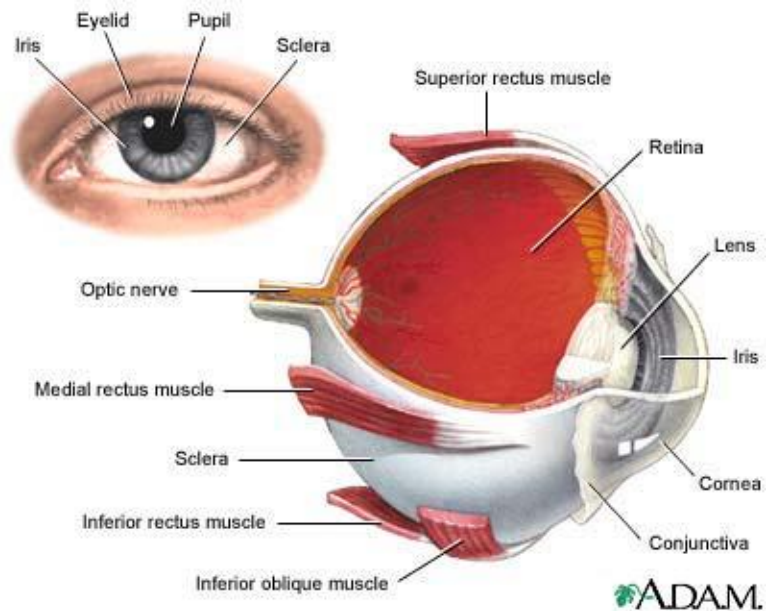


## THE EYE

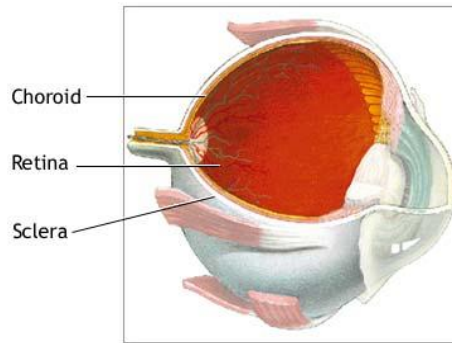
The eye is the organ of sight, a nearly spherical hollow globe filled with fluids (humors). The outer layer or tunic (sclera, or white, and cornea) is fibrous and protective. The middle tunic layer (choroid, ciliary body and the iris) is vascular. The innermost layer (the retina) is nervous or sensory. The fluids in the eye are divided by the lens into the vitreous humor (behind the lens) and the aqueous humor (in front of the lens). The lens itself is flexible and suspended by ligaments which allow it to change shape to focus light on the retina, which is composed of sensory neurons.



## Definition

### CHOROID

The choroid is the middle layer of the eye that contains blood vessels and connective tissue that supplies nutrients to the inner portion of the eye.



ADAM.

The layer of blood vessels and connective tissue between the [sclera](#) (white of the eye) and [retina](#). It is part of the [uvea](#) and supplies nutrients to the inner parts of the eye. Inflammation of the choroid is known as [choroiditis](#).

### SCLERA

The white portion of the eye. A tough, fibrous tissue that extends from the cornea to the optic nerve. It is commonly referred to as the "white of the eye."

### RETINA

Internal layer of the eye that receives and transmits focused images. The retina is normally red due to its rich blood supply. It can be seen with an ophthalmoscope, which allows the examiner to see through the pupil and lens to the retina. Changes in color of the retina or changes in the appearance of retinal blood vessels may indicate disease. Changes in color perception and in vision also indicate disease and indicate the need for a retinal examination.

### UVEA

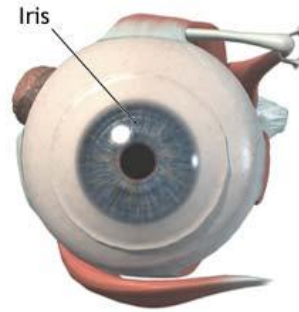
Vascular tunic; Middle coat of the eyeball

## Definition

Vascular layer of the eye beneath the sclera. It consists of the iris, ciliary body, and choroid, which form a pigmented layer.

**IRIS**

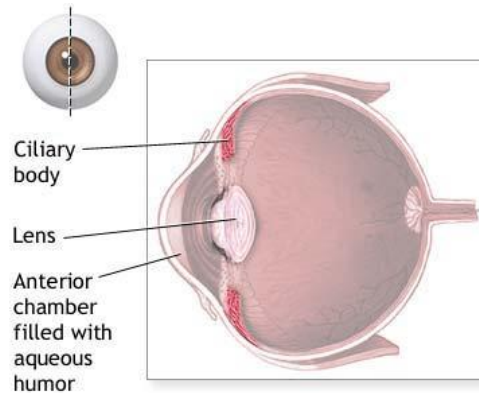
The colored portion of the eye. A membrane located between the cornea and lens. Its round, central opening (the pupil) regulates the entrance of light into the eye by contracting and dilating



ADAM.

**CILIARY BODY**

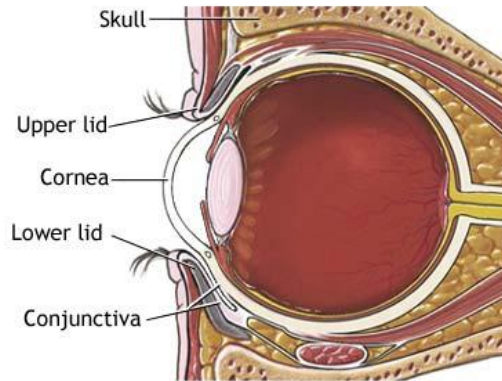
Vascular structure of the eye that secretes the transparent liquid within the eye (aqueous humor) and contains the ciliary muscle, responsible for changing the shape of the lens.



ADAM.

## CORNEA

The cornea is the clear layer covering the front of the eye. The cornea works with the lens of the eye to focus images on the retina



ADAM.

## CORNEAL INJURY

**Definition** An injury to the cornea, the curved transparent covering at the front of the eye. See also [corneal ulcers and infections](#).

### Causes, incidence, and risk factors

The cornea is the clear covering of the front of the eye. It works with the lens of the eye to focus images on the [retina](#). Injuries to the cornea are common.

Superficial corneal injuries, called corneal abrasions, may be caused by foreign bodies (such as sand or dust), overuse of contact lenses or exposure to ultraviolet radiation. Risk factors include working in a dusty environment, prolonged exposure to the sun or artificial ultraviolet light sources, and overuse of contact lenses or ill-fitting contact lenses.



Penetrating corneal injuries may occur with major trauma. High speed particles, such as chips from hammering metal on metal, are particularly dangerous.

### Symptoms

- Blurred vision
- Abnormal sensitivity to light
- Sensation of foreign body in the eye
- Eye pain
- Redness of the eye
- Swollen eyelids

### Signs and tests

- Standard ophthalmic exam
- Slit lamp examination of the eye
- Fluorescein dye staining of the surface of the eye

### Treatment

Anyone with severe eye pain needs to be evaluated in an emergency care center or by an ophthalmologist immediately. Simple corneal injuries are treated by removing the foreign material if present, and covering the eye with a patch to let the cornea heal itself. Antibiotic drops or ointments are often used to prevent infection.

DO NOT try to remove a lodged foreign body in the eye without professional assistance. (See first aid for eye emergencies.) The risk of further injury is great. A particle that is large enough to damage the cornea may not be visible without magnification or staining of the eye.

Antibiotic ointment or drops may be prescribed until a corneal abrasion has healed. Getting rest and placing a patch over the affected eye may help. Driving and other potentially dangerous situations should be avoided while the eye is patched, since depth perception is altered.

Any suspicion of a penetrating injury to the eye requires immediate evaluation by an ophthalmologist or emergency physician.

Chemical burns may occur with acids or alkalis splashed in the eye. Many household chemicals are strong acids or alkalis. Drain cleaners and oven cleaners are particularly dangerous. If chemicals are splashed in the eye, the eye should be IMMEDIATELY flushed with tap water for 15 minutes, and the patient should then be rushed to the nearest emergency facility.

### **Expectations (prognosis)**

Superficial corneal injuries normally heal very rapidly with treatment, and the eye should be back to normal within 2 days. Penetrating corneal injuries are much more serious and the prognosis will depend on the nature of the specific injury.

**Complications** Severe corneal injury may require extensive surgery or even corneal transplantation surgery.

**Calling your health care provider** Call your health care provider if the injury has not significantly improved in 2 days with treatment.

### **Prevention**

Safety goggles should be worn at all times when using hand or power tools, when using chemicals, during high impact sports, or in other situations where there is a potential for eye injury. Sunglasses designed to screen ultraviolet light should be worn during prolonged exposure to sunlight, even during the winter.

## ***CORNEAL ULCERS and INFECTIONS***

### **Alternative names**

Bacterial keratitis; Fungal keratitis; Acanthamoeba keratitis; Herpes simplex keratitis

### **Definition**

A non-penetrating erosion or open sore in the outer layer of the cornea, the transparent area at the front of the eyeball. See also corneal injury.

### **Causes, incidence, and risk factors**

Corneal ulcers are most commonly caused by an infection with bacteria, viruses, fungi or amoebae. Other causes are abrasions or foreign bodies, inadequate eyelid closure, severely dry eyes, severe allergic eye disease, and various inflammatory disorders.

Contact lens wear, especially soft contact lenses worn overnight, may be a precipitating factor. Herpes simplex keratitis is a serious viral infection. It may have recurrences that are triggered by stress, exposure to sunlight, or any condition which impairs the immune system.

Fungal keratitis can occur after a corneal injury involving plant material, or in immunosuppressed people. Acanthamoeba keratitis occurs in contact lens users, especially those who attempt to make their own homemade cleaning solutions.

Risk factors are dry eyes, severe allergies, history of inflammatory disorders, contact lens wear, immunosuppression, trauma and generalized infection.

### **Symptoms**

- Eye pain
- Impaired vision
- Eye redness
- White patch on the cornea
- Sensitivity to light (photophobia)
- Watery eyes
- Eye burning, itching and discharge

### **Signs and tests**

- Visual acuity
- Refraction test
- Tear test
- Slit-lamp examination
- Pupillary reflex response
- Keratometry (measurement of the cornea)
- Scraping the ulcer for analysis or culture
- Fluorescein stain of the cornea

Blood tests to check for inflammatory disorders may also be needed.

## Treatment

Treating corneal ulcers and infections depends on the cause. They should be treated as soon as possible to prevent further injury to the cornea. Broad antibiotic coverage is started and then more specific antibiotic, antiviral, or antifungal eye drops are prescribed (as soon as the agent which causes the ulcer has been identified).

Corticosteroid eye drops may be used to reduce inflammation in certain conditions. Severe ulcers may need to be treated with corneal transplantation.

## Expectations (prognosis)

Untreated, a corneal ulcer or infection can permanently damage the cornea. Untreated corneal ulcers may also perforate the eye, resulting in spread of the infection inside, increasing the risk of permanent visual impairment.

## Complications

- Corneal scarring
- Severe vision loss

## Calling your health care provider

Call your health care provider if impaired vision or eye pain occur.

## Prevention

Prompt, early attention by an ophthalmologist for an eye infection may prevent the condition from worsening to the point of ulceration. Wash hands and pay rigorous attention to cleanliness while handling contact lenses, and avoid wearing contact lenses overnight.



## Tear duct blockage

### Alternative names

Dacryostenosis; Blocked nasolacrimal duct

**Definition** A partial or complete obstruction in the duct system that carries tears away from the surface of the eye to the nose.

### Causes, incidence, and risk factors

Tears from the surface of the eye are normally drained into the nose by a convoluted tube called the nasolacrimal duct. If this duct is blocked, the tears will accumulate and overflow onto the cheek, even when a person isn't crying.

**Symptoms** The symptom is increased tearing, which overflows onto the face or cheek.

Tears are necessary for the normal lubrication of the eye and to wash away particles and foreign bodies. Excessive tear production or improper drainage of the tear duct results in watery eyes. Irritation, infection, and inward-growing eyelashes can also cause watery eyes. An infection or blockage of the tear duct can also cause excessive watering of the eyes when tears do not drain normally through the nose.

Increased tearing is sometimes accompanied by yawning, vomiting, laughing, and eyestrain.

Oddly enough, one of the most common causes of tear is dry eyes. Drying causes the eyes to become uncomfortable which stimulates the body to produce too many tears. One of the main evaluations for tearing, is to check if the eyes are too dry.

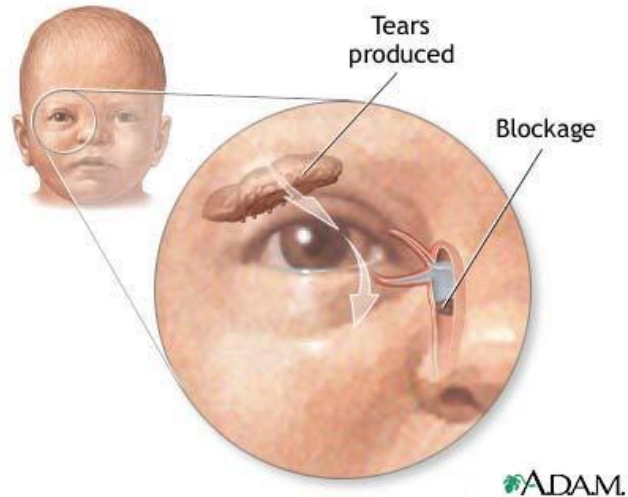
### Signs and tests

- Standard ophthalmic exam
- Internal examination of the nose
- [Fluorescein eye stain](#) to observe the drainage of tears
- Special x-ray studies may be done to study the duct

### Treatment

For children with incomplete nasolacrimal duct development, massaging the lacrimal sac area several times a day, as instructed by an ophthalmologist, may be enough to open the tear duct. Persistent cases may require opening by a probing procedure. This may occasionally require anesthesia.

Adults require treatment of the cause of the obstruction. This may re-open the duct if there is minimal damage. Often surgical reconstruction (dacryocystorhinostomy) will be needed to re-establish normal tear drainage and stop the overflow onto the cheek.



## Expectations (prognosis)

Congenital tear duct blockage often clears spontaneously by 6 months of age. If it does not clear on its own, the outcome is still likely to be good with treatment.

Tear duct obstruction in adults has a variable outcome depending on the cause.

## Complications

Tear duct blockage may increase the risk of eye infections.

## Calling your health care provider

Anyone with tear overflow onto the cheek requires examination, since one of the possible causes is a tumor. Earlier treatment is more successful, and may be lifesaving.

## Prevention

Many cases cannot be prevented. Adequate treatment of nasal infections and conjunctivitis may reduce risk. Safety measures may reduce the risk of trauma.

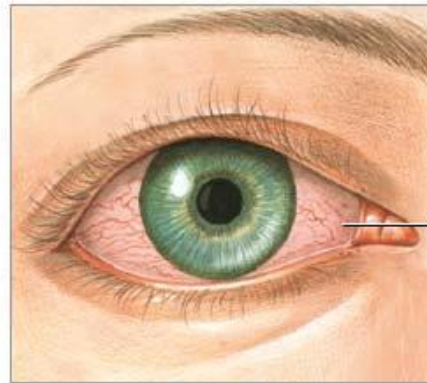
**Definition** A partial or complete obstruction in the duct system that carries tears away from the surface of the eye to the nose.

## Causes, incidence, and risk factors

Tears from the surface of the eye are normally drained into the nose by a convoluted tube called the nasolacrimal duct. If this duct is blocked, the tears will accumulate and overflow onto the cheek, even when a person isn't crying.

## **RED EYE (BLOODSHOT)**

Apply warm compresses to soften crusts on the eyelids. For bacterial infections, washing the eye(s) gently will help remove some of the bacteria, but your health care provider should still be contacted. Eyedrops (such as Visine) may soothe minor conjunctivitis, but will not cure the problem.



Scleral  
irritation

ADAM.

### **Alternative names**

Bloodshot eyes; Scleral injection; Conjunctival injection.

### **Definition**

Red eyes are characterized by dilated blood vessels causing the appearance of redness on the surface of the eye.

### **Considerations**

Bloodshot eyes appear red because the vessels in the surface of the white portion of the eye ([sclera](#)) become enlarged. This may result from mechanical irritation, environmental irritants (such as extremely dry air, excess sun exposure), [allergic reactions](#), infection, and other medical conditions.

A bright red, uniformly dense bloody area on the sclera results from a small amount of bleeding into the conjunctiva. It is often first noted in the morning on arising.

This is a fairly common occurrence, and of little significance. If upon awakening in the morning, you notice a bloody blotch in one eye that doesn't hurt, but just looks bad, don't worry. It is usually caused by straining or coughing, and it generally clears up on its own after a few days.

### **Common Causes**

- Straining or coughing
- [Blepharitis](#)
- [Foreign bodies in the cornea and conjunctiva](#)
- [Conjunctivitis](#)

- [Corneal abrasion](#)
- [Corneal ulcers and infections](#)
- [Iritis](#)
- [Ocular lacerations and intraocular foreign bodies](#)
- [Uveitis](#)
- Bleeding problems from excess use of blood thinning drugs

### Home Care

For fatigue or eyestrain, try to rest. No treatment is necessary. Otherwise, see your primary health care provider or an ophthalmologist for medical treatment.

If [conjunctivitis](#) is suspected or confirmed, avoid touching the infected eye and then rubbing the other eye -- this condition is very contagious.

### Call your health care provider if

- Bloodshot eyes persists for longer than one or two days.
- There is eye pain and vision problems.

### What to expect at your health care provider's office

The medical history will be obtained and a physical examination performed.

Medical history questions documenting eye redness in detail may include:

- Location
  - Are both eyes affected?
  - If only one eye, which one?
  - What part of the eye is affected -- all of the white part, or just a small location?
- Time pattern
  - Did it begin suddenly?
  - Has it ever happened before?
  - Does it persist?
- Other
  - Does it get worse after movement of the eyes?
  - What other symptoms are also present?

***The physical examination should include a detailed eye examination.***

#### ***Intervention:***

***The eyes may need irrigation with normal saline solution, and any foreign bodies will need to be removed. Eye drops may be prescribed.***

#### ***After seeing your health care provider:***

***You may want to add a diagnosis related to bloodshot eyes to your personal medical record.***

## ***Foreign objects in eye***

Flush the eye with clean water  
to remove foreign objects

### **Alternative names**

Removal of particle in the eye

### **Information**

Question:

What is the best way to remove a particle from your eye?



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Answer:

Avoid rubbing your eyes. Flush the eye with clean water. See [eye emergency](#) for first aid measures.

## ***EYE EMERGENCY***

### **Definition**

Any condition, which if untreated, may lead to visual loss. Eye emergencies include chemical exposure, cuts, scratches, foreign bodies in the eye, burns, and blunt injuries to the eye.

### **Considerations**

It is important to get medical attention for all significant eye problems. Since the eye is easily damaged, a delay in getting medical attention can cause permanent eye damage and loss of sight.

Many eye problems that are not due to injury (such as a painful red eye) have no appropriate first aid, but do need urgent medical attention.

Chemical injury to the eye can be caused by an occupational accident or by common household products such as cleaning solutions, garden chemicals, solvents, or many other types of chemicals. Fumes and aerosols can also cause chemical burns.

With acidic burns, the hazing of the cornea often clears with a good chance of recovery. Alkaline substances such as lime, lye, commercial drain cleaners, and sodium hydroxide found in refrigeration equipment present great danger of permanent corneal damage. Ongoing damage may occur in spite of prompt treatment. Risk factors are exposure to these chemicals.

A foreign body such as dust or sand can enter the eye at any time. Certain occupations such as metal or wood working may have a higher risk. The injury may be limited to the conjunctiva and the cornea, or it may affect the sclera.

Persistent pain and redness are indicators that professional treatment is needed. A foreign body may be a threat to sight if the object enters the eye itself or damages the cornea or lens. Foreign bodies propelled at high speed by machining, grinding, or hammering metal on metal present the highest risk.

A black eye is usually caused by direct trauma to the eye or face. Certain types of skull fractures can result in bruising around the eyes, even in the absence of direct trauma to the eye(s). Bleeding under the skin causes a bruise and the discoloration associated with it.

The tissue surrounding the eye turns black and blue, and then it gradually becomes purple, green, and yellow before the abnormal coloring disappears within 2 weeks. Usually, swelling of the eyelid and tissue around the eye occurs as well.

Occasionally, serious damage to the eye itself occurs from the pressure of the swollen tissue. Bleeding inside the eye can reduce vision, cause glaucoma, or damage the cornea. Accidents, occupational injuries, sports injuries, and violence are some of the risk factors associated with black eyes.

### Causes

- Head injury
- Acute iritis
- Acute conjunctivitis
- Acute glaucoma
- Orbital cellulitis
- Eyelid laceration
- Corneal abrasion
- Foreign body or object in the eye
- Chemical injury
- Blow or laceration to the eye

### Symptoms

- Eye pain
- Loss of vision
- Decreased vision
- Double vision
- Redness -- bloodshot appearance
- Sensitivity to light
- Bleeding
- Bruising
- Cuts or wounds
- Headache
- Itchy eyes
- Pupils of unequal size
- Stinging and burning
- Sensation of foreign body in the eye

### First Aid

#### FOREIGN BODY IN THE EYE

Often, the eye will clear itself of a tiny object through blinking and tearing. If not, here are some

first aid measures:

1. Do not rub the eye. Wash your hands before examining the eye.
2. Examine the affected eye in a well-lighted area. To find a foreign body, have the victim look up and down, and then side to side.
3. If you can't find the object, grasp the eyelid and gently pull down on the lower lid to expose the fold between the eyelid and the globe of the eye. If necessary, pull up on the upper lid.
4. If the foreign body can be seen on the inner surface of either the lower or upper lid, try to gently flush it out with water or use a cotton-tipped swab to invert the eyelid and inspect the underside.
5. If the foreign object is embedded in the eyeball, cover the victim's eyes with a sterile pad or clean cloth. DO NOT try to remove the object. Get medical help.
6. If you cannot locate the foreign body, or if you remove it, but the victim still has discomfort or blurred vision, cover the victim's eyes with a sterile pad or clean cloth. Get medical help.

#### FOR AN OBJECT STUCK IN THE EYE

1. Leave the object in place. Do not touch it or apply any pressure to it.
2. Wash your hands.
3. Calm and reassure the victim.
4. Bandage the eye. If the object is large, place a paper cup or cone over the injured eye and tape it in place. If the object is small, cover both eyes with a clean cloth or sterile dressing.
5. Try to keep the victim calm and quiet until you have medical help.

#### FOR CHEMICAL INJURY TO THE EYE

1. Irrigation with tap water should begin IMMEDIATELY. Turn the victim's head so the injured eye is down and to the side. Holding the eyelid open, pour fresh water in the eye for 15 minutes, or until you have medical help. You may have to force the victim's eyes open.
2. If both eyes are affected, or if the chemicals are also on other parts of the body, have the victim take a shower.
3. Remove contact lenses -- but only after the eyes have been rinsed.
4. Cover both eyes (even if only one eye is affected) with a clean dressing, and avoid any rubbing of the eyes. Even if only one eye is affected, covering both eyes will help discourage eye movement.
5. After following the above instructions, seek medical help urgently.

#### FOR EYE BURNS

1. Flush the eyes with cool water (unless it is painful to do so) to reduce swelling and to help relieve the pain.
2. Apply a cool compress to the eyes, but avoid applying pressure.
3. If there is swelling in or around the eyes, if the lashes or lid skin is burned, or if there is any change in vision, seek medical help.

**FOR CUTS OR BLOWS TO THE EYE**

1. If the eyeball has been injured, get medical help immediately.
2. Gently apply cold compresses to reduce swelling and help stop any bleeding. Do not apply pressure to control bleeding.
3. If blood is pooling in the eye, cover both of the victim's eyes with a clean cloth or sterile dressing, and get medical help immediately.

**FOR EYEBALL (CORNEA) CUTS OR SCRATCHES**

1. Get medical help.
2. Avoid applying pressure to the eye.

**FOR EYELID CUTS**

1. If the eyelid is injured, carefully wash the eye. Apply a thick layer of bacitracin or mupirocin ointment on the eyelid and on the exposed eyeball, if the victim cannot close his eyelid. Place a patch over the eye. Seek immediate medical attention.
2. If the cut is bleeding, apply direct pressure with a clean, dry cloth until the bleeding subsides.
3. Rinse with water, cover with a clean dressing, and place a cold compress on the dressing to reduce pain and swelling.
4. If the cut is more than several millimeters, or if the cut goes across the edge of the lid, seek medical help.

**FOR CONJUNCTIVITIS (pink or red eye)**

An itchy red or pink eye is often caused by a viral infection. Other causes may include a bacterial infection, allergy, something in the eye, or irritation. If the eye has been infected by a virus or bacteria, symptoms include: tearing; itching; runny yellow or greenish pus; crusted eyelids and lashes; and swollen eyelids.

1. Rinse the eye several times daily with artificial tears (which can be purchased without a prescription). You can place a cool washcloth over the closed eyelids to help relieve any itching or swelling. If there is yellowish pus, you may have a bacterial infection. A doctor may prescribe antibiotic eyedrops for 4 to 5 days.
2. If the symptoms do not improve, or if you have difficulty with vision, get medical help.
3. If there is considerable discharge from the eyes, or if there is swelling of the eyelids, get medical help. If there is pain (rather than itching), extreme sensitivity to light, visual loss, or nausea, the cause may be a more serious condition, and immediate medical attention should be obtained.

**Do Not**

- DO NOT press on an injured eye, or allow the victim to rub the eye(s).
- DO NOT remove contact lenses unless rapid swelling is occurring, or you cannot get prompt medical help.
- DO NOT attempt to remove a foreign body that is resting on the cornea (the clear surface of the eye through which we see), or that appears to be embedded in any part of the eye -- get medical help.



- DO NOT use dry cotton (including cotton swabs) or sharp instruments (such as tweezers) on the eye.
- DO NOT attempt to remove an embedded object.
- DO NOT let a burn become contaminated. Avoid breathing or coughing on the burned area.

**Call immediately for emergency medical assistance if**

- There appears to be any scratch, cut, or penetration of the eyeball
- Any chemical gets into a victim's eye
- Eye pain persists
- There are any vision problems
- Nausea accompanies eye pain

**Prevention**

- Supervise children carefully.
- Teach safety.
- Always wear protective eye wear when using power tools, hammers, or other striking tools.
- Always wear protective eye wear when working with toxic chemicals.

## Conjunctivitis

Inflammation - conjunctiva; Pink eye

### Definition

Conjunctivitis is inflammation or infection of the membrane lining the eyelids (conjunctiva).

### Causes, incidence, and risk factors

The conjunctiva is exposed to bacteria and other irritants. Tears help protect the conjunctiva by diluting bacteria and washing it away. Tears also contain enzymes and antibodies which kill bacteria.

There are many causes of conjunctivitis. Viruses are the most common cause. Other types include bacterial, Chlamydial, fungal, and parasitic agents (rarely).

Pink eye refers to a viral infection of the conjunctiva. These infections are very contagious, especially among children. The virus is similar to the type which cause the common cold. The key is handwashing to prevent spreading the virus.

- Bacteria are an uncommon cause of conjunctivitis. Many physicians will give a mild antibiotic eyedrop for all cases of pink eye to prevent bacterial conjunctivitis. Other causes are allergies (allergic conjunctivitis), chemical exposure, and certain systemic diseases.

### Symptoms

- Tearing, increased
- Eye pain
- Redness in the eyes
- Gritty feeling in the eyes
- Itching of the eye
- Blurred vision
- Sensitivity to light
- Crusts that form on the eyelid overnight

### Signs and tests

- Examination of eyes
- Swab of conjunctiva for analysis

### Treatment

Treatment of conjunctivitis depends upon the cause.

Allergic conjunctivitis may respond to treatment for underlying allergies, or it may disappear on its own when the causative allergen is removed. Cool compresses may be soothing for allergic conjunctivitis.

Antibiotic medication, usually eye drops, is effective for bacterial conjunctivitis. Viral conjunctivitis

will disappear on its own. The discomfort with viral or bacterial conjunctivitis can be soothed by applying warm compresses (a clean cloth soaked in warm water) to closed eyes.

### **Expectations (prognosis)**

The outcome is usually good with treatment.

### **Complications**

Reinfection within a household or school may occur if preventive measures are not followed.

### **Calling your health care provider**

Call for an appointment with your health care provider if symptoms persist longer than 3 or 4 days.

### **Prevention**

Good hygiene can help prevent the spread of conjunctivitis:

- Keep hands away from the eye.
- Wash the hands frequently.
- Change pillowcases frequently.
- Replace eye cosmetics regularly.
- Do not share eye cosmetics.
- Do not share towels or handkerchiefs.
- Proper use and care of contact lenses.