-Closure Glaucoma

A type of glaucoma caused by a sudden and severe rise in eye pressure. Occurs when the pupil enlarges too much or too quickly, and the outer edge of the iris blocks the eye's drainage canals. Can be either acute or chronic.

Aqueous Humor

The fluid made in 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, powerful beam of 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 tool 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 monitors how much light enters the inner part of the eye.

Retina

The part of the eye that carries light and 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 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 four 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.

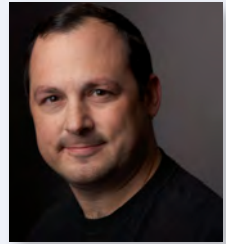
GRF Mission

To prevent vision loss from glaucoma by investing in innovative research, education, and support with the ultimate goal of finding a cure.

Pictured On The Cover:

David Calkins, PhD, at Vanderbilt University is one of four principal research investigators in Glaucoma Research Foundation's Catalyst For a Cure consortium:

"Our collaborative approach to research is bringing exciting new insights into understanding neuronal loss in glaucoma."



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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GLAUCOMA
RESEARCH FOUNDATION

251 Post Street, Suite 600, San Francisco, CA 94108
Phone: (415) 986-3162 • Toll-free: (800) 826-6693 • Fax: (415) 986-3763
Email: answers@glaucoma.org
www.glaucoma.org