Table of Contents

Age-Related Macular Degeneration

Video

- https://youtu.be/hZe7VxtuQB0
- https://youtu.be/-ylL2YKYzuY

At a glance: AMD

- **Early Symptoms:** None
- **Later Symptoms:** Loss of the central vision you need to see details straight ahead
- **Diagnosis:** Dilated eye exam
- **Treatment:** Dietary supplements (vitamins and minerals), injections, laser treatment

What is AMD?

Age-related macular degeneration (AMD) is an eye disease that can blur the sharp, central vision you need for activities like reading and driving. “Age-related” means that it often happens in older people. “Macular” means it affects a part of your eye called the macula.

AMD is a common condition — it’s a leading cause of vision loss for people age 50 and older. AMD doesn’t cause complete blindness but losing your central vision can make it harder to see faces, drive, or do close-up work like cooking or fixing things around the house.

AMD happens very slowly in some people. Even if you have early AMD, you may not experience vision loss for a long time. For other people, AMD progresses faster and can lead to central vision loss in one eye or both eyes.

What are the symptoms of AMD?

As AMD progresses, many people see a blurry area near the center of their vision. Over time, this blurry area may get bigger or you may see blank spots. Things may also seem less bright than before.
Some people may also notice that straight lines start to look wavy. This can be a warning sign for late AMD. If you notice this symptom, see your eye doctor right away.

Amblyopia (Lazy Eye)

Video

- https://youtu.be/eLbmk1Go8YQ

At a glance: Amblyopia

- **Symptoms:** Poor vision in 1 eye
- **Diagnosis:** Eye exam
- **Treatment:** Eye drops or wearing an eye patch

What is amblyopia?

Amblyopia (also called lazy eye) is a type of poor vision that happens in just 1 eye. It develops when there's a breakdown in how the brain and the eye work together, and the brain can't recognize the sight from 1 eye. Over time, the brain relies more and more on the other, stronger eye — while vision in the weaker eye gets worse.

It's called "lazy eye" because the stronger eye works better. But people with amblyopia are not lazy, and they can't control the way their eyes work.

Amblyopia starts in childhood, and it's the most common cause of vision loss in kids. Up to 3 out of 100 children have it. The good news is that early treatment works well and usually prevents long-term vision problems.

What are the symptoms of amblyopia?

Symptoms of amblyopia can be hard to notice. Kids with amblyopia may have poor depth perception — they have trouble telling how near or far something is. Parents may also notice signs that their child is struggling to see clearly, like:

- Squinting
- Shutting 1 eye
- Tilting their head

In many cases, parents don't know their child has amblyopia until a doctor diagnoses it during an eye exam. That is why it's important for all kids to get a vision screening at least once between ages 3 and 5.

Anophthalmia and Microphthalmia

Video

- https://youtu.be/oq7n40gunHI

At a glance: Anophthalmia and Microphthalmia

- **Signs:** Being born without one or both eyes (anophthalmia) or with unusually small eyes (microphthalmia)
- **Diagnosis:** Prenatal tests, physical exam
- **Treatment:** Prosthetics, surgery

What are anophthalmia and microphthalmia?

Anophthalmia and microphthalmia are often used interchangeably. Microphthalmia is a disorder in which one or both eyes are abnormally small, while anophthalmia is the absence of one or both eyes. These rare disorders develop during pregnancy and can be associated with other birth defects.

What causes anophthalmia and microphthalmia?

Causes of these conditions may include genetic mutations and abnormal chromosomes. Researchers also believe that environmental factors, such as exposure to X-rays, chemicals, drugs, pesticides, toxins, radiation, or viruses, increase the risk of anophthalmia and microphthalmia, but research is not conclusive. Sometimes the cause in an individual patient cannot be determined.

What's the treatment for anophthalmia and microphthalmia?

There is no treatment for severe anophthalmia or microphthalmia that will create a new eye or restore vision. However, some less severe forms of microphthalmia may benefit from medical or surgical treatments. In almost all cases improvements to a child's appearance are possible. Children can be fitted for a prosthetic (artificial) eye for cosmetic purposes and to promote socket growth.

Astigmatism

Video

- https://youtu.be/cwYxq28-PBk

At a glance: Astigmatism

- **Symptoms:** Headaches, blurry vision, eye strain, trouble seeing at night
- **Diagnosis:** Dilated eye exam
- **Treatment:** Eyeglasses, contact lenses, surgery

What is astigmatism?

Astigmatism is a common eye problem that can make your vision blurry or distorted. It happens when your cornea (the clear front layer of your eye) or lens (an inner part of your eye that helps the eye focus) has a different shape than normal.
The only way to find out if you have astigmatism is to get an eye exam. Eyeglasses or contact lenses can help you see better — and some people can get surgery to fix their astigmatism.

What are the symptoms of astigmatism?

The most common symptoms of astigmatism are:

- Blurry vision
- Needing to squint to see clearly
- Headaches
- Eye strain
- Trouble seeing at night

If you have mild astigmatism, you might not notice any symptoms. That's why it's important to get regular eye exams — your eye doctor can help you make sure you're seeing as clearly as possible. This is especially true for children, who may be less likely to realize that their vision isn't normal.

What causes astigmatism?

Astigmatism happens when your cornea or lens has a different shape than normal. The shape makes light bend differently as it enters your eye, causing a refractive error.

Behçet's Disease

Video

- https://youtu.be/WZhViVDcJgc

At a glance: Behçet's Disease

- **Symptoms:** Blurry vision, eye pain, red eyes, mouth sores, genital sores, skin problems
- **Diagnosis:** Medical history
- **Treatment:** Medicine (steroids)

What is Behçet's disease?

Behçet's disease is an autoimmune disease that results from damage to blood vessels throughout the body, particularly veins. In an autoimmune disease, the immune system attacks and harms the body's own tissues. This disease is also known as adamantiades.

What causes Behçet's disease?

The exact cause is unknown. It is believed that an autoimmune reaction may cause blood vessels to become inflamed, but it is not clear what triggers this reaction.

What are the symptoms of Behçet's disease?

Behçet's disease affects each person differently. The four most common symptoms are mouth sores, genital sores, inflammation inside of the eye, and skin problems.
Inflammation inside of the eye (uveitis, retinitis, and iritis) occurs in more that half of those with Behçet's disease and can cause blurred vision, pain, and redness.
Other symptoms may include arthritis, blood clots, and inflammation in the central nervous system and digestive organs.

What's the treatment for Behçet's disease?

There is no cure for Behçet's disease. Treatment typically focuses on reducing discomfort and preventing serious complications. Corticosteroids and other medications that suppress the immune system may be prescribed to treat inflammation.

Bietti's Crystalline Dystrophy

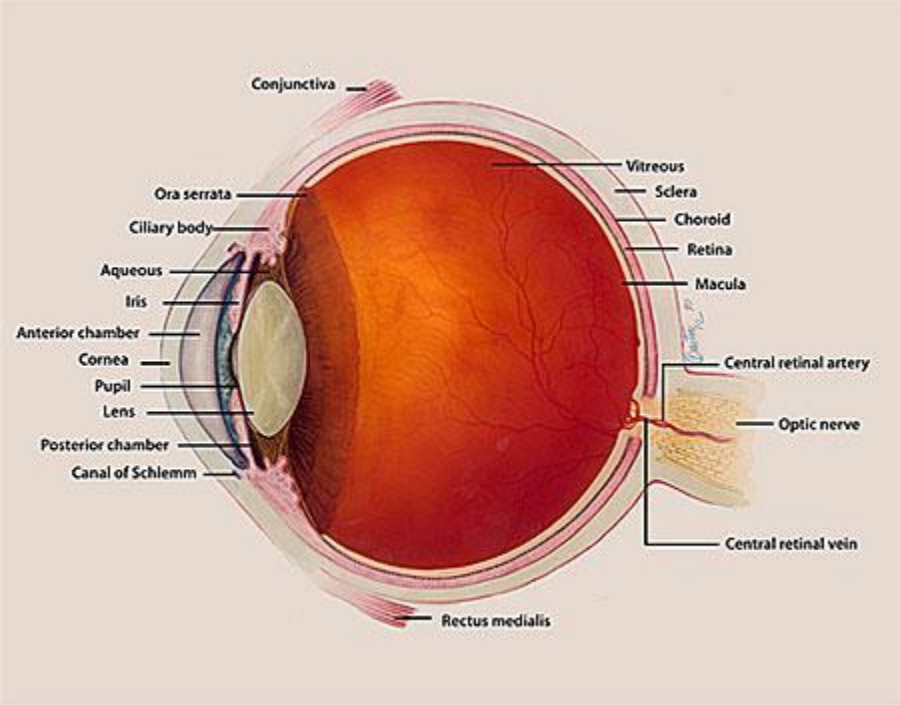
Video

- https://youtu.be/spTCC9B1qDY

At a glance: Bietti's Crystalline Dystrophy

- **Symptoms:** Vision loss — especially night vision and peripheral (side) vision
- **Diagnosis:** Genetic testing
- **Treatment:** None

What is Bietti's crystalline dystrophy?



Bietti's crystalline dystrophy (BCD) is an inherited eye disease named for Dr. G. B. Bietti, an Italian ophthalmologist, who described three patients with similar symptoms in 1937.
This disease is also known as Bietti's crystalline corneoretinal dystrophy.

What causes BCD?

From family studies, we know that BCD is inherited primarily in an autosomal recessive fashion. This means that an affected person receives one nonworking gene from each of his or her parents. A person who inherits a nonworking gene from only one parent will be a carrier but will not develop the disease. A person with BCD syndrome will pass on one gene to each of his or her children. However, unless the person has children with another carrier of BCD genes, the individual's children are not at risk for developing the disease.

What are the symptoms of BCD?
The symptoms of BCD include: crystals in the cornea (the clear covering of the eye); yellow, shiny deposits on the retina; and progressive atrophy of the retina, choriocapillaries and choroid (the back layers of the eye). This tends to lead to progressive night blindness and visual field constriction. BCD is a rare disease and appears to be more common in people with Asian ancestry.
People with BCD have crystals in some of their white blood cells (lymphocytes) that can be seen by using an electron microscope. Researchers have been unable to determine exactly what substance makes up these crystalline deposits. Their presence does not appear to harm the patient in any other way except to affect vision.

What's the treatment for BCD?
At this time, there is no treatment for BCD. Scientists hope that findings from gene research will be helpful in finding treatments for patients with BCD.

Blepharitis

Video

- https://youtu.be/X93z8UChoRc

At a glance: Blepharitis
- **Symptoms:** Irritated or itchy eyes, sensitivity to light, extra tears or dry eyes, swollen eyelids, blurry vision, crusty eyelashes
- **Diagnosis:** Eye exam
- **Treatment:** Keeping eyelids clean, warm compresses, antibiotics or steroid eye drops (for severe cases)

What is blepharitis?
Blepharitis is a common condition that causes inflammation of the eyelids. The condition can be difficult to manage because it tends to recur.

What other conditions are associated with blepharitis?
Complications from blepharitis include:
- Stye: A red tender bump on the eyelid that is caused by an acute infection of the oil glands of the eyelid.
- Chalazion: This condition can follow the development of a stye. It is a usually painless firm lump caused by inflammation of the oil glands of the eyelid. Chalazion can be painful and red if there is also an infection.

- Problems with the tear film: Abnormal or decreased oil secretions that are part of the tear film can result in excess tearing or dry eye. Because tears are necessary to keep the cornea healthy, tear film problems can make people more at risk for corneal infections.

What causes blepharitis?

Blepharitis occurs in two forms:

- **Anterior blepharitis** affects the outside front of the eyelid, where the eyelashes are attached. The two most common causes of anterior blepharitis are bacteria (Staphylococcus) and scalp dandruff.
- **Posterior blepharitis** affects the inner eyelid (the moist part that makes contact with the eye) and is caused by problems with the oil (meibomian) glands in this part of the eyelid. Two skin disorders can cause this form of blepharitis: acne rosacea, which leads to red and inflamed skin, and scalp dandruff (seborrheic dermatitis).

What are the symptoms of blepharitis?

Symptoms of either form of blepharitis include a foreign body or burning sensation, excessive tearing, itching, sensitivity to light (photophobia), red and swollen eyelids, redness of the eye, blurred vision, frothy tears, dry eye, or crusting of the eyelashes on awakening.

What's the treatment for blepharitis?

Treatment for both forms of blepharitis involves keeping the lids clean and free of crusts. Warm compresses should be applied to the lid to loosen the crusts, followed by a light scrubbing of the eyelid with a cotton swab and a mixture of water and baby shampoo. Because blepharitis rarely goes away completely, most patients must maintain an eyelid hygiene routine for life. If the blepharitis is severe, an eye care professional may also prescribe antibiotics or steroid eyedrops.

When scalp dandruff is present, a dandruff shampoo for the hair is recommended as well. In addition to the warm compresses, patients with posterior blepharitis will need to massage their eyelids to clean the oil accumulated in the glands. Patients who also have acne rosacea should have that condition treated at the same time.

Blepharospasm

Video

- https://youtu.be/ZsK4xF3M8PA

At a glance: Blepharospasm

- **Symptoms:** Involuntary blinking or eyelid spasm, light sensitivity, tiredness
- **Diagnosis:** Eye exam
- **Treatment:** Botulinum toxin (Botox) injection, surgery, relaxation techniques

What is blepharospasm?

Blepharospasm is an abnormal, involuntary blinking or spasm of the eyelids.

What causes blepharospasm?

Blepharospasm is associated with an abnormal function of the basal ganglion from an unknown cause. The basal ganglion is the part of the brain responsible for controlling the muscles. In rare cases, heredity may play a role in the development of blepharospasm.

What are the symptoms of blepharospasm?

Most people develop blepharospasm without any warning symptoms. It may begin with a gradual increase in blinking or eye irritation. Some people may also experience fatigue, emotional tension, or sensitivity to bright light. As the condition progresses, the symptoms become more frequent, and facial spasms may develop. Blepharospasm may decrease or cease while a person is sleeping or concentrating on a specific task.

What's the treatment for blepharospasm?

To date, there is no successful cure for blepharospasm, although several treatment options can reduce its severity.

In the United States and Canada, the injection of Oculinum (botulinum toxin, or Botox) into the muscles of the eyelids is an approved treatment for blepharospasm. Botulinum toxin, produced by the bacterium Clostridium botulinum, paralyzes the muscles of the eyelids.

Medications taken by mouth for blepharospasm are available but usually produce unpredictable results. Any symptom relief is usually short term and tends to be helpful in only 15 percent of the cases.

Myectomy, a surgical procedure to remove some of the muscles and nerves of the eyelids, is also a possible treatment option. This surgery has improved symptoms in 75 to 85 percent of people with blepharospasm.

Alternative treatments may include biofeedback, acupuncture, hypnosis, chiropractic, and nutritional therapy. The benefits of these alternative therapies have not been proven.

Cataracts

Video

- https://youtu.be/d5D0B2PoC7U
- https://youtu.be/eLrqi5ETj0w

At a glance: Cataracts

- **Early Symptoms:** None
- **Later Symptoms:** Blurry vision, colors that seem faded, sensitivity to light, trouble seeing at night, double vision
- **Diagnosis:** Dilated eye exam
- **Treatment:** Surgery

What are cataracts?

A cataract is a cloudy area in the lens of your eye. Cataracts are very common as you get older. In fact, more than half of all Americans age 80 or older either have cataracts or have had surgery to get rid of cataracts.
At first, you may not notice that you have a cataract. But over time, cataracts can make your vision blurry, hazy, or less colorful. You may have trouble reading or doing other everyday activities.
The good news is that surgery can get rid of cataracts. Cataract surgery is safe and corrects vision problems caused by cataracts.

What are the types of cataracts?

Most cataracts are **age-related** — they happen because of normal changes in your eyes as you get older. But you can get cataracts for other reasons — for example, after an eye injury or after surgery for another eye problem (like glaucoma).
No matter what type of cataract you have, the treatment is always surgery.

What are the symptoms of cataracts?

You might not have any symptoms at first, when cataracts are mild. But as cataracts grow, they can cause changes in your vision. For example, you may notice that:

- Your vision is cloudy or blurry
- Colors look faded
- You can't see well at night
- Lamps, sunlight, or headlights seem too bright
- You see a halo around lights
- You see double (this sometimes goes away as the cataract gets bigger)
- You have to change the prescription for your glasses often

These symptoms can be a sign of other eye problems, too. Be sure to talk to your eye doctor if you have any of these problems.
Over time, cataracts can lead to vision loss.

Am I at risk for cataracts?

Your risk for cataracts goes up as you get older. You're also at higher risk if you:

- Have certain health problems, like diabetes
- Smoke
- Drink too much alcohol
- Have a family history of cataracts
- Have had an eye injury, eye surgery, or radiation treatment on your upper body
- Have spent a lot of time in the sun
- Take steroids (medicines used to treat a variety of health problems, like arthritis and rashes)

If you're worried you might be at risk for cataracts, talk with your doctor. Ask if there is anything you can do to lower your risk.

What causes cataracts?

Most cataracts are caused by normal changes in your eyes as you get older.
When you're young, the lens in your eye is clear. Around age 40, the proteins in the lens of your eye start to break down and clump together. This clump makes a cloudy area on your lens — or a cataract. Over time, the cataract gets more severe and clouds more of the lens.
Learn more about what causes cataracts

How can I prevent cataracts?

You can take steps to protect your eyes and delay cataracts.

- **Wear sunglasses and a hat** with a brim to block the sun.
- **Quit smoking**. If you're ready to quit, call 1-800-QUIT-NOW (1-800-784-8669) for free support.
- **Eat healthy**. Eat plenty of fruits and vegetables — especially dark, leafy greens like spinach, kale, and collard greens.
- **Get a dilated eye exam**. If you're age 60 or older, get a dilated eye exam at least once every 2 years.

How will my eye doctor check for cataracts?

An eye doctor can check for cataracts as part of a dilated eye exam. The exam is simple and painless — your doctor will give you some eye drops to dilate (widen) your pupil and then check your eyes for cataracts and other eye problems.
Learn what to expect from a dilated eye exam

What's the treatment for cataracts?

Surgery is the only way to get rid of a cataract, but you may not need to get surgery right away.

Home treatment. Early on, you may be able to make small changes to manage your cataracts. You can do things like:

- Use brighter lights at home or work
- Wear anti-glare sunglasses
- Use magnifying lenses for reading and other activities

New glasses or contacts. A new prescription for eyeglasses or contact lenses can help you see better with cataracts early on.

Surgery. Your doctor might suggest surgery if your cataracts start getting in the way of everyday activities like reading, driving, or watching TV. During cataract surgery, the doctor removes the clouded lens and replaces it with a new, artificial lens (also called an intraocular lens, or IOL). This surgery is very safe, and 9 out of 10 people who get it can see better afterwards.

Cerebral Visual Impairment (CVI)

Video

- https://youtu.be/xIJf_1nACfo

At a glance: CVI

- **Symptoms:** Low vision, trouble seeing things like faces or moving objects
- **Diagnosis:** Medical history, eye exam, brain scans, other tests that measure ability to do daily activities or school work
- **Treatment:** Vision rehabilitation, educational support

What is CVI?

Cerebral visual impairment (sometimes called cortical visual impairment or CVI) is a disorder caused by damage to the parts of the brain that process vision. It's most common in babies and young children, but can continue into adulthood.

A child with CVI has vision problems that are caused by their brain that can't be explained by a problem with their eyes. Normally, the eyes send electrical signals to the

brain, and the brain turns those signals into the images you see. If you have CVI, your brain has trouble processing and understanding these signals.
CVI is a leading cause of vision loss among kids in the United States. For some children with CVI, vision gets better over time , but everybody is different. If your child has CVI, make sure that they get early intervention and therapy, educational support, and other special services to help them develop and learn.

What are the symptoms of CVI?

CVI can cause a variety of visual problems that can range from mild to severe. Kids with CVI may have trouble:

- Responding to the things they see
- Seeing certain parts of what is in front of them, like busy moving scenes
- Recognizing faces and objects
- Recognizing things in cluttered spaces
- Reaching for something while they're looking at it
- Understanding what they're looking at

Parents may also notice that their child with CVI:

- Reacts slowly to visual cues
- Prefers to look at things that are moving
- Prefers to look at things in a certain part of their vision, like with their peripheral (side) vision

Some kids with CVI tend to stare at light (like lamps or the sun), while others are sensitive to light.
Kids with CVI often have other disabilities or health problems, including:

- Developmental disabilities
- Cerebral palsy (a brain disorder that causes movement problems)
- Epilepsy (a brain disorder that causes seizures)
- Hearing loss

What causes CVI?

CVI is caused by an injury to the brain. Most of the time, these injuries happen before, during, or shortly after birth. Common causes of CVI in babies and young children include:

- Lack of oxygen or blood supply to the brain — often because of a stroke
- Hydrocephalus (when fluid builds up in the brain)
- Infections that reach the brain
- Head injury
- Certain genetic conditions

Babies who are born prematurely (early) are more likely to have CVI.

Coloboma

Video

- https://youtu.be/eVcgxEuLlSs

At a glance: Coloboma

- **Symptoms:** Being born without part of the eye, sensitivity to light, vision loss, missing a specific area of vision
- **Diagnosis:** Eye exam
- **Treatment:** Glasses or contacts, eye drops, wearing an eye patch, low vision devices, early intervention (learning support), surgery (in some cases)

What is a coloboma?

Coloboma comes from a Greek word which means "curtailed". It is used to describe conditions where normal tissue in or around the eye is missing from birth.

To understand coloboma, it is useful to be familiar with the normal structure and appearance of the eye, and the terms related to the different parts of the eye.

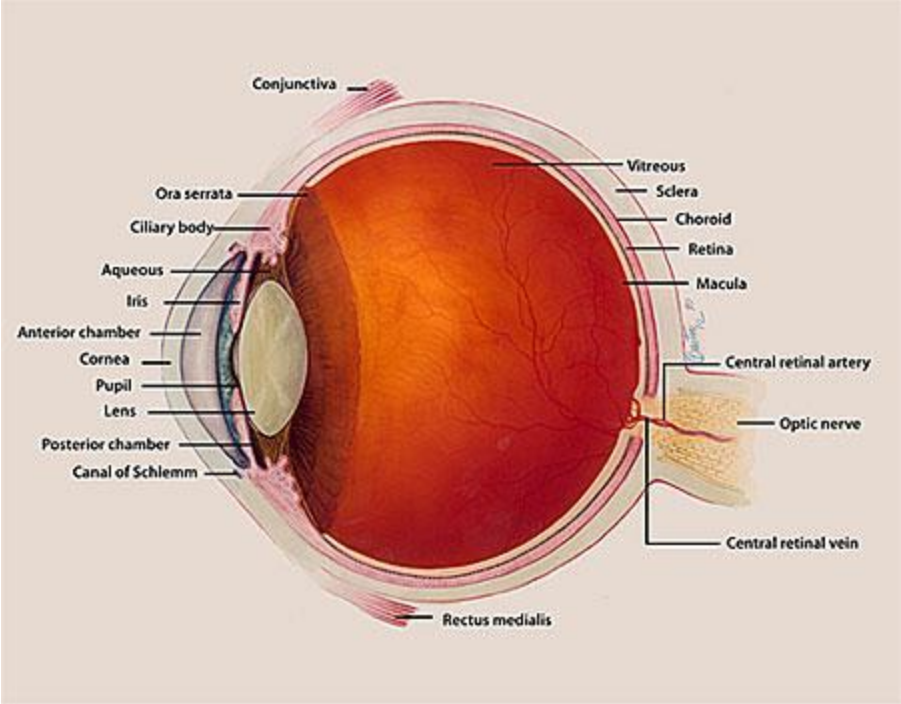


Diagram of the eye

What are the different types of coloboma?

There are different kinds of coloboma, depending on which part of the eye is missing. Coloboma can affect the:

- Eyelid

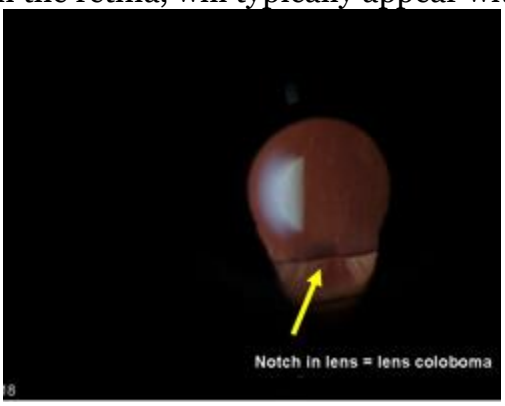
- Lens
- Macula
- Optic nerve
- Uvea

Eyelid coloboma

In eyelid coloboma, a piece of either the upper or lower eyelid is absent. Eyelid coloboma may be part of a genetic syndrome or happen as a result of a disruption of eyelid development in a baby. A syndrome is a specific grouping of birth defects or symptoms present in one person (www.genome.gov).

Lens coloboma

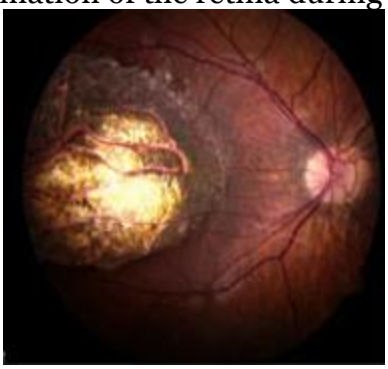
In this type of coloboma, a piece of the lens is absent. The lens, which helps focus light on the retina, will typically appear with a notch.



Lens coloboma

Macular coloboma

This happens when the center of the retina, called the macula, does not develop normally. The macula is responsible for daylight, fine and color vision. Macular coloboma may be caused when normal eye development is interrupted or following an inflammation of the retina during development of the baby.

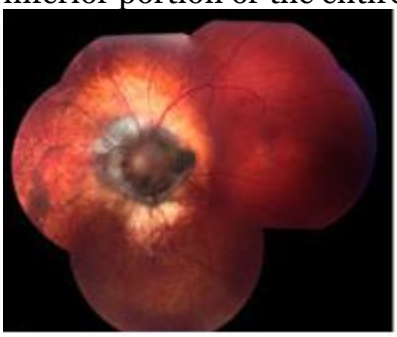


Macular coloboma

Optic nerve coloboma

Optic nerve coloboma refers to one of two distinct things:

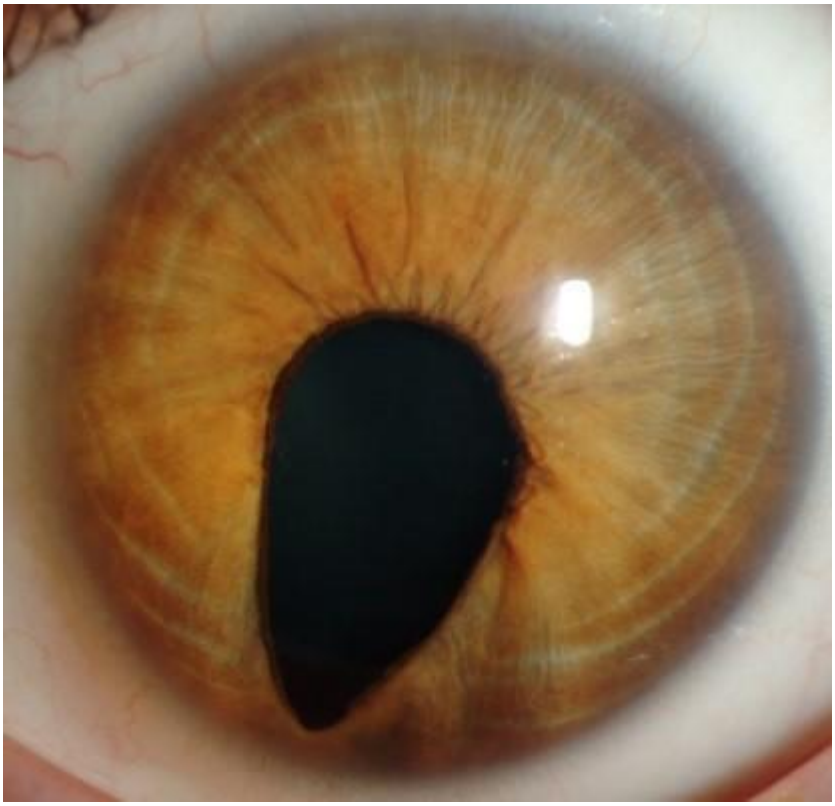
1. An abnormal optic nerve that is deeply "excavated" or hollowed out. In some cases, it can also be referred to as an optic nerve pit. The optic nerve is the bundle of nerve fibers that relays the light signals from the eye to the brain.
2. A uveal coloboma that is large enough to involve the optic nerve, either the inferior portion or the entire optic disc.



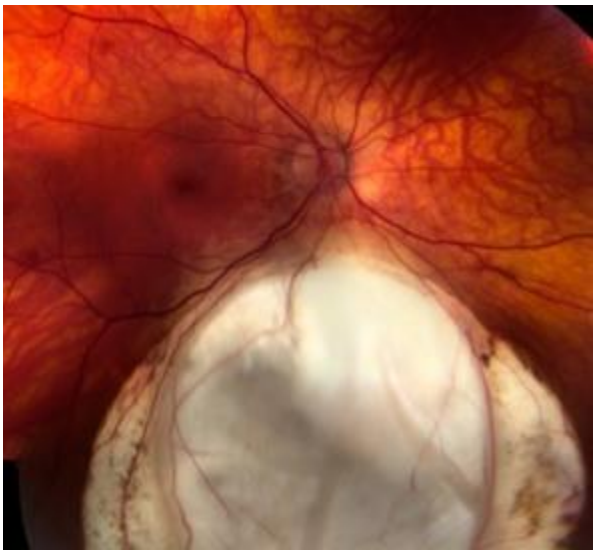
Optic nerve coloboma

Uveal coloboma

This coloboma can present as an iris coloboma (the iris is the colored part of the eye), with the traditional "keyhole" or "cat-eye" appearance to the iris, and/or as a chorio-retinal coloboma where the retina in the lower inside corner of the eye is missing.



Iris coloboma



Chorio-retinal coloboma

How common is uveal coloboma?

Uveal coloboma is a rare condition that is not always well documented. Depending on the study and where the study was conducted, a majority of estimates range from 0.4 to 5 cases per 10,000 births. Some cases may go unnoticed because uveal coloboma does not always affect vision or the outside appearance of the eye.

Uveal coloboma is a significant cause of blindness. Studies estimate that 5 to 10 percent of blind European children have uveal coloboma or uveal coloboma-related malformations.

What causes uveal coloboma?

It is believed that uveal coloboma is primarily genetic in origin. "Genetic" means that the coloboma was caused by a gene that was not working properly when the eye was forming. Sometimes coloboma is part of a specific genetic syndrome, for which the genetics are known. For instance, coloboma is one feature of CHARGE syndrome, which is associated with a change in, or a complete deletion of a gene called *CHD7* in most cases.

Researchers have found genes associated with an eye malformation in the microphthalmia, anophthalmia, coloboma (MAC) spectrum in up to 20% of cases. To date, however, we still do not know which genes explain most cases of coloboma. For more information about what genes are and what a genetic condition is, please visit the National Library of Medicine's Genetics Home Reference.

Some researchers have proposed that certain environmental factors may contribute to developing coloboma, either in humans or in animals. These findings have been published over time in the research literature, but there has been no systematic analysis of possible links. For instance, it is known that babies exposed to alcohol during pregnancy can develop coloboma — but they also have other anomalies. There are no known strong links between environmental exposures and isolated coloboma.

It is always possible that coloboma happens strictly by chance. In summary, there is little data to presently say why coloboma happened to a person in a family where no one else is affected.

How does uveal coloboma happen?

To understand how uveal coloboma happens, we first have to understand how the eye forms in the developing baby. The eyes start as stalks coming out of the brain. The tip of each stalk will become the eye itself, while the rest of the stalk will become the optic nerve linking the eye to the brain. There is a seam at the bottom of each stalk, where blood vessels originally run. This seam is known as the optic fissure, or the choroidal fissure, or the embryonic fissure. Starting at the fifth week of gestation (pregnancy), this seam must close. The closure starts roughly in the middle of the developing eye and runs in both directions. This process is finished by the seventh week of gestation. If, for some reason, the closure does not happen, a uveal coloboma is formed.

Depending on where the closure did not happen, the baby can have an iris coloboma (front of the fissure), a chorio-retinal coloboma (back of the fissure), or any combination of these. Uveal coloboma can affect one eye (unilateral) or both eyes (bilateral). The condition can be the same in both eyes (symmetric) or different in both eyes (asymmetric). A uveal coloboma may go from front to back (continuous) or have "skip lesions". The fact that the seam runs at the bottom of the stalk is the reason why uveal coloboma is always located in the lower inside corner of the eye.

How can uveal coloboma be inherited?

Isolated coloboma can follow all possible patterns of single gene inheritance, namely autosomal dominant, autosomal recessive and X-linked. For more information on inheritance patterns, please visit the National Library of Medicine's Genetics Home Reference. In one family, however, coloboma will follow only one pattern. For instance, in case of an autosomal dominant pattern, a person with coloboma would have a one in two chance of passing on the coloboma to each of his or her offspring. In families with a single case of coloboma, it is not possible to say what pattern of inheritance is involved; therefore, it is not possible to give an exact recurrence risk number. The recurrence risk of coloboma computed from averaging data across many families (empiric risk) is about 10 percent. This is an imperfect number, as it mixes information from families where this risk may be close to 0 percent with information from families where the actual risk may be 25 percent or even 50 percent.

The topic of inheritance of coloboma is complicated by several factors:

- Sometimes a person who is at risk for developing coloboma may not develop the condition, or it may be so minor that it goes unnoticed. This may appear in the family history as an inconsistent, non-interpretable pattern of inheritance.
- Knowing the pattern of inheritance of coloboma in a family does not give information on how the vision of an at-risk person will be affected. The location (front vs. back of the eye), side (left eye, right eye or both) and size of the coloboma cannot be predicted.
- There may be more than one gene involved in being at risk for coloboma, and environmental factors might play a role.

For coloboma due to a known syndrome, such as CHARGE syndrome, inheritance is based on what is known about the genetic basis of that particular syndrome. However, it is rarely, if ever, possible to say whether coloboma will be a feature of the syndrome in a person inheriting the genetic background responsible for this syndrome.

What are the symptoms of uveal coloboma?

There may or may not be any symptoms related to coloboma; it all depends on the amount and location of the missing tissue. People with a coloboma affecting the macula and the optic nerve will likely have reduced vision. In general, it is difficult to exactly predict what level of vision a baby will have only by looking at how much of the retina is missing. A more precise estimate of the level of vision can be obtained over time, as the child grows and can perform more vision tests.

People with a coloboma affecting any part of the retina will have what is called a "field defect". A field defect means that a person is missing vision in a specific location. Because coloboma is located in the lower part of the retina, vision in the upper part of the field of vision will be missing. This may or may not be noticeable to the affected person and may or may not affect performing daily activities.

A person with a coloboma affecting the front of the eye only will not have any decreased vision from it. Some people, however, have reported being more sensitive to light.

Are there other diseases or conditions associated with coloboma?

In the eye

Coloboma is sometimes found in association with other eye features. These may include:

- Difference in eye color between the two eyes (heterochromia)
- Small eye (microphthalmia)
- Increased thickness of the cornea. The cornea is the clear front part of the eye.
- Clouding of the lens (cataract)
- Elevated pressure in the eye (glaucoma)
- Retinal malformation (retinal dysplasia)
- Nearsightedness (myopia) or farsightedness (hyperopia)
- Involuntary eye movements (nystagmus)
- Protrusion of the back of the eyeball (posterior staphyloma)

In other parts of the body

Coloboma may be an isolated feature or may be found with other features. Sometimes these other features may be few and minor, such as skin tags near the ear. Sometimes they may be more numerous and severe, such as a heart or a kidney defect. A few of these associations may be genetic syndromes. These include (but are not limited to):

- CHARGE syndrome
- Cat-Eye syndrome
- Kabuki syndrome
- 13q deletion syndrome
- Wolf-Hirshhorn syndrome

What's the treatment for uveal coloboma?

Patients with uveal coloboma should have yearly follow-up exams by an eye care professional. However, there is currently no medication or surgery that can cure or reverse coloboma and make the eye whole again. Treatment consists of helping patients adjust to vision problems and make the most of the vision they have by:

- Correcting any refractive error with glasses or contact lenses.
- Maximizing the vision of the most affected eye in asymmetric cases. This may involve patching or using drops to temporarily blur vision in the stronger eye for a limited period of time.
- Ensuring that amblyopia (lazy eye) does not develop in childhood in case of asymmetry. Sometimes amblyopia treatment (patching, glasses and/or drops) can improve vision in eyes even with severe colobomas.
- Treating any other eye condition that may be present with coloboma, such as cataracts.
- Treating any complications that might arise from a retinal coloboma later in life, such as the growth of new blood vessels at the back of the eye (neovascularization) and/or retinal detachment. These complications are rare, in the order of 1-2% based on our experience.
- Using low vision devices, as needed.
- Making use of rehabilitation services, such as early intervention programs.
- Offering genetic counseling to the patient and family members.

If the eye with the coloboma is very small (microphthalmia), other follow-ups may be needed. Conformers and expanders may be used to help support the face and encourage the eye socket to grow. Children may also be fitted for a prosthetic (artificial) eye to improve appearance. As the face develops, new conformers will need to be made.

For people who wish to alter the appearance of a coloboma affecting the front of the eye, two options are currently available:

- Colored contact lenses that make the black part of the eye (pupil) round.
- Surgery to make the pupil rounder. This procedure pulls and sutures together the lower edges of the iris.

Color Blindness

Video

- https://youtu.be/7Apx-mTeLQE

At a glance: Color Blindness

- **Symptoms:** Trouble telling the difference between colors
- **Diagnosis:** Color vision test
- **Treatment:** Special glasses and contacts, visual aids

What is color blindness?

If you have color blindness, it means you see colors differently than most people. Most of the time, color blindness makes it hard to tell the difference between certain colors.

Usually, color blindness runs in families. There's no cure, but special glasses and contact lenses can help. Most people who are color blind are able to adjust and don't have problems with everyday activities.

What are the types of color blindness?

The most common type of color blindness makes it hard to tell the difference between red and green. Another type makes it hard to tell the difference between blue and yellow. People who are completely color blind don't see color at all, but that's not very common.

Learn more about types of color blindness

What are the symptoms of color blindness?

The main symptom of color blindness is not seeing colors the way most people do. If you're color blind, you may have trouble seeing:

- The difference between colors
- How bright colors are
- Different shades of colors

Symptoms of color blindness are often so mild that you may not notice them. And since we get used to the way we see colors, many people with color blindness don't know they have it.

People with very serious cases of color blindness might have other symptoms, too — like quick side-to-side eye movements (nystagmus) or sensitivity to light.

Am I at risk for color blindness?

Men have a much higher risk than women for color blindness. You're also more likely to have color blindness if you:

- Have a family history of color blindness
- Have certain eye diseases, like glaucoma or age-related macular degeneration (AMD)
- Have certain health problems, like diabetes, Alzheimer's disease, or multiple sclerosis (MS)
- Take certain medicines
- Are white

If you think you may have color blindness, talk with your doctor about getting checked.

When to get your child tested

It can be tricky to diagnose color blindness in children. Kids who are color blind might try to hide it. But being color blind can make it harder to read off a chalkboard or do other activities, so it's important to get your child tested if you're concerned.

Get your child tested if they have a family history of color blindness or if they seem to be having trouble learning colors.

Ask your child's eye doctor to test them. You also may be able to get your child tested at school.

What causes color blindness?

The most common kinds of color blindness are genetic, meaning they're passed down from parents.

Color blindness can also happen because of damage to your eye or your brain. And color vision may get worse as you get older — often because of cataracts (cloudy areas in the lens of the eye).
Learn more about what causes color blindness

Did you know?
Everyone sees color a little differently — even people who aren't color blind
About 1 in 12 men are color blind
Most people with color blindness are born with it, but sometimes it doesn't show up until later in life

How can I find out if I have color blindness?
Your eye doctor can usually use a simple test to tell you if you're color blind.
During the test, your eye doctor will show you a circle made of many different colored dots. The circle has a shape inside it that's made out of dots — like a number, a letter, or a squiggly line. This shape is easy to see if you don't have color blindness, but people who are color blind have a hard time seeing it.
Learn more about getting checked for color blindness

What's the treatment for color blindness?
There's no cure for color blindness that's passed down in families, but most people find ways to adjust to it. Children with color blindness may need help with some classroom activities, and adults with color blindness may not be able to do certain jobs, like being a pilot or graphic designer. Keep in mind that most of the time, color blindness doesn't cause serious problems.
If your color blindness is happening because of another health problem, your doctor will treat the condition that's causing the problem. If you're taking a medicine that causes color blindness, your doctor may adjust how much you take or suggest you switch to a different medicine.
If color blindness is causing problems with everyday tasks, there are devices and technology that can help, including:

Glasses and contacts. Special contact lenses and glasses may help people who are color blind tell the difference between colors.

Visual aids. You can use visual aids, apps, and other technology to help you live with color blindness. For example, you can use an app to take a photo with your phone or tablet and then tap on part of the photo to find out the color of that area.
Talk over your options with your eye doctor. Remember these tips:

- Ask your doctor about visual aids and technology that can help you with everyday tasks
- Encourage family members to get checked for color blindness, since it can run in families

Convergence Insufficiency

Video

- https://youtu.be/v95Utmna6rA

At a glance: Convergence Insufficiency

- **Symptoms:** Blurred or double vision when looking at near objects
- **Diagnosis:** Convergence insufficiency exam
- **Treatment:** In-office vision therapy

What is convergence insufficiency (CI)?

Convergence insufficiency (CI) is a condition in which a person's eyes have a tendency to drift outward when looking at objects at near distances, and their ability to converge (rotate the eyes towards each other) is inadequate. People with CI may have symptoms when trying to perform near-based activities such as reading, working on a computer or smart phone, watching video, or playing video games. Symptoms include performance-related problems (loss of concentration, loss of place with reading, reading slowly) and eye-related symptoms (eyes hurt, diplopia, blurred vision, headaches). CI is not a condition caused by a muscle weakness. Instead, in CI the neuromuscular ability (the nerves' control of muscle function) to compensate for the poor convergence is abnormal.

Why do people with CI have difficulty focusing on near objects?

To see objects as clear, single images, our brains merge information from both eyes. The process requires that the eyes converge and focus on the same point. As objects move closer to the face, the eyes must turn inward to maintain convergence and eye alignment. Most people can converge on objects as close as 2.5 centimeters (1 inch) from the nose. But people with CI can have trouble converging and maintaining eye alignment when looking at near objects. People with CI often experience blurry or double vision, eye strain, and discomfort when reading or doing near work activities over a long period of time.

Who gets CI?

CI is a common eye condition in both children and adults. In the absence of a concussion or other brain injury, we do not know why some people develop CI, but we do know that between 4 and 17 percent of children and adults are thought to have CI. While CI usually begins in childhood, it can begin at any age, and without treatment CI can persist for many years. Recent studies have found that CI is very common after concussions that do not resolve in a few weeks.

Are there conditions similar to CI?

CI is referred to as an eye-teaming (the ability of the eyes to work together) problem and is usually not related to refractive errors such as myopia (nearsightedness), hyperopia or presbyopia (general or age-related farsightedness). There are many other types of eye teaming problems, but CI is the most common. People with 20/20 vision can have CI.

How is CI diagnosed?

An optometrist or ophthalmologist can diagnose CI by asking questions and examining the patient. The doctor may ask about symptoms such as blurry vision, headache, double vision, and eye fatigue when focusing near for long periods of time. To diagnose CI, a doctor must take the following measurements:

- **Near point of convergence**: the closest point to the face at which the eyes continue to converge together. People with CI typically have a near point of convergence more than 6 cm from the face.
- **Positive fusional vergence**: Positive fusional vergence refers to the neuromuscular ability of the eyes to converge inward. This is the key underlying problem associated with CI. The doctor uses a series of prisms with increasing magnitude and ask the patient to maintain single vision while looking though these prisms.
- **Exodeviation**: This refers to the tendency for the eyes to drift outward and is a key part of the examination. People with CI will have greater exodeviation while looking at near objects than while looking at far objects.
- **Accommodation**: Accommodation refers to the ability to change focus from far to near. A high percentage of people with CI also have trouble focusing the eyes on near objects.

How is CI treated?

CI is treated with vision therapy. The objective of vision therapy is to normalize the neuromuscular ability to converge (positive fusional vergence). Vision therapy generally includes practice converging and focusing on objects with both eyes at various distances. Special equipment is used to stimulate and monitor the alignment of the eyes.
The NEI Convergence Insufficiency Treatment Trial (CITT) has shown that the most effective treatment for CI is in-office therapy, overseen by a trained therapist, with additional at-home exercises. Most children given in-office therapy showed normal vision or significant improvement in symptoms after 12 weeks.
The NEI CITT Attention and Reading Trial (CITT-ART) has shown that for children with trouble reading, CI treatment alone is not enough to improve reading performance.

Corneal Conditions

Video – Comprehensive Cornea Lecture

- https://youtu.be/AP4QQJF-aMY

At a glance: Corneal Conditions

- **Symptoms:** Eye pain, blurry vision, red or watery eyes, sensitivity to light
- **Diagnosis:** Eye exam
- **Treatment:** Medicine, laser surgery, corneal transplant, artificial cornea

What is the cornea?

The cornea is the clear outer layer at the front of the eye. The cornea helps your eye to focus light so you can see clearly.
Learn more about the cornea

What are the main types of corneal conditions?

There are several common conditions that affect the cornea.
Injuries. Small abrasions (scratches) on the cornea usually heal on their own. Deeper scratches or other injuries can cause corneal scarring and vision problems.
Allergies. Allergies to pollen can irritate the eyes and cause allergic conjunctivitis (pink eye). This can make your eyes red, itchy, and watery.
Learn more about pink eye
Keratitis. Keratitis is inflammation (redness and swelling) of the cornea. Infections related to contact lenses are the most common cause of keratitis.
Learn more about contact lens-related infections
Dry eye. Dry eye happens when your eyes don't make enough tears to stay wet. This can be uncomfortable and may cause vision problems.
Learn more about dry eye
Corneal dystrophies. Corneal dystrophies cause cloudy vision when material builds up on the cornea. These diseases usually run in families.
Learn more about corneal dystrophies
There are also a number of less common diseases that can affect the cornea — including ocular herpes, Stevens-Johnson Syndrome, iridocorneal endothelial syndrome, and pterygium.
Learn about other types of corneal disease

When to get help right away
Go to the eye doctor or the emergency room if you have:

- Intense eye pain
- Change in vision
- Blurry vision
- Very red, watery eyes
- An object stuck in your eye
- A serious eye injury or trauma — like getting hit hard in the eye

Am I at risk for corneal conditions?
Some corneal conditions, like corneal dystrophies, run in families. But there are steps you can take to lower your risk of corneal injuries and infections.
To prevent corneal injuries, wear protective eyewear when you:

- Play sports that use a ball or puck, like baseball or hockey
- Do yardwork, like mowing the lawn or using a weedwhacker
- Make repairs, like painting or hammering
- Use machines, like sanders or drills
- Use chemicals, like bleach or pesticides

If you wear contact lenses, always follow the instructions to clean, disinfect, and store your lenses. This can help prevent corneal infections, like keratitis.
Learn more about contact lenses and how to take care of them

Feel like something's stuck in your eye?

- Try blinking several times
- Try rinsing your eye with clean water or saline (salt) solution
- Try pulling your upper eyelid down over your lower eyelid
- Don't rub your eye — you could scratch your cornea
- If an object is stuck in your eye, don't try to remove it yourself — go to your eye doctor or the emergency room

How will my eye doctor check for corneal conditions?

Eye doctors can check for corneal conditions as part of a comprehensive eye exam. The exam is simple and painless.

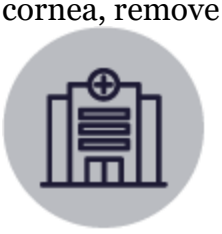
Learn what to expect from a comprehensive dilated eye exam

To check for corneal abrasions (scratches), your eye doctor may use a special type of eye drops called fluorescein dye. The dye makes corneal abrasions easier to see.

What is the treatment for corneal conditions?

Many corneal conditions can be treated with prescription eye drops or pills. If you have advanced corneal disease, you may need a different treatment.

Laser treatment. To treat some corneal dystrophies and other conditions, doctors can use a type of laser treatment called phototherapeutic keratectomy (PTK) to reshape the cornea, remove scar tissue, and make vision clearer.



Corneal transplant surgery. If the damage to your cornea can't be repaired, doctors can remove the damaged part and replace it with healthy corneal tissue from a donor.
Learn more about corneal transplants

Artificial cornea. As an alternative to corneal transplant, doctors can replace a damaged cornea with an artificial cornea, called a keratoprosthesis (KPro).

Diabetic Retinopathy

Video

- https://youtu.be/X17Q_RPUlYo

At a glance: Diabetic Retinopathy

- **Early Symptoms:** None
- **Later Symptoms:** Blurry vision, floating spots in your vision, blindness
- **Diagnosis:** Dilated eye exam
- **Treatment:** Medicine, laser treatment, surgery

What is diabetic retinopathy?
Diabetic retinopathy is an eye condition that can cause vision loss and blindness in people who have diabetes. It affects blood vessels in the retina (the light-sensitive layer of tissue in the back of your eye).
If you have diabetes, it's important for you to get a comprehensive dilated eye exam at least once a year. Diabetic retinopathy may not have any symptoms at first — but finding it early can help you take steps to protect your vision.
Managing your diabetes — by staying physically active, eating healthy, and taking your medicine — can also help you prevent or delay vision loss.

Other types of diabetic eye disease
Diabetic retinopathy is the most common cause of vision loss for people with diabetes. But diabetes can also make you more likely to develop several other eye conditions:

- **Cataracts**. Having diabetes makes you 2 to 5 times more likely to develop cataracts. It also makes you more likely to get them at a younger age. Learn more about cataracts.
- **Open-angle glaucoma**. Having diabetes nearly doubles your risk of developing a type of glaucoma called open-angle glaucoma. Learn more about glaucoma.

What are the symptoms of diabetic retinopathy?
The early stages of diabetic retinopathy usually don't have any symptoms. Some people notice changes in their vision, like trouble reading or seeing faraway objects. These changes may come and go.
In later stages of the disease, blood vessels in the retina start to bleed into the vitreous (gel-like fluid in the center of the eye). If this happens, you may see dark, floating spots or streaks that look like cobwebs. Sometimes, the spots clear up on their own — but it's important to get treatment right away. Without treatment, the bleeding can happen again, get worse, or cause scarring.

What other problems can diabetic retinopathy cause?
Diabetic retinopathy can lead to other serious eye conditions:

- **Diabetic macular edema (DME)**. Over time, about half of people with diabetic retinopathy will develop DME. DME happens when blood vessels in the retina leak fluid, causing swelling in the macula (a part of the retina). If you have DME, your vision will become blurry because of the extra fluid in your macula.
- **Neovascular glaucoma**. Diabetic retinopathy can cause abnormal blood vessels to grow out of the retina and block fluid from draining out of the eye. This causes a type of glaucoma.

Learn more about types of glaucoma

- **Retinal detachment**. Diabetic retinopathy can cause scars to form in the back of your eye. When the scars pull your retina away from the back of your eye, it's called tractional retinal detachment.

Learn more about types of retinal detachment

Am I at risk for diabetic retinopathy?

Anyone with any kind of diabetes can get diabetic retinopathy — including people with type 1, type 2, and gestational diabetes (diabetes that can develop during pregnancy). Your risk increases the longer you have diabetes. More than 2 in 5 Americans with diabetes have some stage of diabetic retinopathy. The good news is that you can lower your risk of developing diabetic retinopathy by controlling your diabetes.

Women with diabetes who become pregnant — or women who develop gestational diabetes — are at high risk for getting diabetic retinopathy. If you have diabetes and are pregnant, have a comprehensive dilated eye exam as soon as possible. Ask your doctor if you'll need additional eye exams during your pregnancy.

What causes diabetic retinopathy?

Diabetic retinopathy is caused by high blood sugar due to diabetes. Over time, having too much sugar in your blood can damage your retina — the part of your eye that detects light and sends signals to your brain through a nerve in the back of your eye (optic nerve).

Diabetes damages blood vessels all over the body. The damage to your eyes starts when sugar blocks the tiny blood vessels that go to your retina, causing them to leak fluid or bleed. To make up for these blocked blood vessels, your eyes then grow new blood vessels that don't work well. These new blood vessels can leak or bleed easily.

How will my eye doctor check for diabetic retinopathy?

Eye doctors can check for diabetic retinopathy as part of a dilated eye exam. The exam is simple and painless — your doctor will give you some eye drops to dilate (widen) your pupil and then check your eyes for diabetic retinopathy and other eye problems.

Learn what to expect from a dilated eye exam

If you have diabetes, it's very important to get regular eye exams. If you do develop diabetic retinopathy, early treatment can stop the damage and prevent blindness.

If your eye doctor thinks you may have severe diabetic retinopathy or DME, they may do a test called a fluorescein angiogram. This test lets the doctor see pictures of the blood vessels in your retina.

What can I do to prevent diabetic retinopathy?

Managing your diabetes is the best way to lower your risk of diabetic retinopathy. That means keeping your blood sugar levels as close to normal as possible. You can do this by getting regular physical activity, eating healthy, and carefully following your doctor's instructions for your insulin or other diabetes medicines.

To help control your blood sugar, you'll need a special test called an A1c test. This test shows your average blood sugar level over a 3-month period. Talk with your doctor about lowering your A1c level to help prevent or manage diabetic retinopathy.

Learn more about the A1c test

Having high blood pressure or high cholesterol along with diabetes increases your risk for diabetic retinopathy. So controlling your blood pressure and cholesterol can also help lower your risk for vision loss.

What's the treatment for diabetic retinopathy and DME?
In the early stages of diabetic retinopathy, your eye doctor will probably just keep track of how your eyes are doing. Some people with diabetic retinopathy may need a comprehensive dilated eye exam as often as every 2 to 4 months.
In later stages, it's important to start treatment right away — especially if you experience changes in your vision. While it won't undo any damage to your vision, treatment can stop your vision from getting worse. It's also important to take steps to control your diabetes, blood pressure, and cholesterol.

Injections. Medicines called anti-VEGF drugs can slow down or reverse diabetic retinopathy. Other medicines, called corticosteroids, can also help.
Learn more about injections to treat diabetic retinopathy

Laser treatment. To reduce swelling in your retina, eye doctors can use lasers to make the blood vessels shrink and stop leaking.
Learn more about laser treatment for diabetic retinopathy

Eye surgery. If your retina is bleeding a lot or you have a lot of scars in your eye, your eye doctor may recommend a type of surgery called a vitrectomy.

Dry Eye

Video

- https://youtu.be/Pp1oLaegaso

At a glance: Dry Eye

- **Symptoms:** Burning, dry or scratchy feeling, blurry vision, red eyes
- **Diagnosis:** Eye exam, measuring amount and thickness of tears
- **Treatment:** Medicine (pills or eye drops), lifestyle changes

What is dry eye?

Dry eye happens when your eyes don't make enough tears to stay wet, or when your tears don't work correctly. This can make your eyes feel uncomfortable, and in some cases it can also cause vision problems.

Dry eye is common — it affects millions of Americans every year. The good news is that if you have dry eye, there are lots of things you can do to keep your eyes healthy and stay comfortable.

What are the symptoms of dry eye?

Dry eye can cause:

- A scratchy feeling, like there's something in your eye
- Stinging or burning feelings in your eye
- Red eyes
- Sensitivity to light
- Blurry vision

Am I at risk for dry eye?

Anyone can get dry eye, but you might be more likely to have dry eye if you:

- Are age 50 or older
- Are female
- Wear contact lenses
- Don't get enough vitamin A (found in foods like carrots, broccoli, and liver) or omega-3 fatty acids (found in fish, walnuts, and vegetable oils)
- Have certain autoimmune conditions, like lupus or Sjögren syndrome

What causes dry eye?

Normally, glands above your eyes make tears that keep your eyes wet. Dry eye happens when your tears don't do their job. This could mean:

- Your glands don't make enough tears to keep your eyes wet
- Your tears dry up too fast
- Your tears just don't work well to keep your eyes wet

Learn more about the causes of dry eye

How will my eye doctor check for dry eye?
Your doctor can check for dry eye as part of a comprehensive dilated eye exam.
Learn more about what to expect during a comprehensive dilated eye exam
Be sure to tell your doctor if you think you might have dry eye. To find out if you have dry eye, your doctor might check:

- The amount of tears your eyes make
- How long it takes for your tears to dry up
- The structure of your eyelids

Floaters

Video

- https://youtu.be/36elf-vOM-4

At a glance: Floaters

- **Symptoms:**

Small, dark spots or squiggly lines that move around in your vision

- **Diagnosis:**

Dilated eye exam

- **Treatment:**

None (for mild cases), surgery (for severe cases)

What are floaters?
Floaters are little "cobwebs" or specks that float about in your field of vision. They are small, dark, shadowy shapes that can look like spots, thread-like strands, or squiggly lines. They move as your eyes move and seem to dart away when you try to look at them directly. They do not follow your eye movements precisely, and usually drift when your eyes stop moving.
Most people have floaters and learn to ignore them; they are usually not noticed until they become numerous or more prominent. Floaters can become apparent when looking at something bright, such as white paper or a blue sky.

Floaters and retinal detachment
Sometimes a section of the vitreous pulls the fine fibers away from the retina all at once, rather than gradually, causing many new floaters to appear suddenly. This is called a vitreous detachment, which in most cases is not sight-threatening and requires no treatment.
However, a sudden increase in floaters, possibly accompanied by light flashes or peripheral (side) vision loss, could indicate a retinal detachment. A retinal detachment

occurs when any part of the retina, the eye's light-sensitive tissue, is lifted or pulled from its normal position at the back wall of the eye.

A retinal detachment is a serious condition and should always be considered an emergency. If left untreated, it can lead to permanent visual impairment within two or three days or even blindness in the eye.
Those who experience a sudden increase in floaters, flashes of light in peripheral vision, or a loss of peripheral vision should have an eye care professional examine their eyes as soon as possible.

What causes floaters?

Floaters occur when the vitreous, a gel-like substance that fills about 80 percent of the eye and helps it maintain a round shape, slowly shrinks.
As the vitreous shrinks, it becomes somewhat stringy, and the strands can cast tiny shadows on the retina. These are floaters.
In most cases, floaters are part of the natural aging process and simply an annoyance. They can be distracting at first, but eventually tend to "settle" at the bottom of the eye, becoming less bothersome. They usually settle below the line of sight and do not go away completely.
However, there are other, more serious causes of floaters, including infection, inflammation (uveitis), hemorrhaging, retinal tears, and injury to the eye.

Am I at risk for floaters?

Floaters are more likely to develop as we age and are more common in people who are very nearsighted, have diabetes, or who have had a cataract operation.

What are the symptoms of floaters?

Floaters are little "cobwebs" or specks that float about in your field of vision. They are small, dark, shadowy shapes that can look like spots, thread-like strands, or squiggly lines. They move as your eyes move and seem to dart away when you try to look at them directly. They do not follow your eye movements precisely, and usually drift when your eyes stop moving.

What's the treatment for floaters?

For people who have floaters that are simply annoying, no treatment is recommended. On rare occasions, floaters can be so dense and numerous that they significantly affect vision. In these cases, a vitrectomy, a surgical procedure that removes floaters from the vitreous, may be needed.
A vitrectomy removes the vitreous gel, along with its floating debris, from the eye. The vitreous is replaced with a salt solution. Because the vitreous is mostly water, you will not notice any change between the salt solution and the original vitreous.
This operation carries significant risks to sight because of possible complications, which include retinal detachment, retinal tears, and cataract. Most eye surgeons are reluctant to recommend this surgery unless the floaters seriously interfere with vision.

Glaucoma

Video

- https://youtu.be/TgjdPgSxeYg

At a glance: Glaucoma

- **Early Symptoms:** None
- **Later Symptoms:** Loss of side (peripheral) vision, blindness
- **Diagnosis:** Dilated eye exam
- **Treatment:** Medicine (usually eye drops), laser treatment, surgery

What is glaucoma?

Glaucoma is a group of eye diseases that can cause vision loss and blindness by damaging a nerve in the back of your eye called the optic nerve.
The symptoms can start so slowly that you may not notice them. The only way to find out if you have glaucoma is to get a comprehensive dilated eye exam.
There's no cure for glaucoma, but early treatment can often stop the damage and protect your vision.

What are the types of glaucoma?

There are many different types of glaucoma, but the most common type in the United States is called **open-angle glaucoma** — that's what most people mean when they talk about glaucoma. Other types of glaucoma are less common, like angle-closure glaucoma and congenital glaucoma.
Learn more about the types of glaucoma

What are the symptoms of glaucoma?

At first, glaucoma doesn't usually have any symptoms. That's why half of people with glaucoma don't even know they have it.
Over time, you may slowly lose vision, usually starting with your side (peripheral) vision — especially the part of your vision that's closest to your nose. Because it happens so slowly, many people can't tell that their vision is changing, especially at first.
But as the disease gets worse, you may start to notice that you can't see things off to the side anymore. Without treatment, glaucoma can eventually cause blindness.

Am I at risk for glaucoma?

Anyone can get glaucoma, but some people are at higher risk. You're at higher risk if you:

- Are over age 60
- Are African American or Hispanic/Latino and over age 40
- Have a family history of glaucoma

Talk with your doctor about your risk for glaucoma, and ask how often you need to get checked.

When to get help right away
Angle-closure glaucoma can cause these sudden symptoms:

- Intense eye pain
- Upset stomach (nausea)
- Red eye
- Blurry vision

If you have these symptoms, go to your doctor or an emergency room now.

What causes glaucoma?
Scientists aren't sure what causes the most common types of glaucoma, but many people with glaucoma have high eye pressure (intraocular pressure) — and treatments that lower eye pressure help to slow the disease.
Learn more about what causes glaucoma
There's no way to prevent glaucoma. That's why eye exams are so important — so you and your doctor can find it before it affects your vision.

How will my eye doctor check for glaucoma?
Eye doctors can check for glaucoma as part of a comprehensive dilated eye exam. The exam is simple and painless — your doctor will give you some eye drops to dilate (widen) your pupil and then check your eyes for glaucoma and other eye problems. The exam includes a visual field test to check your peripheral (side) vision.

Idiopathic Intracranial Hypertension

Video

- https://youtu.be/UBWf6RU9Cas

At a glance: Idiopathic Intracranial Hypertension

- **Symptoms:** Blind spots, loss of peripheral (side) vision, double vision, temporary blindness, severe headaches
- **Diagnosis:** Physical exam, medical history, dilated eye exam, vision test, nervous system test, brain imaging, spinal tap
- **Treatment:** Weight loss through diet and exercise, medicine, surgery

What is idiopathic intracranial hypertension?
Intracranial hypertension is a condition due to high pressure within the spaces that surround the brain and spinal cord. These spaces are filled with cerebrospinal fluid (CSF), which cushions the brain from mechanical injury, provides nourishment, and carries away waste.

The most common symptoms of intracranial hypertension are headaches and visual loss, including blind spots, poor peripheral (side) vision, double vision, and short temporary episodes of blindness. Many patients experience permanent vision loss. Other common symptoms include pulsatile tinnitus (ringing in the ears) and neck and shoulder pain.
Intracranial hypertension can be either acute or chronic. In chronic intracranial hypertension, the increased CSF pressure can cause swelling and damage to the optic nerve—a condition called papilledema.
Chronic intracranial hypertension can be caused by many conditions including certain drugs such as tetracycline, a blood clot in the brain, excessive intake of vitamin A, or brain tumor. It can also occur without a detectable cause. This is idiopathic intracranial hypertension (IIH).
Because the symptoms of IIH can resemble those of a brain tumor, it is sometimes known by the older name pseudotumor cerebri, which means “false brain tumor.”

Am I at risk for IIH?

An estimated 100,000 Americans have IIH, and the number is rising as more people become obese or overweight. The disorder is most common in women between the ages of 20 and 50; about 5 percent of those affected are men. Obesity, defined as a body mass index (BMI) greater than 30, is a major risk factor. BMI is a number based on your weight and height. The Centers for Disease Control and Prevention offers an online BMI calculator. A recent gain of 5-15 percent of total body weight is also considered a risk factor for this disorder, even for people with a BMI less than 30.

How will my eye doctor check for IIH?

A thorough medical history and physical exam are needed to identify risk factors for IIH and to evaluate for the many potential causes of increased intracranial pressure. A neurological exam will also be performed. In IIH, the exam is normal except for findings related to increased intracranial pressure, including papilledema, visual loss, and possible weakness in the lateral rectus muscles, which are located near your temples and help turn the eyes outward. Weakness in these muscles can cause the eyes to turn inward, toward the nose, producing double vision.
A number of vision tests may also be performed, including a comprehensive dilated eye exam to look for signs of papilledema. Visual field testing is done to evaluate your peripheral vision. This testing measures the area of space you can see at a given instant without moving your head or eyes.
Brain imaging, including computed tomography (CT) and magnetic resonance imaging (MRI) scans, will be performed to look for a brain tumor, injury, or other potential cause for your symptoms. Normal findings on these exams are essential to a diagnosis of IIH.
A lumbar puncture, also known as a spinal tap, will be performed. In this procedure, a needle is inserted into a CSF-filled sac below the spinal cord in the lower back. The CSF pressure will be measured, and a small amount of CSF will be collected for analysis to look for causes of increased intracranial pressure. The procedure may also cause a temporary reduction in CSF pressure and symptoms.

What's the treatment for IIH?

If a diagnosis of IIH is confirmed, regular visual field tests and comprehensive dilated eye exams are recommended to monitor any changes in vision.
Sustainable weight loss through healthy eating, salt restriction, and exercise is a critical part of treatment for people with IIH who are overweight. Studies show that modest weight loss, around 5-10 percent of total body weight, may be sufficient to reduce signs and symptoms. If lifestyle changes are not successful in reducing weight and relieving IIH, weight loss surgery may be recommended for those with a BMI greater than 40.
For many people, weight loss can be difficult to achieve and maintain. And for those who are able to adjust their weight, relief from IIH tends to be gradual. Acetazolamide (Diamox), a drug that decreases CSF production, is therefore often used as an add-on therapy to weight loss. The drug is taken orally. Common side effects include fatigue, nausea, tingling hands and feet, and a metallic taste, usually triggered by carbonated drinks. These can be reversed by lowering the dose or stopping the drug.
It's important to remember that some medications, such as tetracycline, may help trigger IIH, and that stopping them may lead to improvement.
In rapidly progressive cases that do not respond to other treatments, surgery may be needed to relieve pressure on the optic nerve. Therapeutic shunting, which involves surgically inserting a tube to drain CSF from ventricles or inner brain cavities, can be used to remove excess CSF and lower pressure. In a procedure called optic nerve sheath fenestration, pressure on the optic nerve is relieved by making a small window into the covering that surrounds the nerve just behind the eyeball.

What's the prognosis?

For most people, IIH usually improves with treatment. For others, it progressively worsens with time, or it can resolve and then recur. About 5-10 percent of women with IIH experience disabling vision loss. Most patients do not need surgical treatment.

Low Vision

Video

- https://youtu.be/Sm6d4t873oI part 1
- https://youtu.be/OmlKEGG5e-E part 2
- https://youtu.be/TWmaZZDgPX0 part 3

At a glance: Low Vision

- **Signs:** Blurry vision, not seeing well enough to do everyday tasks like reading and driving
- **Diagnosis:** Dilated eye exam
- **Treatment:** Vision aids, vision rehabilitation

What is low vision?

Low vision is a vision problem that makes it hard to do everyday activities. It can't be fixed with glasses, contact lenses, or other standard treatments like medicine or surgery.

You may have low vision if you can't see well enough to do things like:

- Read
- Drive
- Recognize people's faces
- Tell colors apart
- See your television or computer screen clearly

What are the types of low vision?

The type of low vision that you have depends on the disease or condition that caused your low vision. The most common types of low vision are:

- Central vision loss (not being able to see things in the center of your vision)
- Peripheral vision loss (not being able to see things out of the corners of your eyes)
- Night blindness (not being able to see in low light)
- Blurry or hazy vision

What causes low vision?

Many different eye conditions can cause low vision, but the most common causes are:

- Age-related macular degeneration (AMD)
- Cataracts
- Diabetic retinopathy (a condition that can cause vision loss in people with diabetes)
- Glaucoma

Low vision is more common in older adults because many of the diseases that can cause it are more common in older adults. Aging doesn't cause low vision on its own.

Eye and brain injuries and certain genetic disorders can also cause low vision.

How will my eye doctor check for low vision?

Your doctor can check for low vision as part of a dilated eye exam. The exam is simple and painless. Your doctor will ask you to read letters that are up close and far away, and will check whether you can see things in the center and at the edges of your vision. Then, they will give you some eye drops to dilate (widen) your pupil and check for other eye problems — including conditions that could cause low vision.

Learn what to expect from a dilated eye exam

What's the treatment for low vision?

Unfortunately, low vision is usually permanent. Eyeglasses, medicine, and surgery can't usually cure low vision — but sometimes they can improve vision, help you do everyday activities more easily, or keep your vision from getting worse.

Treatment options will depend on the specific eye condition that caused your low vision. Ask your doctor if there are any treatments that could improve your vision or help protect your remaining vision.

Macular Edema

Video

- https://youtu.be/XgDyqKnIsEM

At a glance: Macular Edema

- **Symptoms:** Blurry or distorted vision, seeing colors as faded or washed out
- **Diagnosis:** Dilated eye exam, imaging tests of the eye
- **Treatment:** Medicines (eye drops, pills, or injections), vitrectomy (surgery)

What is macular edema?

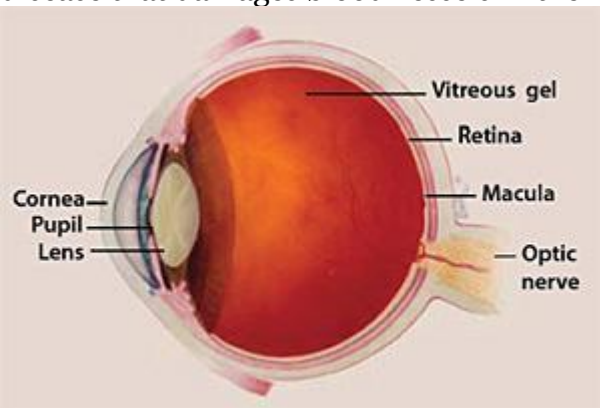
Macular edema is the build-up of fluid in the macula, an area in the center of the retina. The retina is the light-sensitive tissue at the back of the eye and the macula is the part of the retina responsible for sharp, straight-ahead vision. Fluid buildup causes the macula to swell and thicken, which distorts vision.

What are the symptoms of macular edema?

The primary symptom of macular edema is blurry or wavy vision near or in the center of your field of vision. Colors might also appear washed out or faded. Most people with macular edema will have symptoms that range from slightly blurry vision to noticeable vision loss. If only one eye is affected, you may not notice your vision is blurry until the condition is well-advanced.

What causes macular edema?

Macular edema occurs when there is abnormal leakage and accumulation of fluid in the macula from damaged blood vessels in the nearby retina. A common cause of macular edema is diabetic retinopathy, a disease that can happen to people with diabetes. Macular edema can also occur after eye surgery, in association with age-related macular degeneration, or as a consequence of inflammatory diseases that affect the eye. Any disease that damages blood vessels in the retina can cause macular edema.



Diabetic macular edema (DME)

Diabetic macular edema (DME) is caused by a complication of diabetes called diabetic retinopathy. Diabetic retinopathy is the most common diabetic eye disease and the leading cause of irreversible blindness in working age Americans. Diabetic retinopathy usually affects both eyes.

Diabetic retinopathy is caused by ongoing damage to the small blood vessels of the retina. The leakage of fluid into the retina may lead to swelling of the surrounding tissue, including the macula.

DME is the most common cause of vision loss in people with diabetic retinopathy. Poor blood sugar control and additional medical conditions, such as high blood pressure, increase the risk of blindness for people with DME. DME can occur at any stage of diabetic retinopathy, although it is more likely to occur later as the disease goes on. Experts estimate that approximately 7.7 million Americans have diabetic retinopathy and of those, about 750,000 also have DME. A recent study suggests that non-Hispanic African Americans are three times more likely to develop DME than non-Hispanic whites, most likely due to the higher incidence of diabetes in the African American population.

Eye surgery

Macular edema may develop after any type of surgery that is performed inside the eye, including surgery for cataract, glaucoma, or retinal disease. A small number of people who have cataract surgery (experts estimate only 1-3 percent) may develop macular edema within a few weeks after surgery. If one eye is affected, there is a 50 percent chance that the other eye will also be affected. Macular edema after eye surgery is usually mild, short-lasting, and responds well to eye drops that treat inflammation.

Age-related macular degeneration

Age-related macular degeneration (AMD) is a disease characterized by deterioration or breakdown of the macula, which is responsible for sharp, central vision. In neovascular AMD, also called “wet” AMD, blood vessels begin to grow up from the choroid (the bed of blood vessels below the retina) and into the retina. These new and abnormal blood vessels leak fluid into the macula and cause macular edema.

Blockage of retinal blood vessels

When retinal veins are blocked (retinal vein occlusion), blood does not drain properly and it leaks into the retina. If it leaks into the macula, this produces macular edema. Leakage is worsened by the severity of the blockage, how many veins are involved, and the pressure inside them. Retinal vein occlusion is most often associated with age-related atherosclerosis, diabetes, high blood pressure, and eye conditions such as glaucoma or inflammation.

Inflammatory diseases that affect the retina

Uveitis describes a group of inflammatory diseases that cause swelling in the eye and destroy eye tissues. The term “uveitis” is used because the diseases most often affect a part of the eye called the uvea. However, uveitis is not limited to the uvea. Uveitis can affect the cornea, iris, lens, vitreous, retina, optic nerve, and the white of the eye (sclera).

Inflammatory diseases and disorders of the immune system may also affect the eye and cause swelling and breakdown of tissue in the macula. These disorders include cytomegalovirus infection, retinal necrosis, sarcoidosis, Behçet's syndrome, toxoplasmosis, Eales' disease, and Vogt-Koyanagi-Harada syndrome.

How will my eye doctor check for macular edema?

To diagnose macular edema, your eye care professional will conduct a thorough eye exam and look for abnormalities in the retina. The following tests may be done to determine the location and extent of the disease:

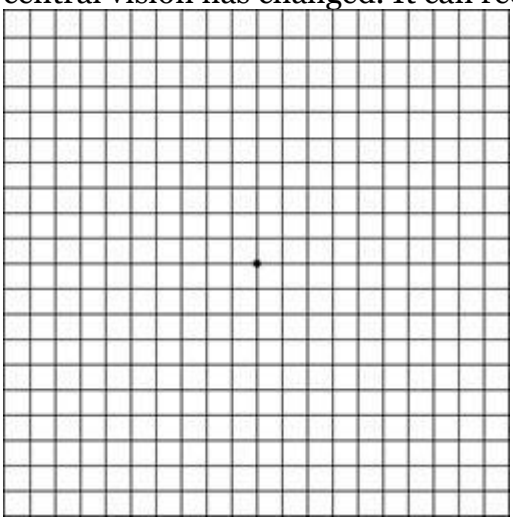
Visual acuity test. A visual acuity test is a common way to identify vision loss and can help to diagnose vision loss as a result of macular edema. This test uses a standardized chart or card with rows of letters that decrease in size from top to bottom. Covering one eye, you will be asked to read out loud the smallest line of letters that you can see. When done, you will test the other eye.

Dilated eye exam. A dilated eye exam is used to more thoroughly examine the retina. It gives additional information about the condition of the macula and helps detect the presence of blood vessel leakage or cysts. Drops are placed in your eyes to widen, or dilate, your pupils. Your eye care professional then examines your retina for signs of damage or disease.

Fluorescein angiogram. If earlier tests indicate you could have macular edema, your eye care professional may perform a fluorescein angiogram. In this test, a special dye is injected into your arm and a camera takes photos of the retina as the dye travels through the blood vessels. This test helps your ophthalmologist identify the amount of damage to the macula.

Optical coherence tomography. This is a test that uses a special light and a camera for detailed views of the cell layers inside the retina. It detects the thickness of the retina and so it's useful in determining the amount of swelling in the macula. Your eye care professional may also use optical coherence tomography after your treatment to track how well you are healing.

The Amsler Grid. The Amsler Grid provides an easy way to test whether or not your central vision has changed. It can recognize even small changes in your vision.



If you need reading glasses, wear them when you look at the Amsler grid. The grid should be at the same distance from your eyes as your usual reading material – about 14 inches. Test both eyes, one at a time, to see if any parts of the grid look distorted, missing, or dark. Mark the areas of the chart that you're not seeing properly and bring it with you to your next eye exam.

What's the treatment for macular edema?

Treatment for macular edema is determined by the type of macular edema you have. The most effective treatment strategies first aim at the underlying cause of macular edema, such as diabetes or high blood pressure, and then directly treat the damage in the retina.

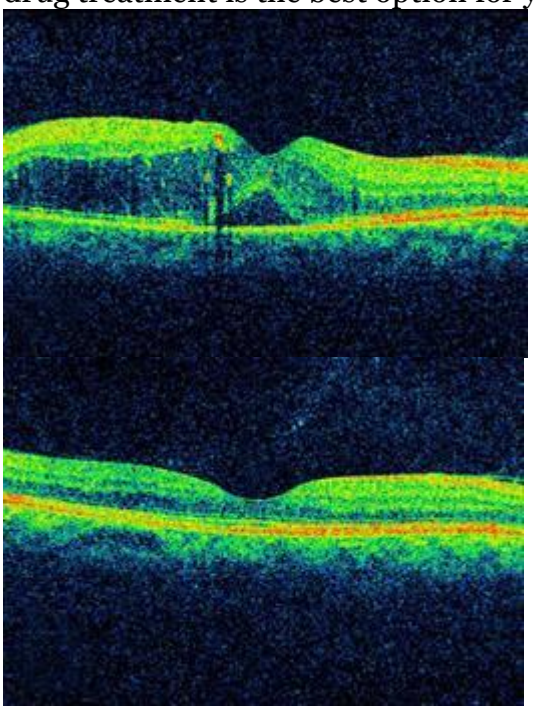
Treatments for diabetic macular edema and macular edema caused by other conditions are often the same. However, some cases of macular edema may need additional treatments to address associated conditions.

In the recent past, the standard treatment for macular edema was focal laser photocoagulation, which uses the heat from a laser to seal leaking blood vessels in the retina. However, recent clinical trials, many of them supported by NEI, have led doctors to move away from laser therapy to drug treatments injected directly into the eye.

Anti-VEGF injections

The current standard of care for macular edema is intravitreal injection. During this painless procedure, numbing drops are applied to the eye, and a short thin needle is used to inject medication into the vitreous gel (the fluid in the center of the eye). The drugs used in this treatment – Avastin, Eylea, and Lucentis – block the activity of a substance called vascular endothelial growth factor (VEGF). VEGF promotes blood vessel growth. In a healthy eye, this is not a problem. But in some conditions, the retina becomes starved for blood and VEGF becomes overactive. This causes the growth of fragile blood vessels which can rupture and leak blood into the retina and macula, causing macular edema. Anti-VEGF treatment blocks the activity of VEGF and slows the progress of macular edema.

The anti-VEGF drugs all work in similar ways to block vessel formation and prevent leakage in the retina. A recent NEI-supported clinical trial that directly compared the effectiveness of the three drugs for DME found that the drugs performed similarly for patients with mild vision problems. However, Eylea performed better for those with more serious vision loss (20/50 or worse). Your eye care professional will discuss which drug treatment is the best option for you.



DME, as viewed by optical coherence tomography (OCT). The two images were taken before (Top) and after anti-VEGF treatment (Bottom). The dip in the retina is the fovea, a region of the macula where vision is normally at its sharpest. Note the swelling of the macula and elevation of the fovea before treatment.

Anti-inflammatory treatments

Corticosteroid (steroid) treatments, which reduce inflammation, are the primary treatment for macular edema caused by inflammatory eye diseases. These anti-inflammatory drugs are usually administered via eye drops, pills, or injections of sustained-release corticosteroids into or around the eye. Clinicians now have the option of three FDA-approved sustained-release corticosteroid implants for more serious or longer-lasting conditions:

- Ozurdex is an implant that delivers an extended release dose of dexamethasone. It is approved for DME, macular edema following retinal vein occlusion, and [non-infectious] uveitis.
- Retisert is an implant that delivers an extended release dose of fluocinolone acetonide. It is approved for the treatment of uveitis, as well as DME that doesn't respond to corticosteroids.
- Iluvien is an implant that releases small doses of fluocinolone acetonide over the course of several years. The U.S. Food and Drug Administration has approved it for treating DME.

Nonsteroidal anti-inflammatory drugs (NSAIDs), in the form of eye drops, are sometimes used either before or after cataract surgery to prevent the development of macular edema. Because they are chemically different from corticosteroids, NSAIDs may be used when the eye doesn't respond to steroid treatment or to avoid the side-effects of steroid use in the eye.

Vitrectomy
Some cases of macular edema are caused when the vitreous (the gel that fills the area between the lens and the retina) pulls on the macula. Surgery to remove the vitreous gel, called a vitrectomy, relieves the pulling on the macula. Vitrectomy also may be required to remove blood that has collected in the vitreous or to correct vision when other treatments for macular edema are unsuccessful. Most vitrectomy surgeries are performed as outpatient surgery.

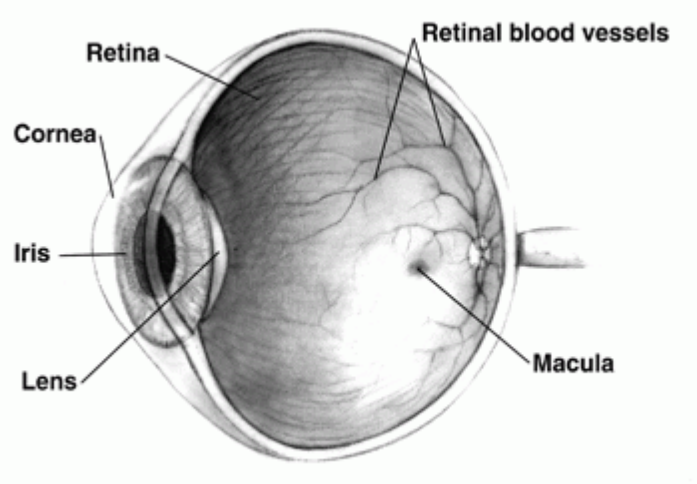
Macular Hole

Video

- https://youtu.be/jxPCrMbL0N4

At a glance: Macular Hole
- **Symptoms:** Blurry or distorted vision, loss of central vision
- **Diagnosis: I**maging test of the eye
- **Treatment:** Vitrectomy (surgery)

What is a macular hole?
A macular hole is a small break in the macula, located in the center of the eye's light-sensitive tissue called the retina. The macula provides the sharp, central vision we need for reading, driving, and seeing fine detail.
A macular hole can cause blurred and distorted central vision. Macular holes are related to aging and usually occur in people over age 60.



Is a macular hole the same as age-related macular degeneration?

No. Macular holes and age-related macular degeneration are two separate and distinct conditions, although the symptoms for each are similar. Both conditions are common in people 60 and over. An eye care professional will know the difference.

Are there different types of a macular hole?

Yes. There are three stages to a macular hole:

- **Foveal detachments (Stage I)**. Without treatment, about half of Stage I macular holes will progress.
- **Partial-thickness holes (Stage II)**. Without treatment, about 70 percent of Stage II macular holes will progress.
- **Full-thickness holes (Stage III)**.

The size of the hole and its location on the retina determine how much it will affect a person's vision. When a Stage III macular hole develops, most central and detailed vision can be lost. If left untreated, a macular hole can lead to a detached retina, a sight-threatening condition that should receive immediate medical attention.

What are the symptoms of a macular hole?

Macular holes often begin gradually. In the early stage of a macular hole, people may notice a slight distortion or blurriness in their straight-ahead vision. Straight lines or objects can begin to look bent or wavy. Reading and performing other routine tasks with the affected eye become difficult.

What causes a macular hole?

Most of the eye's interior is filled with vitreous, a gel-like substance that fills about 80 percent of the eye and helps it maintain a round shape. The vitreous contains millions of fine fibers that are attached to the surface of the retina. As we age, the vitreous slowly shrinks and pulls away from the retinal surface. Natural fluids fill the area where the vitreous has contracted. This is normal. In most cases, there are no adverse effects. Some patients may experience a small increase in floaters, which are little "cobwebs" or specks that seem to float about in your field of vision.

However, if the vitreous is firmly attached to the retina when it pulls away, it can tear the retina and create a macular hole. Also, once the vitreous has pulled away from the surface of the retina, some of the fibers can remain on the retinal surface and can contract. This increases tension on the retina and can lead to a macular hole. In either case, the fluid that has replaced the shrunken vitreous can then seep through the hole onto the macula, blurring and distorting central vision.

Macular holes can also occur in other eye disorders, such as high myopia (nearsightedness), injury to the eye, retinal detachment, and, rarely, macular pucker.

Is my other eye at risk?

If a macular hole exists in one eye, there is a 10-15 percent chance that a macular hole will develop in your other eye over your lifetime. Your doctor can discuss this with you.

What's the treatment for a macular hole?

Although some macular holes can seal themselves and require no treatment, surgery is necessary in many cases to help improve vision. In this surgical procedure – called a

vitrectomy – the vitreous gel is removed to prevent it from pulling on the retina and replaced with a bubble containing a mixture of air and gas. The bubble acts as an internal, temporary bandage that holds the edge of the macular hole in place as it heals. Surgery is performed under local anesthesia and often on an out-patient basis.
Following surgery, patients must remain in a face-down position, normally for a day or two but sometimes for as long as two-to-three weeks. This position allows the bubble to press against the macula and be gradually reabsorbed by the eye, sealing the hole. As the bubble is reabsorbed, the vitreous cavity refills with natural eye fluids.
Maintaining a face-down position is crucial to the success of the surgery. Because this position can be difficult for many people, it is important to discuss this with your doctor before surgery.

What are the risks of surgery?

The most common risk following macular hole surgery is an increase in the rate of cataract development. In most patients, a cataract can progress rapidly, and often becomes severe enough to require removal. Other less common complications include infection and retinal detachment either during surgery or afterward, both of which can be immediately treated.
For a few months after surgery, patients are not permitted to travel by air. Changes in air pressure may cause the bubble in the eye to expand, increasing pressure inside the eye.

How successful is this surgery?

Vision improvement varies from patient to patient. People that have had a macular hole for less than six months have a better chance of recovering vision than those who have had one for a longer period. Discuss vision recovery with your doctor before your surgery. Vision recovery can continue for as long as three months after surgery.

What if I cannot remain in a face-down position after the surgery?

If you cannot remain in a face-down position for the required period after surgery, vision recovery may not be successful. People who are unable to remain in a face-down position for this length of time may not be good candidates for a vitrectomy. However, there are a number of devices that can make the “face-down” recovery period easier on you. There are also some approaches that can decrease the amount of “face-down” time. Discuss these with your doctor.

Macular Pucker

Video

- https://youtu.be/_thCo5zmCHk

At a glance: Macular Pucker

- **Symptoms:** Blurry or distorted vision, gray area or blind spot in central vision
- **Diagnosis:** Dilated eye exam, imaging test of the eye
- **Treatment:** None (in most cases), vitrectomy (surgery) or injections (for more severe cases)

What is a macular pucker?

A macular pucker is scar tissue that has formed on the eye's macula, located in the center of the light-sensitive tissue called the retina. The macula provides the sharp, central vision we need for reading, driving, and seeing fine detail. A macular pucker can cause blurred and distorted central vision.
Macular pucker is also known as epiretinal membrane, preretinal membrane, cellophane maculopathy, retina wrinkle, surface wrinkling retinopathy, premacular fibrosis, and internal limiting membrane disease.

Is a macular pucker the same as age-related macular degeneration?

No. A macular pucker and age-related macular degeneration are two separate and distinct conditions, although the symptoms for each are similar. An eye care professional will know the difference.

Is a macular pucker similar to a macular hole?

Although both have similar symptoms - distorted and blurred vision - macular pucker and a macular hole are different conditions. They both result from tugging on the retina from a shrinking vitreous. When the vitreous separates from the retina, usually as part of the aging process, it can cause microscopic damage to the retina. As the retina heals itself, the resulting scar tissue can cause a macular pucker. Rarely, a macular pucker will develop into a macular hole. An eye care professional can readily tell the difference between macular pucker and macular hole.

What are the symptoms of a macular pucker?

Vision loss from a macular pucker can vary from no loss to severe loss, although severe vision loss is uncommon. People with a macular pucker may notice that their vision is blurry or mildly distorted, and straight lines can appear wavy. They may have difficulty in seeing fine detail and reading small print. There may be a gray area in the center of your vision, or perhaps even a blind spot.

Can macular pucker get worse?

For most people, vision remains stable and does not get progressively worse. Usually macular pucker affects one eye, although it may affect the other eye later.

What causes a macular pucker?

Most of the eye's interior is filled with vitreous, a gel-like substance that fills about 80 percent of the eye and helps it maintain a round shape. The vitreous contains millions of fine fibers that are attached to the surface of the retina. As we age, the vitreous slowly shrinks and pulls away from the retinal surface. This is called a vitreous detachment, and is normal. In most cases, there are no adverse effects, except for a small increase in

floaters, which are little “cobwebs” or specks that seem to float about in your field of vision.
However, sometimes when the vitreous pulls away from the retina, there is microscopic damage to the retina’s surface (Note: This is not a macular hole). When this happens, the retina begins a healing process to the damaged area and forms scar tissue, or an epiretinal membrane, on the surface of the retina. This scar tissue is firmly attached to the retina surface. When the scar tissue contracts, it causes the retina to wrinkle, or pucker, usually without any effect on central vision. However, if the scar tissue has formed over the macula, our sharp, central vision becomes blurred and distorted.

What's the treatment for a macular pucker?
A macular pucker usually requires no treatment. In many cases, the symptoms of vision distortion and blurriness are mild, and no treatment is necessary. People usually adjust to the mild visual distortion, since it does not affect activities of daily life, such as reading and driving. Neither eye drops, medications, nor nutritional supplements will improve vision distorted from macular pucker. Sometimes the scar tissue – which causes a macular pucker – separates from the retina, and the macular pucker clears up. Rarely, vision deteriorates to the point where it affects daily routine activities. However, when this happens, surgery may be recommended. This procedure is called a vitrectomy, in which the vitreous gel is removed to prevent it from pulling on the retina and replaced with a salt solution (Because the vitreous is mostly water, you will notice no change between the salt solution and the normal vitreous). Also, the scar tissue which causes the wrinkling is removed. A vitrectomy is usually performed under local anesthesia.
After the operation, you will need to wear an eye patch for a few days or weeks to protect the eye. You will also need to use medicated eye drops to protect against infection.

How successful is this surgery?
Surgery to repair a macular pucker is very delicate, and while vision improves in most cases, it does not usually return to normal. On average, about half of the vision lost from a macular pucker is restored; some people have significantly more vision restored, some less. In most cases, vision distortion is significantly reduced. Recovery of vision can take up to three months. Patients should talk with their eye care professional about whether treatment is appropriate.

Pink Eye

Video

- https://youtu.be/wo3F0OAXF-g

At a glance: Pink Eye

- **Symptoms:** Pink or red eyes, itchy or burning eyes, watery eyes, unusual fluid (discharge) coming from the eyes
- **Diagnosis:** Eye exam, lab tests
- **Treatment:** Medicine (eye drops or ointment)

What is pink eye?

Pink eye, or conjunctivitis, causes swelling and redness in the inside of your eyelid and the white part of your eye. Your eye may also feel itchy and painful.
Pink eye is common, and some types of pink eye spread very easily. You can keep from spreading it to other people by washing your hands often and not sharing items like pillowcases, towels, or makeup.
Some types of pink eye get better on their own. If your case is mild, you can ease your symptoms at home using a cold compress and eye drops you can get over the counter, meaning without a prescription. Other types of pink eye may need treatment from a doctor.

Pink eye in newborns

Pink eye can cause serious health problems for newborn babies. Call a doctor now if your baby has:

- Unusual fluid (discharge) coming from the eye
- Puffy red eyelids

What are the symptoms of pink eye?

The most common symptoms of pink eye are:

- Pink or red eyes
- Itchy or burning eyes
- Watery eyes
- White, yellow, or green fluid (discharge) coming from your eyes
- Crust along your eyelids or eyelashes, which may keep your eyes from opening when you wake up

Pink eye may also cause:

- Swollen eyelids
- A feeling like something's stuck in your eye
- Sensitivity to bright light
- Blurry vision
- A lump in front of your ear

If you wear contact lenses, you may notice that they feel uncomfortable or don't stay in place.

Am I at risk for pink eye?

Anyone can get pink eye. It's one of the most common eye problems for both children and adults.
You're more likely to get pink eye if you:

- Come in contact with someone else who has pink eye
- Recently had a respiratory infection, like a cough or a cold
- Wear contact lenses
- Come in contact with something you're allergic to

Newborn babies are also at higher risk for pink eye — and it can be very serious.
Learn more about pink eye in newborns

What causes pink eye?

Most of the time, pink eye is caused by a virus or bacteria. Viral pink eye is the most common type.
You can also get pink eye from allergies to things like pollen or pet fur — or from other things that can bother your eyes, like pool water with chlorine, air pollution, or makeup. It can be hard to figure out the exact cause of pink eye, because the symptoms are usually the same.
Learn more about what causes pink eye

How can I prevent pink eye from spreading?

Viral and bacterial pink eye spread very easily from person to person — but you can take steps to keep pink eye from spreading.
If you're around someone who has pink eye:

- Wash your hands often with soap and water. If you don't have soap and water, you can use hand sanitizer with alcohol in it.
- Wash your hands after you touch the person with pink eye or something that person used — for example, if you help put eye drops in their eyes, or put their bed sheets in the washing machine.
- Always wash your hands before touching your eyes.
- Don't share personal items that the person with pink eye has used — including pillows, towels, makeup, or glasses.

If you have pink eye:

- Wash your hands often with soap and water. Be extra careful about washing them after you touch your eyes or use eye drops or medicine. If you don't have soap and water, you can use hand sanitizer with alcohol in it.
- Avoid touching or rubbing your eyes.
- If you have discharge, wash the area around your eyes 2 or 3 times a day. Use a clean, wet washcloth or a fresh cotton ball each time. Be sure to wash your hands before and after washing your eyes.
- Don't share personal items with other people — including pillows, towels, makeup, or glasses.
- Clean your glasses regularly.
- If you wear contact lenses, follow your eye doctor's instructions for cleaning, storing, and replacing them.

You can also take steps to prevent getting pink eye again:

- Throw away any makeup that you used while you had pink eye. This includes eye makeup, face makeup, and brushes or sponges.
- Throw away contact lens solution, contact lenses, and cases that you used while you had pink eye.
- Clean your glasses and cases.

When do I need to see a doctor for pink eye?

Most cases of pink eye get better on their own. Go to the doctor if:

- You have a lot of pain in your eye

- Your eye is very red
- You notice a lot of mucus coming from your eyes
- Your vision is blurry or you're sensitive to light — and it doesn't get better when you wipe away discharge from your eye
- Your symptoms don't get better after a few days — or they get worse
- You have a health condition that weakens your immune system, like cancer or HIV
- You have symptoms of pink eye and you wear contacts, or you recently scratched your eye

The doctor will look at your eyes and ask you some questions to find out what caused your pink eye and decide on the best way to treat it.

What's the treatment for pink eye?

Pink eye often gets better on its own after 7 to 10 days. But sometimes, you need treatment from a doctor.

Refractive Errors

Video

- https://youtu.be/NpZI1eKiadg

At a glance: Refractive Errors

- **Types:** Nearsightedness (myopia), farsightedness (hyperopia), astigmatism, presbyopia
- **Most Common Symptom:** Blurred vision
- **Diagnosis:** Eye exam
- **Treatment:** Eyeglasses, contact lenses, surgery

What are refractive errors?

Refractive errors are a type of vision problem that makes it hard to see clearly. They happen when the shape of your eye keeps light from focusing correctly on your retina (a light-sensitive layer of tissue in the back of your eye).

Refractive errors are the most common type of vision problem. More than 150 million Americans have a refractive error — but many don't know that they could be seeing better. That's why eye exams are so important.

If you have a refractive error, your eye doctor can prescribe eyeglasses or contact lenses to help you see clearly.

What are the types of refractive errors?

There are 4 common types of refractive errors:

- Nearsightedness (myopia) makes far-away objects look blurry
- Farsightedness (hyperopia) makes nearby objects look blurry

- Astigmatism can make far-away and nearby objects look blurry or distorted
- Presbyopia makes it hard for middle-aged and older adults to see things up close

Learn more about the common types of refractive errors

What are the symptoms of refractive errors?

The most common symptom is blurry vision. Other symptoms include:

- Double vision
- Hazy vision
- Seeing a glare or halo around bright lights
- Squinting
- Headaches
- Eye strain (when your eyes feel tired or sore)
- Trouble focusing when reading or looking at a computer

Some people may not notice the symptoms of refractive errors. It's important to get eye exams regularly — so your eye doctor can make sure you're seeing as clearly as possible. If you wear glasses or contact lenses and still have these symptoms, you might need a new prescription. Talk to your eye doctor and get an eye exam if you are having trouble with your vision.

Am I at risk for refractive errors?

Anyone can have refractive errors, but you're at higher risk if you have family members who wear glasses or contact lenses.

Most types of refractive errors, like nearsightedness, usually start in childhood.

Presbyopia is common in adults ages 40 and older.

Talk with your doctor about your risk for refractive errors, and ask how often you need to get checked.

What causes refractive errors?

Refractive errors can be caused by:

- Eyeball length (when the eyeball grows too long or too short)
- Problems with the shape of the cornea (the clear outer layer of the eye)
- Aging of the lens (an inner part of the eye that is normally clear and helps the eye focus)

Did you know?

Refraction is the bending of light rays as they pass through one object to another

The cornea and lens bend (refract) light rays to focus them on the retina

When the shape of the eye changes, it also changes the way the light rays bend and focus — and that can cause blurry vision

How will my eye doctor check for refractive errors?

Eye doctors can check for refractive errors as part of a comprehensive eye exam. The exam is simple and painless. Your doctor will ask you to read letters that are up close and far away. Then, they may give you some eye drops to dilate (widen) your pupil and check for other eye problems.

Learn what to expect from a comprehensive dilated eye exam

What's the treatment for refractive errors?
Eye doctors can correct refractive errors with glasses or contact lenses, or fix the refractive error with surgery.

Glasses. Eyeglasses are the simplest and safest way to correct refractive errors. Your eye doctor will prescribe the right eyeglass lenses to give you the clearest possible vision.
Learn more about eyeglasses

Contacts. Contact lenses sit on the surface of your eyes and correct refractive errors. Your eye doctor will fit you for the right lenses and show you how to clean and wear them safely.
Learn more about contact lenses

Surgery. Some types of surgery, like laser eye surgery, can change the shape of your cornea to fix refractive errors. Your eye doctor can help you decide if surgery is right for you.

Retinal Detachment

Video

- https://youtu.be/HHefZIQzj8Y

At a glance: Retinal Detachment

- **Symptoms:** A sudden increase in the number of specks floating in your vision (floaters), flashes of light in one eye or both eyes, a "curtain" or shadow over your field of vision
- **Treatment:** If you have any of these sudden symptoms, **go to your eye doctor or the emergency room right away**. Retinal detachment can cause permanent vision loss — but getting treatment right away can help protect your vision.

What is retinal detachment?

Retinal detachment is an eye problem that happens when your retina (a light-sensitive layer of tissue in the back of your eye) is pulled away from its normal position at the back of your eye.

What are the symptoms of retinal detachment?

If only a small part of your retina has detached, you may not have any symptoms. But if more of your retina is detached, you may not be able to see as clearly as normal, and you may notice other sudden symptoms, including:

- A lot of new gray or black specks floating in your field of vision (floaters)
- Flashes of light in one eye or both eyes
- A dark shadow or "curtain" on the sides or in the middle of your field of vision

Retinal detachment can be a medical emergency. If you have symptoms of a detached retina, it's important to go to your eye doctor or the emergency room right away. The symptoms of retinal detachment often come on quickly. If the retinal detachment isn't treated right away, more of the retina can detach — which increases the risk of permanent vision loss or blindness.

Am I at risk for retinal detachment?

Anyone can have a retinal detachment, but some people are at higher risk. You are at higher risk if:

- You or a family member has had a retinal detachment before
- You've had a serious eye injury
- You've had eye surgery, like surgery to treat cataracts

Some other problems with your eyes may also put you at higher risk, including:

- Diabetic retinopathy (a condition in people with diabetes that affects blood vessels in the retina)
- Extreme nearsightedness (myopia), especially degenerative myopia
- Posterior vitreous detachment (when the gel-like fluid in the center of the eye pulls away from the retina)
- Certain other eye diseases, including retinoschisis or lattice degeneration

If you're concerned about your risk for retinal detachment, talk with your eye doctor.

What causes retinal detachment?
There are many causes of retinal detachment, but the most common causes are aging or an eye injury.
There are 3 types of retinal detachment: rhematogenous, tractional, and exudative. Each type happens because of a different problem that causes your retina to move away from the back of your eye.
Learn more about what causes each type of retinal detachment

How can I prevent retinal detachment?
There's no way to prevent retinal detachment — but you can lower your risk by wearing safety goggles or other protective eye gear when doing risky activities like playing sports.
If you experience any symptoms of retinal detachment, go to your eye doctor or the emergency room right away. Early treatment can help prevent permanent vision loss.
It's also important to get comprehensive dilated eye exams regularly. A dilated eye exam can help your eye doctor find a small retinal tear or detachment early, before it starts to affect your vision.

Did you know?
Retinal detachment can happen to anyone
If you have an eye injury or trauma (like something hitting your eye), it's important to see an eye doctor to check for early signs of retinal detachment
Seeing a few small specks in your vision (floaters) is normal — but if you suddenly see a lot more floaters than usual, it's important to get your eyes checked right away

How will my eye doctor check for retinal detachment?
If you see any warning signs of a retinal detachment, your eye doctor can check your eyes with a dilated eye exam. The exam is simple and painless — your doctor will give you some eye drops to dilate (widen) your pupil and then look at your retina at the back of your eye.
Learn what to expect from a dilated eye exam
If your eye doctor still needs more information after a dilated eye exam, you may get an ultrasound or an optical coherence tomography (OCT) scan of your eye. Both of these tests are painless and can help your eye doctor see the exact position of your retina.

What's the treatment for retinal detachment?
Depending on how much of your retina is detached and what type of retinal detachment you have, your eye doctor may recommend laser surgery, freezing treatment, or other types of surgery to fix any tears or breaks in your retina and reattach your retina to the back of your eye. Sometimes, your eye doctor will use more than one of these treatments at the same time.

Freeze treatment (cryopexy) or laser surgery. If you have a small hole or tear in your retina, your doctor can use a freezing probe or a medical laser to seal any tears or breaks in your retina. You can usually get these treatments in the eye doctor's office.
Learn more about laser surgery and freezing treatment

Surgery. If a larger part of your retina is detached from the back of your eye, you may need surgery to move your retina back into place. You will probably get these surgeries in a hospital.
Learn more about the surgeries used to repair a detached retina
Treatment for retinal detachment works well, especially if the detachment is caught early. In some cases, you may need a second treatment or surgery if your retina detaches again — but treatment is ultimately successful for about 9 out of 10 people.

Retinitis Pigmentosa

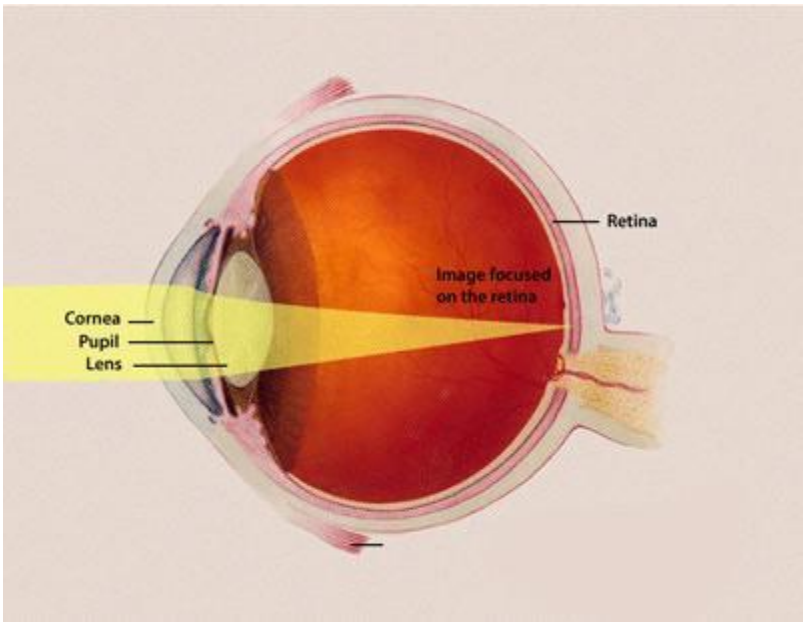
Video

- https://youtu.be/hHiu3cTMgMs

At a glance: Retinitis Pigmentosa

- **Early Symptoms:** Decreased night vision, loss of peripheral (side) vision
- **Late Symptoms:** Vision loss, blindness
- **Diagnosis:** Dilated eye exam, vision test, electroretinogram (a test of the retina), genetic test
- **Treatment:** Low vision aids, vision rehabilitation

What is retinitis pigmentosa?
Retinitis pigmentosa (RP) is a group of rare, genetic disorders that involve a breakdown and loss of cells in the retina — which is the light sensitive tissue that lines the back of the eye. Common symptoms include difficulty seeing at night and a loss of side (peripheral) vision.



The retina is the light-sensitive tissue at the back of the eye that contains photoreceptors and other cell types

How common is RP?
RP is considered a rare disorder. Although current statistics are not available, it is generally estimated that the disorder affects roughly 1 in 4,000 people, both in the United States and worldwide.

What causes RP?
RP is an inherited disorder that results from harmful changes in any one of more than 50 genes. These genes carry the instructions for making proteins that are needed in cells within the retina, called photoreceptors. Some of the changes, or mutations, within genes are so severe that the gene cannot make the required protein, limiting the cell's function. Other mutations produce a protein that is toxic to the cell. Still other mutations lead to an abnormal protein that doesn't function properly. In all three cases, the result is damage to the photoreceptors.

What are photoreceptors?
Photoreceptors are cells in the retina that begin the process of seeing. They absorb and convert light into electrical signals. These signals are sent to other cells in the retina and ultimately through the optic nerve to the brain where they are processed into the images we see. There are two general types of photoreceptors, called rods and cones. Rods are in the outer regions of the retina, and allow us to see in dim and dark light. Cones reside mostly in the central portion of the retina, and allow us to perceive fine visual detail and color.

How is RP inherited?
To understand how RP is inherited, it's important to know a little more about genes and how they are passed from parent to child. Genes are bundled together on structures called chromosomes. Each cell in your body contains 23 pairs of chromosomes. One

copy of each chromosome is passed by a parent at conception through egg and sperm cells. The X and Y chromosomes, known as sex chromosomes, determine whether a person is born female (XX) or male (XY). The 22 other paired chromosomes, called autosomes, contain the vast majority of genes that determine non-sex traits. RP can be inherited in one of three ways:

Autosomal recessive inheritance

In autosomal recessive inheritance, it takes two copies of the mutant gene to give rise to the disorder. An individual with a recessive gene mutation is known as a carrier. When two carriers have a child, there is a:

- 1 in 4 chance the child will have the disorder
- 1 in 2 chance the child will be a carrier
- 1 in 4 chance the child will neither have the disorder nor be a carrier

Autosomal dominant inheritance

In this inheritance pattern, it takes just one copy of the gene with a disorder-causing mutation to bring about the disorder. When a parent has a dominant gene mutation, there is a 1 in 2 chance that any children will inherit this mutation and the disorder.

X-linked inheritance

In this form of inheritance, mothers carry the mutated gene on one of their X chromosomes and pass it to their sons. Because females have two X chromosomes, the effect of a mutation on one X chromosome is offset by the normal gene on the other X chromosome. If a mother is a carrier of an X-linked disorder there is a:

- 1 in 2 chance of having a son with the disorder
- 1 in 2 chance of having a daughter who is a carrier

What are the symptoms of RP?

In the early stages of RP, rods are more severely affected than cones. As the rods die, people experience night blindness and a progressive loss of the visual field, the area of space that is visible at a given instant without moving the eyes. The loss of rods eventually leads to a breakdown and loss of cones. In the late stages of RP, as cones die, people tend to lose more of the visual field, developing tunnel vision. They may have difficulty performing essential tasks of daily living such as reading, driving, walking without assistance, or recognizing faces and objects.

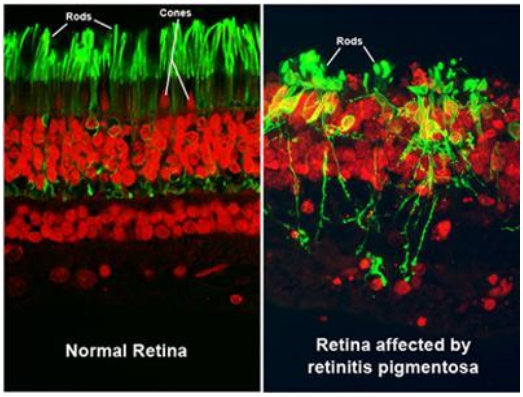


Image courtesy of Robert N. Fariss, Ph.D., chief of the NEI Biological Imaging Core, and Ann H. Milam, Ph.D., former professor in the Department of Ophthalmology at the University of Washington.

How does RP progress?

The symptoms of RP typically appear in childhood. Children often have difficulty getting around in the dark. It can also take abnormally long periods of time to adjust to changes in lighting. As their visual field becomes restricted, patients often trip over things and appear clumsy. People with RP often find bright lights uncomfortable, a condition known as photophobia. Because there are many gene mutations that cause the disorder, its progression can differ greatly from person to person. Some people retain central vision and a restricted visual field into their 50s, while others experience significant vision loss in early adulthood. Eventually, most individuals with RP will lose most of their sight.

A scene as it might be viewed by someone with normal vision and someone with advanced RP.

How will my doctor check for RP?

RP is diagnosed in part through an examination of the retina. An eye care professional will use an ophthalmoscope, a tool that allows for a wider, clear view of the retina. This typically reveals abnormal, dark pigment deposits that streak the retina. These pigment deposits are in part why the disorder was named retinitis pigmentosa. Other tests for RP include:

- **Electroretinogram (ERG).** An ERG measures the electrical activity of photoreceptor cells. This test uses gold foil or a contact lens with electrodes attached. A flash of light is sent to the retina and the electrodes measure rod and cone cell responses. People with RP have a decreased electrical activity, reflecting the declining function of photoreceptors.
- **Visual field testing.** To determine the extent of vision loss, a clinician will give a visual field test. The person watches as a dot of light moves around the half-circle (180 degrees) of space directly in front of the head and to either side. The patient pushes a button to indicate that he or she can see the light. This process results in a map of their visual field and their central vision.
- **Genetic testing.** In some cases, a clinician takes a DNA sample from the person to give a genetic diagnosis. In this way a person can learn about the progression of their particular form of the disorder.

What's the treatment for RP?

Living with vision loss

A number of services and devices are available to help people with vision loss carry out daily activities and maintain their independence. In addition to an eye care professional, it's important to have help from a team of experts, which may include occupational therapists, orientation and mobility specialists, certified low vision therapists, and others.
Learn more about living with low vision
Children with RP may benefit from low vision aids that maximize existing vision. For example, there are special lenses that magnify central vision to expand visual field and eliminate glare. Computer programs that read text are readily available. Closed circuit televisions with a camera can adjust text to suit one's vision. Portable lighting devices can adjust a dark or dim environment. Mobility training can teach people to use a cane or a guide dog, and eye scanning techniques can help people to optimize remaining vision. Once a child is diagnosed, he or she will be referred to a low vision specialist for a comprehensive evaluation. Parents may also want to meet with the child's school administrators and teachers to make sure that necessary accommodations are put in place.
For parents of children with RP, one challenge is to determine when a child might need to learn to use a cane or a guide dog. Having regular eye examinations to measure the progress of the disorder will help parents make informed decisions regarding low vision services and rehabilitation.

Targeted therapies for RP

An NEI-sponsored clinical trial found that a daily dose of 15,000 international units of vitamin A palmitate modestly slowed the progression of the disorder in adults. Because there are so many forms of RP, it is difficult to predict how any one patient will respond to this treatment. Talk to an eye care professional to determine if taking vitamin A is right for you or your child.
An artificial vision device called the Argus II has also shown promise for restoring some vision to people with late-stage RP. The Argus II, developed by Second Sight with NEI support, is a prosthetic device that functions in place of lost photoreceptor cells. It consists of a light-sensitive electrode that is surgically implanted on the retina. A pair of glasses with a camera wirelessly transmits signals to the electrode that are then relayed to the brain. Although it does not restore normal vision, in clinical studies, the Argus II enabled people with RP to read large letters and navigate environments without the use of a cane or guide dog. In 2012, the U.S. Food and Drug Administration (FDA) granted a humanitarian device exemption for use of the Argus II to treat late-stage RP. This means the device has not proven effective, but the FDA has determined that its probable benefits outweigh its risks to health. The Argus II is eligible for Medicare payment.

Retinoblastoma

Video

- https://youtu.be/q0oIUhbK1ok

At a glance: Retinoblastoma

- **Symptoms:** Eye swelling or redness, whiteness in the pupil, eyes that point in different directions
- **Diagnosis:** Dilated eye exam, scans or imaging tests of the eye
- **Treatment:** Chemotherapy, radiation, laser treatment, freezing treatment (cryotherapy), surgery

What is retinoblastoma?
Retinoblastoma is a type of cancer that forms in the retina (the light-sensitive tissue at the back of the eye).

Who is at risk for retinoblastoma?
The disease usually occurs in children younger than 5 years and may be in one eye or in both eyes. In some cases the disease is inherited from a parent.

What's the treatment for retinoblastoma?
Retinoblastoma is a serious, life-threatening disease. However, with early diagnosis and timely treatment, in most cases, a child's eyesight and life can be saved.

Retinopathy of Prematurity

Video

- https://youtu.be/nd7SmmRBmKI

At a glance: Retinopathy of Prematurity

- **Early Symptoms:** None
- **Late Symptoms:** Unusual eye movements, white pupils, vision loss
- **Diagnosis:** Eye exam or photographs of the retinas
- **Treatment:** None (for mild cases), laser treatment, freeze treatment, eye injections (for severe cases)

What is retinopathy of prematurity?
Retinopathy of prematurity (ROP) is a potentially blinding eye disorder that primarily affects premature infants weighing about 2¾ pounds (1250 grams) or less that are born

before 31 weeks of gestation (a full-term pregnancy has a gestation of 38–42 weeks). The smaller a baby is at birth, the more likely that baby is to develop ROP. This disorder — which usually develops in both eyes — is one of the most common causes of visual loss in childhood and can lead to lifelong vision impairment and blindness. ROP was first diagnosed in 1942.

How many infants have retinopathy of prematurity?

Today, with advances in neonatal care, smaller and more premature infants are being saved. These infants are at a much higher risk for ROP. Not all babies who are premature develop ROP. There are approximately 3.9 million infants born in the U.S. each year; of those, about 28,000 weigh 2¾ pounds or less. About 14,000–16,000 of these infants are affected by some degree of ROP. The disease improves and leaves no permanent damage in milder cases of ROP. About 90 percent of all infants with ROP are in the milder category and do not need treatment. However, infants with more severe disease can develop impaired vision or even blindness. About 1,100–1,500 infants annually develop ROP that is severe enough to require medical treatment. About 400–600 infants each year in the US become legally blind from ROP.

Are there different stages of ROP?

Yes. ROP is classified in five stages, ranging from mild (stage I) to severe (stage V):

- **Stage I** — Mildly abnormal blood vessel growth. Many children who develop stage I improve with no treatment and eventually develop normal vision. The disease resolves on its own without further progression.
- **Stage II** — Moderately abnormal blood vessel growth. Many children who develop stage II improve with no treatment and eventually develop normal vision. The disease resolves on its own without further progression.
- **Stage III** — Severely abnormal blood vessel growth. The abnormal blood vessels grow toward the center of the eye instead of following their normal growth pattern along the surface of the retina. Some infants who develop stage III improve with no treatment and eventually develop normal vision. However, when infants have a certain degree of Stage III and “plus disease” develops, treatment is considered. “Plus disease” means that the blood vessels of the retina have become enlarged and twisted, indicating a worsening of the disease. Treatment at this point has a good chance of preventing retinal detachment.
- **Stage IV** — Partially detached retina. Traction from the scar produced by bleeding, abnormal vessels pulls the retina away from the wall of the eye.
- **Stage V** — Completely detached retina and the end stage of the disease. If the eye is left alone at this stage, the baby can have severe visual impairment and even blindness.

Most babies who develop ROP have stages I or II. However, in a small number of babies, ROP worsens, sometimes very rapidly. Untreated ROP threatens to destroy vision.

Can ROP cause other complications?

Yes. Infants with ROP are considered to be at higher risk for developing certain eye problems later in life, such as retinal detachment, myopia (nearsightedness), strabismus (crossed eyes), amblyopia (lazy eye), and glaucoma. In many cases, these eye problems can be treated or controlled.

What causes ROP?

ROP occurs when abnormal blood vessels grow and spread throughout the retina, the tissue that lines the back of the eye. These abnormal blood vessels are fragile and can leak, scarring the retina and pulling it out of position. This causes a retinal detachment. Retinal detachment is the main cause of visual impairment and blindness in ROP.
Several complex factors may be responsible for the development of ROP. The eye starts to develop at about 16 weeks of pregnancy, when the blood vessels of the retina begin to form at the optic nerve in the back of the eye. The blood vessels grow gradually toward the edges of the developing retina, supplying oxygen and nutrients. During the last 12 weeks of a pregnancy, the eye develops rapidly. When a baby is born full-term, the retinal blood vessel growth is mostly complete (the retina usually finishes growing a few weeks to a month after birth). But if a baby is born prematurely, before these blood vessels have reached the edges of the retina, normal vessel growth may stop. The edges of the retina — the periphery — may not get enough oxygen and nutrients.
Scientists believe that the periphery of the retina then sends out signals to other areas of the retina for nourishment. As a result, new abnormal vessels begin to grow. These new blood vessels are fragile and weak and can bleed, leading to retinal scarring. When these scars shrink, they pull on the retina, causing it to detach from the back of the eye.

Are there other risk factors for ROP?

In addition to birth weight and how early a baby is born, other factors contributing to the risk of ROP include anemia, blood transfusions, respiratory distress, breathing difficulties, and the overall health of the infant.
An ROP epidemic occurred in the 1940s and early 1950s when hospital nurseries began using excessively high levels of oxygen in incubators to save the lives of premature infants. During this time, ROP was the leading cause of blindness in children in the US. In 1954, scientists funded by the National Institutes of Health determined that the relatively high levels of oxygen routinely given to premature infants at that time were an important risk factor, and that reducing the level of oxygen given to premature babies reduced the incidence of ROP. With newer technology and methods to monitor the oxygen levels of infants, oxygen use as a risk factor has diminished in importance. Although it had been suggested as a factor in the development of ROP, researchers supported by the National Eye Institute determined that lighting levels in hospital nurseries has no effect on the development of ROP.

What's the treatment for ROP?

The most effective proven treatments for ROP are laser therapy or cryotherapy. Laser therapy “burns away” the periphery of the retina, which has no normal blood vessels. With cryotherapy, physicians use an instrument that generates freezing temperatures to briefly touch spots on the surface of the eye that overlie the periphery of the retina. Both laser treatment and cryotherapy destroy the peripheral areas of the retina, slowing or reversing the abnormal growth of blood vessels. Unfortunately, the treatments also destroy some side vision. This is done to save the most important part of our sight — the sharp, central vision we need for “straight ahead” activities such as reading, sewing, and driving.

Both laser treatments and cryotherapy are performed only on infants with advanced ROP, particularly stage III with "plus disease." Both treatments are considered invasive surgeries on the eye, and doctors don't know the long-term side effects of each.
In the later stages of ROP, other treatment options include:

- **Scleral buckle**. This involves placing a silicone band around the eye and tightening it. This keeps the vitreous gel from pulling on the scar tissue and allows the retina to flatten back down onto the wall of the eye. Infants who have had a sclera buckle need to have the band removed months or years later, since the eye continues to grow; otherwise they will become nearsighted. Sclera buckles are usually performed on infants with stage IV or V.
- **Vitrectomy**. Vitrectomy involves removing the vitreous and replacing it with a saline solution. After the vitreous has been removed, the scar tissue on the retina can be peeled back or cut away, allowing the retina to relax and lay back down against the eye wall. Vitrectomy is performed only at stage V.

Stargardt Disease

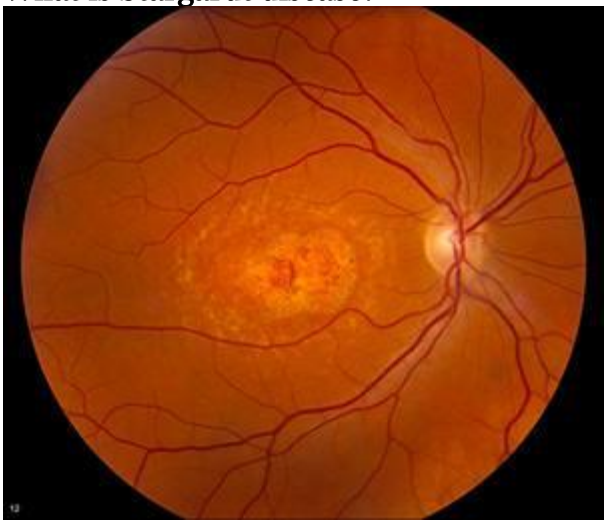
Video

- https://youtu.be/gvLlv4GLCrE

At a glance: Stargardt Disease

- **Symptoms:** Vision loss in childhood or adolescence, light sensitivity, color blindness
- **Diagnosis:** Dilated eye exam, photos or scans of the retina
- **Treatment:** Low vision aids, wearing dark glasses outdoors, avoiding tobacco, occupational therapy

What is Stargardt disease?

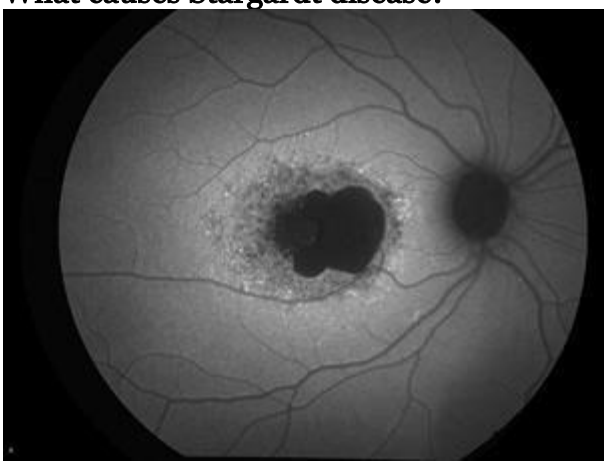


Color fundus photography image from a Stargardt disease patient showing a central macular scar with some pigmentary changes and surrounding perimacular flecks.
Stargardt disease is an inherited disorder of the retina — the tissue at the back of the eye that senses light. The disease typically causes vision loss during childhood or adolescence, although in some forms, vision loss may not be noticed until later in adulthood. It is rare for people with the disease to become completely blind. For most people, vision loss progresses slowly over time to 20/200 or worse. (Normal vision is 20/20).
Stargardt disease is also called Stargardt macular dystrophy, juvenile macular degeneration, or fundus flavimaculatus. The disease causes progressive damage — or degeneration — of the macula, which is a small area in the center of the retina that is responsible for sharp, straight-ahead vision. Stargardt disease is one of several genetic disorders that cause macular degeneration. Experts estimate that 1 in 8-10 thousand people have Stargardt disease.

What are the symptoms of Stargardt disease?

The most common symptom of Stargardt disease is variable, often slow loss of central vision in both eyes. People with the disease might notice gray, black, or hazy spots in the center of their vision, or that it takes longer than usual for their eyes to adjust when moving from light to dark environments. Their eyes may be more sensitive to bright light. Some people also develop color blindness later in the disease.
The progression of symptoms in Stargardt disease is different for each person. People with an earlier onset of disease tend to have more rapid vision loss. Vision loss may decrease slowly at first, then worsen rapidly until it levels off. Most people with Stargardt disease will end up with 20/200 vision or worse. People with Stargardt disease may also begin to lose some of their peripheral (side) vision as they get older.

What causes Stargardt disease?



Fundus autofluorescence image of a patient with Stargardt disease.
The retina contains light-sensing cells called photoreceptors. There are two types of photoreceptors: rods and cones. Together, rod and cones detect light and convert it into electrical signals, which are then “seen” by the brain. Rods are found in the outer retina and help us see in dim and dark lighting. Cones are found in the macula and help us see fine visual detail and color. Both cones and rods die away in Stargardt disease, but for unclear reasons, cones are more strongly affected in most cases.

You may have heard about the importance of vitamin A-rich foods in maintaining healthy vision. That's because vitamin A is needed to make key light-sensitive molecules inside photoreceptors. Unfortunately, this manufacturing process can lead to harmful vitamin A byproducts — which turn out to play a key role in Stargardt disease.
Mutations in a gene called *ABCA4* are the most common cause of Stargardt disease. This gene makes a protein that normally clears away vitamin A byproducts inside photoreceptors. Cells that lack the *ABCA4* protein accumulate clumps of lipofuscin, a fatty substance that forms yellowish flecks. As the clumps of lipofuscin increase in and around the macula, central vision becomes impaired. Eventually, these fatty deposits lead to the death of photoreceptors and vision becomes further impaired.
Mutations in the *ABCA4* gene are also associated with other retinal dystrophies including cone dystrophy, cone-rod dystrophy, and retinitis pigmentosa, a severe form of retinal degeneration.

How is Stargardt disease inherited?

Genes are bundled together on structures called chromosomes. One copy of each chromosome is passed by a parent at conception through egg and sperm cells. The X and Y chromosomes, known as sex chromosomes, determine whether a person is born female (XX) or male (XY) and also carry other non-sex traits.
In autosomal recessive inheritance, it takes two copies of the mutant gene to give rise to the disease. An individual who has one copy of a recessive gene mutation is known as a carrier. When two carriers have a child, there is a:

- 1 in 4 chance of having a child with the disease
- 1 in 2 chance of having a child who is a carrier
- 1 in 4 chance of having a child who neither has the disease nor is a carrier

In autosomal dominant inheritance, it takes just one copy of the mutant gene to bring about the disease. When an affected parent with one dominant gene mutation has a child, there is a 1 in 2 chance that a child will inherit the disease.
Autosomal recessive mutations in the *ABCA4* gene account for about 95 percent of Stargardt disease. The other five percent of cases are caused by rarer mutations in different genes that play a role in lipofuscin function. Some of these mutations are autosomal dominant.

How will my eye doctor check for Stargardt disease?

An eye care professional can make a positive diagnosis of Stargardt disease by examining the retina. Lipofuscin deposits can be seen as yellowish flecks in the macula. The flecks are irregular in shape and usually extend outward from the macula in a ring-like pattern. The number, size, color, and appearance of these flecks are widely variable.
A standard eye chart and other tests may be used to assess symptoms of vision loss in Stargardt disease, including:

- **Visual field testing.** Visual fields testing attempts to measure distribution and sensitivity of field of vision. Multiple methods are available for testing; none is painful and most share a requirement for the patient to indicate ability to see a stimulus / target. This process results in a map of the person's visual field, and can point to a loss of central vision or peripheral vision.
- **Color Testing:** There are several tests that can be used to detect loss of color vision, which can occur late in Stargardt disease. Three tests are often used to get

additional information: fundus photography combined with autofluorescence, electroretinography, and optical coherence tomography.

- A **fundus photo** is a picture of the retina. These photos may reveal the presence of lipofuscin deposits. In fundus autofluorescence (FAF), a special filter is used to detect lipofuscin. Lipofuscin is naturally fluorescent (it glows in the dark) when a specific wavelength of light is shined into the eye. This test can detect lipofuscin that might not be visible with standard fundus photography, making it possible to diagnose Stargardt disease earlier.
- **Electroretinography** (ERG) measures the electrical response of rods and cones to light. During the test, an electrode is placed on the cornea and light is flashed into the eye. The electrical responses are viewed and recorded on a monitor. Abnormal patterns of light response suggest the presence of Stargardt disease or other diseases that involve retinal degeneration.
- **Optical coherence tomography** (OCT) is a scanning device that works a little like ultrasound. While ultrasound captures images by bouncing sound waves off of living tissues, OCT does it with light waves. The patient places his or her head on a chin rest while invisible, near-infrared light is focused on the retina. Because the eye is designed to allow light in, it's possible to get detailed pictures deep within the retina. These pictures are then analyzed for any abnormalities in the thickness of the retinal layers, which could indicate retinal degeneration. OCT is sometimes combined with infrared scanning laser ophthalmoscope (ISLO) to provide additional surface images of the retina.

What's the treatment for Stargardt disease?

Currently, there is no treatment for Stargardt disease. Some ophthalmologists encourage people with Stargardt disease to wear dark glasses and hats when out in bright light to reduce the buildup of lipofuscin. Cigarette smoking and second hand smoke should be avoided. Animal studies suggest that high-dose vitamin A may increase lipofuscin accumulation and potentially accelerate vision loss. Therefore, supplements containing more than the recommended daily allowance of vitamin A should be avoided, or taken only under a doctor's supervision. There is no need to worry about getting too much vitamin A through food.

A number of services and devices can help people with Stargardt disease carry out daily activities and maintain their independence. Low-vision aids can be helpful for many daily tasks and range from simple hand-held lenses to electronic devices such as electronic reading machines or closed circuit video magnification systems. Because many people with Stargardt disease will become visually disabled by their 20s, the disease can have a significant emotional impact. Work, socializing, driving and other activities that may have come easily in the past are likely to become challenging. So counseling and occupational therapies often need to be part of the treatment plan.

Strabismus

Video

- https://youtu.be/-w2xo7K3HRw
- https://youtu.be/fYjIW3KB35U

See Amblyopia (lazy eye)

Usher Syndrome

Video

- https://youtu.be/--jSAgUNLmQ

At a glance: Usher Syndrome

- **Early Symptoms:** Hearing loss or deafness (usually from birth)
- **Late Symptoms:** Loss of peripheral (side) vision, decreased night vision
- **Diagnosis:** Dilated eye exam, visual field test, hearing test, balance test
- **Treatment:** Low vision services, teaching Braille, early intervention (learning support), hearing aids or cochlear implants, teaching sign language or tactile sign language

What is Usher syndrome?

Usher syndrome is the most common condition that affects both hearing and vision; sometimes it also affects balance. The major symptoms of Usher syndrome are deafness or hearing loss and an eye disease called retinitis pigmentosa (RP).

Deafness or hearing loss in Usher syndrome is caused by abnormal development of hair cells (sound receptor cells) in the inner ear. Most children with Usher syndrome are born with moderate to profound hearing loss, depending on the type. Less commonly, hearing loss from Usher syndrome appears during adolescence or later. Usher syndrome can also cause severe balance problems due to abnormal development of the vestibular hair cells, sensory cells that detect gravity and head movement.

RP initially causes night-blindness and a loss of peripheral (side) vision through the progressive degeneration of cells in the retina. The retina is the light-sensitive tissue at the back of the eye and is crucial for vision. As RP progresses, the field of vision narrows until only central vision remains, a condition called tunnel vision. Macular holes (small breaks in the macula, the central part of the retina) and cataracts (clouding of the lens) can sometimes cause an early decline in central vision in people with Usher syndrome.

Who is affected by Usher syndrome?

Usher syndrome affects approximately 4 to 17 per 100,000 people, and accounts for about 50 percent of all hereditary deaf-blindness cases. The condition is thought to account for 3 to 6 percent of all children who are deaf, and another 3 to 6 percent of children who are hard-of-hearing.

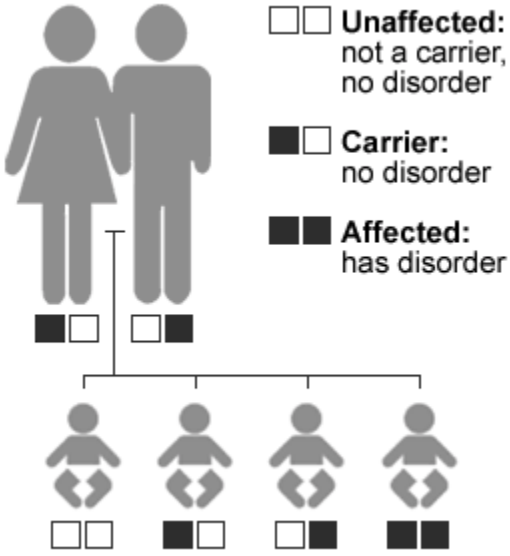
What causes Usher syndrome?

Usher syndrome is inherited, which means that it is passed from parents to a child through genes. Each person inherits two copies of a gene, one from each parent. Sometimes genes are altered, or mutated. Mutated genes may cause cells to develop or act abnormally.

Usher syndrome is inherited as an autosomal recessive disorder. “Autosomal” means that men and women are equally likely to have the disorder and equally likely to pass it on to a child of either sex. “Recessive” means that the condition occurs only when a child inherits two copies of the same faulty gene, one from each parent. A person with one abnormal Usher gene does not have the disorder but is a carrier who has a 50 percent chance of passing on the abnormal gene to each child. When two carriers with the same mutated Usher syndrome gene have a child together, each birth has a:

- one-in-four chance of having a child who neither has Usher syndrome nor is a carrier
- two-in-four chance of having a child who is an unaffected carrier
- one-in-four chance of having Usher syndrome

The hearing, balance, and vision of carriers with one mutant Usher gene are typically normal. Carriers are often unaware of their carrier status.



What are the types of Usher syndrome?

There are three types of Usher syndrome. In the United States, types 1 and 2 are the most common. Together, they account for up to 95 percent of Usher syndrome cases.

Type 1: Children with type 1 Usher syndrome have profound hearing loss or deafness at birth and have severe balance problems. Many obtain little or no benefit from hearing

aids but may be candidates for a cochlear implant — an electronic device that can provide a sense of sound to people with severe hearing loss or deafness. Parents should consult with their child's doctor and other hearing health professionals early to determine communication options for their child. Intervention should begin promptly, when the brain is most receptive to learning language, whether spoken or signed. Balance problems associated with type 1 Usher syndrome delay sitting up without support. Walking rarely occurs prior to 18 months. Vision problems with type 1 Usher syndrome usually begin before age 10, starting with difficulty seeing at night and progressing to severe vision loss over several decades.

Type 2: Children with type 2 Usher syndrome are born with moderate to severe hearing loss but normal balance. Although the severity of hearing loss varies, most children with type 2 Usher syndrome can communicate orally and benefit from hearing aids. RP is usually diagnosed during late adolescence in people with type 2 Usher syndrome.

Type 3: Children with type 3 Usher syndrome have normal hearing at birth. Most have normal to near-normal balance; however, some develop balance problems with age. Decline in hearing and vision varies. Children with type 3 Usher syndrome often develop hearing loss by adolescence, requiring hearing aids by mid-to-late adulthood. Night blindness also usually begins during adolescence. Blind spots appear by the late teens to early twenties. Legal blindness often occurs by midlife.

	Type 1	Type 2	Type 3
Hearing	Profound hearing loss or deafness at birth.	Moderate to severe hearing loss at birth.	Progressive loss in childhood teens.
Vision	Decreased night vision by age 10, progressing to severe vision loss by midlife.	Decreased night vision by adolescence, progressing to severe vision loss by midlife.	Varies in severity and age of night vision problems often b teens and progress to severe loss by midlife.
Balance (vestibular function)	Balance problems from birth.	Normal balance.	Normal to near-normal balan childhood; chance of later pr

How will my doctor check for Usher syndrome?

Diagnosis of Usher syndrome involves asking questions about the patient's medical history and testing of hearing, balance, and vision. Early diagnosis is important, as it improves the likelihood of treatment success. An eye care specialist can use dilating drops to examine the retina for signs of RP. Visual field testing measures side vision. An electroretinogram measures the electrical response of the eye's light-sensitive cells in the retina. Optical coherence tomography may be helpful to assess macular cystic changes. Videonystagmography measures involuntary eye movements that might signify a balance problem. Audiology testing determines hearing sensitivity at a range of frequencies.

Genetic testing may help diagnose Usher syndrome. So far, researchers have found nine genes that cause Usher syndrome. Genetic testing is available for all of them:

- Type 1 Usher syndrome: *MY07a, USH1C, CDH23, PCHD15, USH1G*
- Type 2 Usher syndrome: *USH2A, GPR98, DFNB31*
- Type 3 Usher syndrome: *CLRN1*

Genetic testing for Usher syndrome may be available through clinical research studies. Search for "Usher syndrome" or "Usher genetic testing" at www.clinicaltrials.gov.

What's the treatment for Usher syndrome?

Presently, there is no cure for Usher syndrome. Treatment involves managing hearing, vision, and balance problems. Early diagnosis helps tailor educational programs that consider the severity of hearing and vision loss and a child's age and ability. Treatment may include hearing aids, assistive listening devices, and cochlear implants. It may also include communication methods such as American Sign Language and orientation and mobility training for balance problems. Communication services and independent-living training may include Braille instruction, low-vision services, or auditory (hearing) training.

Vitamin A may slow the progression of RP, according to results from a long-term clinical trial supported by the NEI and the Foundation Fighting Blindness. Based on the study, adults with a common form of RP may benefit from a daily supplement of 15,000 IU (international units) of the palmitate form of vitamin A. Patients should discuss this treatment option with their health care provider before proceeding. Because people with type 1 Usher syndrome did not take part in the study, high-dose vitamin A is not recommended for these patients.

General precautions for vitamin A supplementation:

- Do not substitute vitamin A palmitate with a beta-carotene supplement.
- Do not take vitamin A supplements greater than the recommended dose of 15,000 IU or modify your diet to select foods with high levels of vitamin A.
- Pregnant women should not take high-dose vitamin A supplements due to the increased risk of birth defects. Women considering pregnancy should stop taking high-dose vitamin A supplements for six months before trying to conceive.

Uveitis

Video

- https://youtu.be/-yP_UFLYE-E

At a glance: Uveitis

- **Early Symptoms:** Eye pain, red eyes, blurry vision, floaters (seeing specks or shadows), sensitivity to light
- **Late Symptoms:** Vision loss
- **Diagnosis:** Dilated eye exam, blood tests, medical history, central nervous system tests
- **Treatment:** Medicine (eye drops, injections, pills), surgery

What is uveitis?

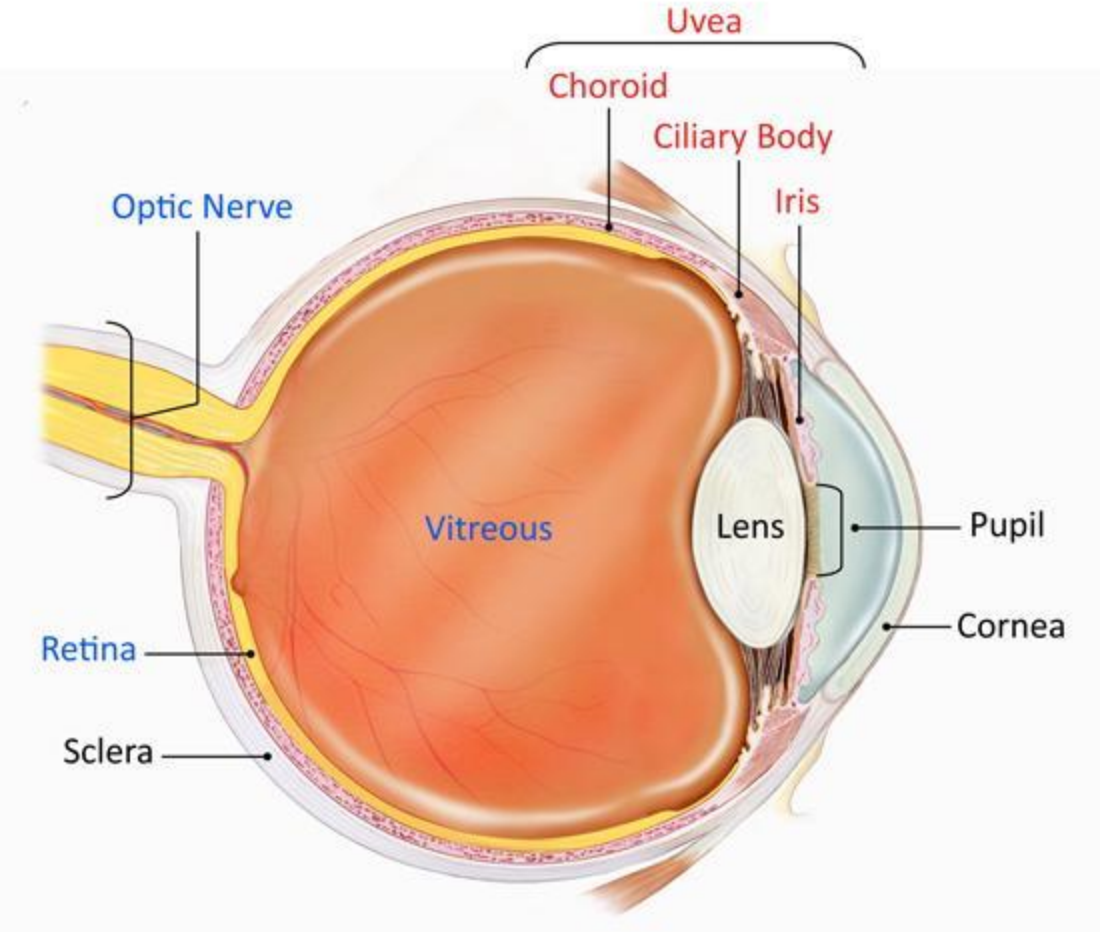
Uveitis is a general term describing a group of inflammatory diseases that produces swelling and destroys eye tissues. These diseases can slightly reduce vision or lead to severe vision loss.

The term “uveitis” is used because the diseases often affect a part of the eye called the uvea. Nevertheless, uveitis is not limited to the uvea. These diseases also affect the lens, retina, optic nerve, and vitreous, producing reduced vision or blindness.
Uveitis may be caused by problems or diseases occurring in the eye or it can be part of an inflammatory disease affecting other parts of the body.
It can happen at all ages and primarily affects people between 20-60 years old.
Uveitis can last for a short (acute) or a long (chronic) time. The severest forms of uveitis reoccur many times.
Eye care professionals may describe the disease more specifically as:

- Anterior uveitis
- Intermediate uveitis
- Posterior uveitis
- Panuveitis uveitis

Eye care professionals may also describe the disease as infectious or noninfectious uveitis.

What is the uvea and what parts of the eye are most affected by uveitis?



The uvea is the middle layer of the eye which contains much of the eye’s blood vessels (see diagram). This is one way that inflammatory cells can enter the eye. Located

between the sclera, the eye's white outer coat, and the inner layer of the eye, called the retina, the uvea consists of the iris, ciliary body, and choroid:
Iris: The colored circle at the front of the eye. It defines eye color, secretes nutrients to keep the lens healthy, and controls the amount of light that enters the eye by adjusting the size of the pupil.
Ciliary Body: It is located between the iris and the choroid. It helps the eye focus by controlling the shape of the lens and it provides nutrients to keep the lens healthy.
Choroid: A thin, spongy network of blood vessels, which primarily provides nutrients to the retina.
Uveitis disrupts vision by primarily causing problems with the lens, retina, optic nerve, and vitreous (see diagram):
Lens: Transparent tissue that allows light into the eye.
Retina: The layer of cells on the back, inside part of the eye that converts light into electrical signals sent to the brain.
Optic Nerve: A bundle of nerve fibers that transmits electrical signals from the retina to the brain.
Vitreous: The fluid filled space inside the eye.

What causes uveitis?

Uveitis is caused by inflammatory responses inside the eye.
Inflammation is the body's natural response to tissue damage, germs, or toxins. It produces swelling, redness, heat, and destroys tissues as certain white blood cells rush to the affected part of the body to contain or eliminate the insult.
Uveitis may be caused by:

- An attack from the body's own immune system (autoimmunity)
- Infections or tumors occurring within the eye or in other parts of the body
- Bruises to the eye
- Toxins that may penetrate the eye

The disease will cause symptoms, such as decreased vision, pain, light sensitivity, and increased floaters. In many cases the cause is unknown.

What diseases are associated with uveitis?

Uveitis can be associated with many diseases including:

- AIDS
- Ankylosing spondylitis
- Behcet's syndrome
- CMV retinitis
- Herpes zoster infection
- Histoplasmosis
- Kawasaki disease
- Multiple sclerosis
- Psoriasis
- Reactive arthritis
- Rheumatoid arthritis
- Sarcoidosis
- Syphilis
- Toxoplasmosis

- Tuberculosis
- Ulcerative colitis
- Vogt Koyanagi Harada's disease

What are the types of uveitis?
Uveitis is usually classified by where it occurs in the eye.

What is anterior uveitis?
Anterior uveitis occurs in the front of the eye. It is the most common form of uveitis, predominantly occurring in young and middle-aged people. Many cases occur in healthy people and may only affect one eye but some are associated with rheumatologic, skin, gastrointestinal, lung and infectious diseases.

What is intermediate uveitis?
Intermediate uveitis is commonly seen in young adults. The center of the inflammation often appears in the vitreous (see diagram). It has been linked to several disorders including, sarcoidosis and multiple sclerosis.

What is posterior uveitis?
Posterior uveitis is the least common form of uveitis. It primarily occurs in the back of the eye, often involving both the retina and the choroid. It is often called choroditis or chorioretinitis. There are many infectious and non-infectious causes to posterior uveitis.

What is panuveitis?
Panuveitis is a term used when all three major parts of the eye are affected by inflammation. Behcet's disease is one of the most well-known forms of pan-uveitis and it greatly damages the retina.
Intermediate, posterior, and panuveitis are the most severe and highly recurrent forms of uveitis. They often cause blindness if left untreated.

What are the symptoms of uveitis?
Uveitis can affect one or both eyes. Symptoms may develop rapidly and can include:
- Blurred vision
- Dark, floating spots in the vision (floaters)
- Eye pain
- Redness of the eye
- Sensitivity to light (photophobia)

Anyone suffering eye pain, severe light sensitivity, and any change in vision should immediately be examined by an ophthalmologist.
The signs and symptoms of uveitis depend on the type of inflammation.
Acute anterior uveitis may occur in one or both eyes and in adults is characterized by eye pain, blurred vision, sensitivity to light, a small pupil, and redness.
Intermediate uveitis causes blurred vision and floaters. Usually it is not associated with pain.
Posterior uveitis can produce vision loss. This type of uveitis can only be detected during an eye examination.

How will my eye doctor check for uveitis?

Diagnosis of uveitis includes a thorough examination and the recording of the patient's complete medical history. Laboratory tests may be done to rule out an infection or an autoimmune disorder.

A central nervous system evaluation will often be performed on patients with a subgroup of intermediate uveitis, called pars planitis, to determine whether they have multiple sclerosis which is often associated with pars planitis.

The eye exams used include:

- **An Eye Chart or Visual Acuity Test.** This test measures whether a patient's vision has decreased.
- **A Funduscopic Exam.** The pupil is widened (dilated) with eye drops and then a light is shown through with an instrument called an ophthalmoscope to noninvasively inspect the back, inside part of the eye.
- **Ocular Pressure.** An instrument, such a tonometer or a tonopen, measures the pressure inside the eye. Drops that numb the eye may be used for this test.
- **A Slit Lamp Exam.** A slit lamp noninvasively inspects much of the eye. It can inspect the front and back parts of the eye and some lamps may be equipped with a tonometer to measure eye pressure. A dye called fluorescein, which makes blood vessels easier to see, may be added to the eye during the examination. The dye only temporarily stains the eye.

What's the treatment for uveitis?

Uveitis treatments primarily try to eliminate inflammation, alleviate pain, prevent further tissue damage, and restore any loss of vision. Treatments depend on the type of uveitis a patient displays. Some, such as using corticosteroid eye drops and injections around the eye or inside the eye, may exclusively target the eye whereas other treatments, such immunosuppressive agents taken by mouth, may be used when the disease is occurring in both eyes, particularly in the back of both eyes.

An eye care professional will usually prescribe steroidal anti-inflammatory medication that can be taken as eye drops, swallowed as a pill, injected around or into the eye, infused into the blood intravenously, or, released into the eye via a capsule that is surgically implanted inside the eye. Long-term steroid use may produce side effects such as stomach ulcers, osteoporosis (bone thinning), diabetes, cataracts, glaucoma, cardiovascular disease, weight gain, fluid retention, and Cushing's syndrome. Usually other agents are started if it appears that patients need moderate or high doses of oral steroids for more than 3 months.

Other immunosuppressive agents that are commonly used include medications such as methotrexate, mycophenolate, azathioprine, and cyclosporine. These treatments require regular blood tests to monitor for possible side effects. In some cases, biologic response modifiers (BRM), or biologics, such as, adalimumab, infliximab, daclizumab, abatacept, and rituximab are used. These drugs target specific elements of the immune system. Some of these drugs may increase the risk of having cancer.

Anterior uveitis treatments

Anterior uveitis may be treated by:

- Taking eye drops that dilate the pupil to prevent muscle spasms in the iris and ciliary body (see diagram)

- Taking eye drops containing steroids, such as prednisone, to reduce inflammation

Intermediate, posterior, and panuveitis treatments
Intermediate, posterior, and panuveitis are often treated with injections around the eye, medications given by mouth, or, in some instances, time-release capsules that are surgically implanted inside the eye. Other immunosuppressive agents may be given. A doctor must make sure a patient is not fighting an infection before proceeding with these therapies.
A recent NEI-funded study, called the Multicenter Uveitis Treatment Trial (MUST), compared the safety and effectiveness of conventional treatment for these forms of uveitis, which suppresses a patient's entire immune system, with a new local treatment that exclusively suppressed inflammation in the affected eye. Conventionally-treated patients were initially given high doses of prednisone, a corticosteroid medication, for 1 to 4 weeks which were then reduced gradually to low doses whereas locally-treated patients had a capsule that slowly released fluocinolone, another corticosteroid medication, surgically inserted in their affected eyes. Both treatments improved vision to a similar degree, with patients gaining almost one line on an eye chart. Conventional treatment produced few side effects. In contrast, the implant produced more eye problems, such as abnormally high eye pressure, glaucoma, and cataracts. Although both treatments decreased inflammation in the eye, the implant did so faster and to a greater degree. Nevertheless, visual improvements were similar to those of patients given conventional treatment.

Vitreous Detachment

Video

- https://youtu.be/QF1_ZJWCYj0

At a glance: Vitreous Detachment
- **Symptoms:** Floaters (small spots or squiggly lines in your vision), flashes of light in peripheral (side) vision
- **Diagnosis:** Dilated eye exam
- **Treatment:** None (in most cases)

What is vitreous detachment?
Most of the eye's interior is filled with vitreous, a gel-like substance that helps the eye maintain a round shape. There are millions of fine fibers intertwined within the vitreous that are attached to the surface of the retina, the eye's light-sensitive tissue. As we age, the vitreous slowly shrinks, and these fine fibers pull on the retinal surface. Usually the fibers break, allowing the vitreous to separate and shrink from the retina. This is a **vitreous detachment**.

In most cases, a vitreous detachment, also known as a posterior vitreous detachment, is not sight-threatening and requires no treatment.

Am I at risk for vitreous detachment?

A vitreous detachment is a common condition that usually affects people over age 50, and is very common after age 80. People who are nearsighted are also at increased risk. Those who have a vitreous detachment in one eye are likely to have one in the other, although it may not happen until years later.

What are the symptoms of vitreous detachment?

As the vitreous shrinks, it becomes somewhat stringy, and the strands can cast tiny shadows on the retina that you may notice as floaters, which appear as little "cobwebs" or specks that seem to float about in your field of vision. If you try to look at these shadows they appear to quickly dart out of the way.

One symptom of a vitreous detachment is a small but sudden increase in the number of new floaters. This increase in floaters may be accompanied by flashes of light (lightning streaks) in your peripheral, or side, vision. In most cases, either you will not notice a vitreous detachment, or you will find it merely annoying because of the increase in floaters.

How does vitreous detachment affect vision?

Although a vitreous detachment does not threaten sight, once in a while some of the vitreous fibers pull so hard on the retina that they create a macular hole to or lead to a retinal detachment. Both of these conditions are sight-threatening and should be treated immediately.

If left untreated, a macular hole or detached retina can lead to permanent vision loss in the affected eye. Those who experience a sudden increase in floaters or an increase in flashes of light in peripheral vision should have an eye care professional examine their eyes as soon as possible.

How will my eye doctor check for vitreous detachment?

The only way to diagnose the cause of the problem is by a comprehensive dilated eye examination. If the vitreous detachment has led to a macular hole or detached retina, early treatment can help prevent loss of vision.