

## Eye Anatomy, Diseases, and Trauma

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## Objectives

- Review the affects of medical or traumatic eye problems
- Review the anatomy of the eye
- Review medical conditions affecting the eye
- Review types of trauma affecting the eye
- Review treatment modalities in eye trauma

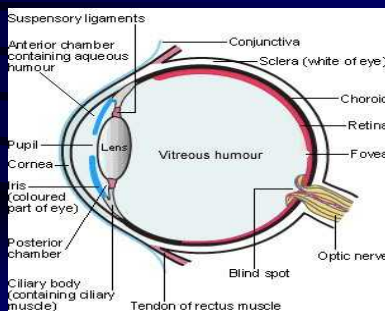
## Affects of Eye Trauma and Disease

- Sudden or gradual loss of vision can cause:
- Confusion
- Fear
- Disorientation
- This does not take into consideration the possible pain that can be involved

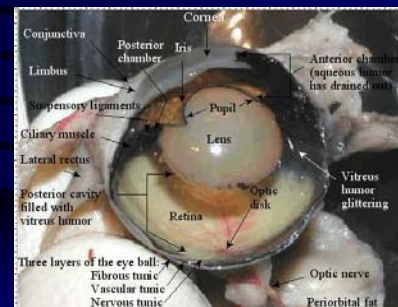
## Affects of Eye Trauma and Disease

- All of the above can lead to complications for the patient, providers, and caregivers

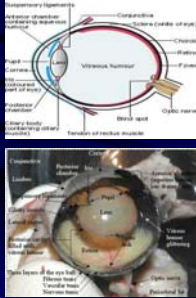
## Eye Anatomy



## Eye Anatomy

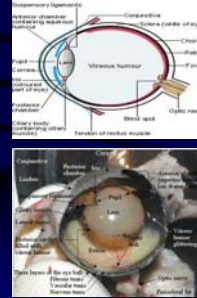


## Eye Anatomy



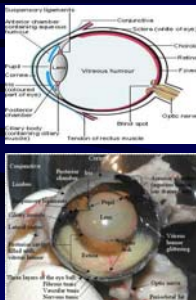
- Anterior Chamber:
- This is the space in the front portion of the eye between the cornea and the iris. This space is filled with aqueous humor.

## Eye Anatomy



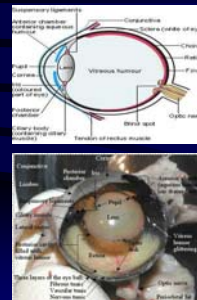
- Aqueous Humour:
- This is the clear fluid between the anterior chamber and posterior chamber that is produced by the ciliary body. Aqueous humor is important in controlling the pressure inside the eye and giving the front of the eye its shape.

## Eye Anatomy



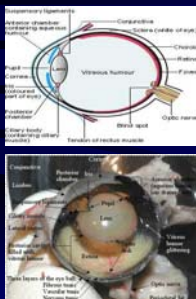
- Blind Spot:
- The area of the optic disk where the optic nerve fibers exit the eye and where there are no light-sensitive cells.

## Eye Anatomy



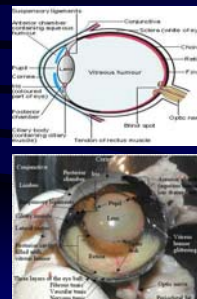
- Choroid:
- The middle layer of the eye located between the sclera and the retina. It contains several layers of blood vessels that provide crucial support to other areas of the eye. The choroids, along with the iris and ciliary body, are collectively known as the uvea. Inflammation in this area is known as uveitis.

## Eye Anatomy



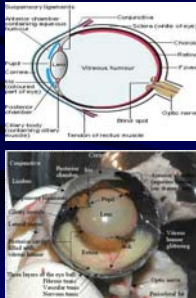
- Ciliary Body:
- The ring of tissue between the iris and the choroid consisting of muscles and blood vessels that changes the shape of the lens and manufactures the aqueous humor.

## Eye Anatomy



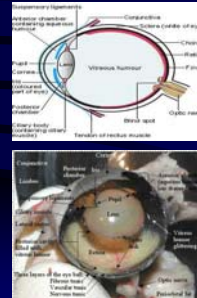
- Cones:
- Cone-shaped light-sensitive cells in the retina, particularly the part known as the macula. The cones are mostly used during daylight, when the pupils are small; to allow a person to see details and shapes, especially colors.

## Eye Anatomy



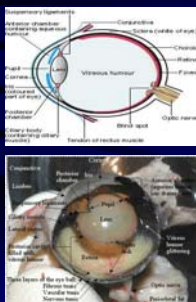
- Conjunctiva:
- The mucous membrane that is on the inside of the eyelids and on the surface of the eyeballs well as the sclera (the "white of the eye"). When the conjunctiva becomes irritated or inflamed, it is known as conjunctivitis. One common type of conjunctivitis that many children experience is "pink eye".

## Eye Anatomy



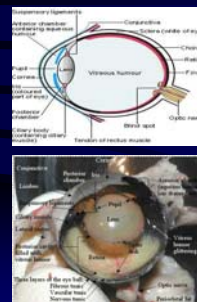
- Conjunctivitis can be present in just one eye, or it can affect both eyes. Symptoms include redness of the eyes or the edges of the eyelids, swelling of the eyelids or itching. Giant papillary conjunctivitis is when bumps or ridges form on the inside of the eyelids, making contact lens wear uncomfortable.

## Eye Anatomy



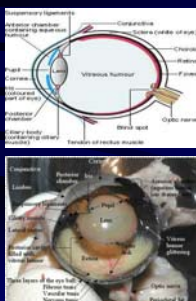
- Cornea:
- The transparent membrane on the front of the eye through which we see. It is the tissue that is reshaped during laser vision correction. It begins the process of seeing by focusing on the retina and the light that it receives.

## Eye Anatomy



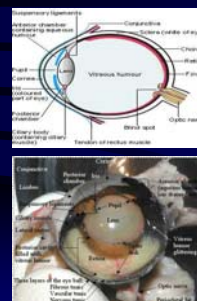
- Cornea:
- There are five layers to the cornea, each with a distinct function: Epithelium, Bowman's membrane, stroma, Descemet's membrane, and endothelium.

## Eye Anatomy



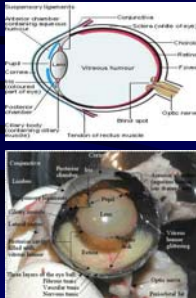
- Extraocular muscles:
- The tiny muscles that surround the eye and control its movements. There are six total muscles; the lateral rectus, medial rectus, superior oblique, inferior oblique, superior rectus, and inferior rectus.

## Eye Anatomy



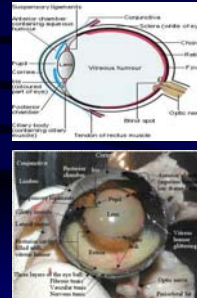
- Extraocular muscles:
- The primary function of the four rectus muscles is to control the eye's movements from left to right and up and down. The two oblique muscles rotate the eyes inward and outward. All six muscles work in unison; when they do not function properly, the condition is called strabismus.

## Eye Anatomy



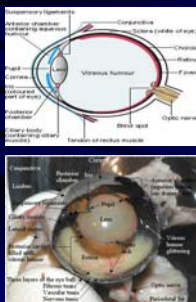
- Fovea:
- A small part of the macula, which itself is a small part of the retina. The fovea is important because it has many cells that allow color vision.

## Eye Anatomy



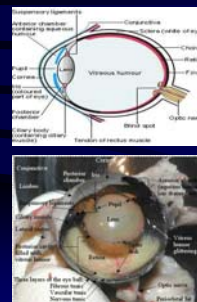
- Iris:
- The “color” of our eyes. The iris responds to changing amounts of light by altering the pupil size (bigger in less light and smaller in more light).

## Eye Anatomy



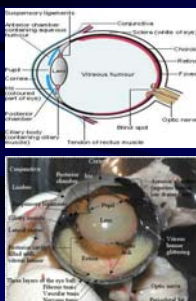
- Lens:
- Housed behind the iris, the lens is the second component that focuses light rays. Light rays that pass through the lens travel through the vitreous onto the retina. When the lens becomes clouded, it is called a cataract. Surgery for cataracts involves removing the clouded lens and, usually, replacing it with a man-made one.

## Eye Anatomy



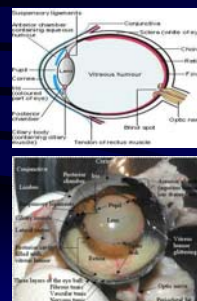
- Macula:
- The area of the retina responsible for the center of our vision. The macula often deteriorates as we age, causing age-related macular degeneration. Many patients with this condition lose some or all of their ability to see straight ahead, and are left with only peripheral (side) vision.

## Eye Anatomy



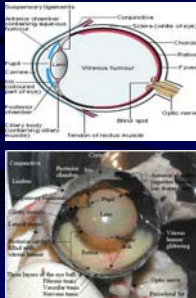
- Optic disk:
- The head of the optic nerve that is formed by the meeting of all retinal fiber nerves.

## Eye Anatomy



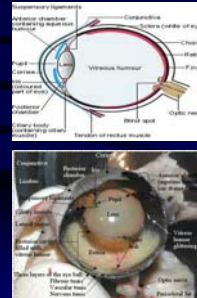
- Optic nerve:
- The path from the eye to the brain. The electronic impulses that are developed by the retina that are imbedded in the brain's visual cortex, thus creating a visual image. It is the largest ocular nerve and is crucial to vision. Glaucoma is one disease that damages the optic nerve.

## Eye Anatomy



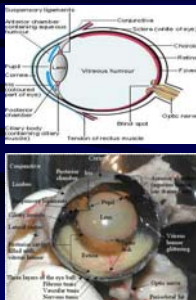
- Punctum:
- The hole in the upper and lower eyelids through which tears exit the eyes. In patients with dry eyes, temporary or permanent plugs may be inserted to help keep tears in the eyes. Tears flow through the punctum to the nose., which is why people often experience a runny nose when crying.

## Eye Anatomy



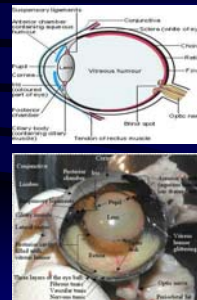
- Pupil:
- The black central part of the iris that changes size in response to how much light is being received by the eye.

## Eye Anatomy



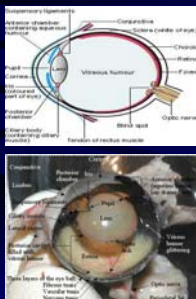
- Retina:
- A thin lining that is the back inner part of the eye. Its light-sensitive cells convert the image that is focused through the cornea and lens to electric impulses. These impulses are then passed through the optic nerve.

## Eye Anatomy



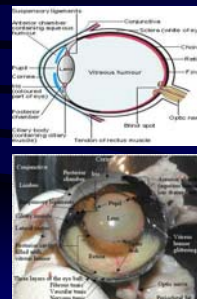
- Rods:
- Cells in the retina that enable vision in darkness and dim light.

## Eye Anatomy



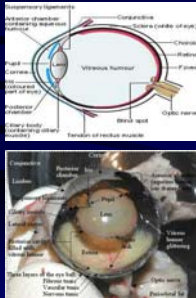
- Sclera:
- The area commonly referred to as the white of the eye.

## Eye Anatomy



- Uvea:
- The colored, middle layers of the eye. It includes the iris (colored part of the eye), choroids (a thin membrane containing many blood vessels), and ciliary body (the part of the eye that joins these together). The uvea is very important because its veins and arteries transport blood to the parts of the eye that are critical for vision. Inflammation in this part of the eye is known as uveitis.

## Eye Anatomy



- Vitreous:
- The gelatinous matter between the lens and the retina. It is what is removed during “vitrectomy”, a procedure used in treating some retinal problems, when people see moving specks in their vision often described and “floaters”, this is usually where they are located.

## Common Trauma and Diseases of the Eye

- Although there is very little that EMS can do for the typical eye disease prehospitally, it helps to be familiar with the common eye diseases and their causes.

## Common Trauma and Diseases of the Eye

- Cellulitis:
- Cellulitis is a skin infection caused by bacteria. The infection extends into the tissues below the outer layer of skin (subcutaneous tissue). It most often develops anywhere the skin has been broken—often from a cut, burn, or an insect bite. The infection spreads from the skin to underlying tissues. In severe cases, it can spread quickly, within hours or days. Cellulitis is usually not contagious.



## Common Trauma and Diseases of the Eye



- Canaliculitis
- The **lacrimal canaliculi**, also known as the **lacrimal canals** or **lacrimal ducts**, are the small channels in each eyelid that commence at minute orifices. Canaliculitis is an inflammation of the canaliculus

## Common Trauma and Diseases of the Eye



- Chalazion
- A chalazion is a cyst in the eyelid that is caused by inflammation of the meibomian gland, usually on the upper eyelid

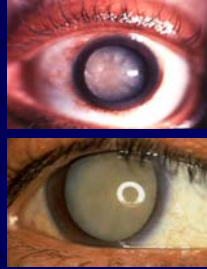
## Common Trauma and Diseases of the Eye



- Herpes Zoster
- Herpes Zoster, also known as shingles, is the reactivation of varicella zoster virus (one of the Herpesviridae group), leading to a crop of painful blisters over the area of a dermatome.

## Common Trauma and Diseases of the Eye

- Cataract
- A **cataract** is an opacity that develops in the crystalline lens of the eye or in its envelope.



## Common Trauma and Diseases of the Eye

- **Conjunctivitis** (commonly called "**pinkeye**") is an inflammation of the conjunctiva (the outermost layer of the eye and the inner surface of the eyelids), most commonly due to an allergic reaction or an infection (usually bacterial or viral).



## Common Trauma and Diseases of the Eye

- Corneal Ulcer
- Corneal ulcers generally form when the cornea is damaged in some way. The break in the cornea allows organisms to enter and cause an infection. The organisms may be a type of bacteria, virus, or fungus. Allergies or other eye conditions may also cause corneal ulcers.



## Common Trauma and Diseases of the Eye

- Alkali Burn – Injury
- Alkali chemicals are more destructive than acidic chemicals because of their ability to adhere to the eye and penetrate tissues.



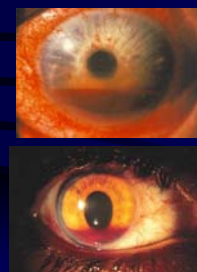
## Common Trauma and Diseases of the Eye

- Alkali Burn – Injury
- **Alkali-based chemicals**
- Lime (cement, plaster, whitewash)
- Drain cleaners
- Lye
- Metal polishes
- Ammonia
- Oven cleaners
- **Acid-based chemicals**
- Swimming pool acid (muriatic acid)
- Battery (sulfuric acid)



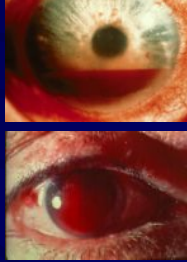
## Common Trauma and Diseases of the Eye

- Hyphema
- **Hyphema** is a term used to describe bleeding in the anterior chamber (the space between the cornea and the iris) of the eye. It occurs when blood vessels in the iris bleed and leak into the clear aqueous fluid. Hyphemas are usually characterized by pooling of blood in the anterior chamber that may be visible to the naked eye.



## Common Trauma and Diseases of the Eye

- Hyphema
- The red blood cells of very small hyphemas are visible only with magnification. Even the slightest amount of blood in the anterior chamber will cause decreased vision when mixed in the clear aqueous fluid.



## Common Trauma and Diseases of the Eye

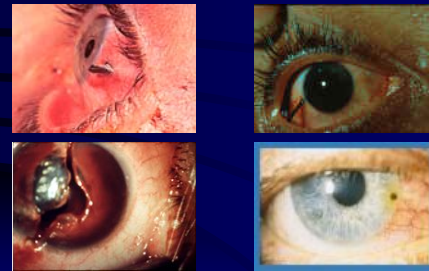
- Eye Contusion
- Eye injury, including blunt injury (contusion) or cut (laceration) can involve the eyeball, eyelid, bones around the eyeball (eye socket) and the muscles attached to the eyeball. The major symptoms are swelling, redness, tenderness, pain, bleeding or bruising in or around the eye. In addition, blurred vision may occur.



## Foreign Bodies - Impaled Objects



## Foreign Bodies - Impaled Objects



## Treatment of Eye Trauma and Diseases

- Eye Diseases:
- Treatment consist of supportive care for the patient to include pain management if needed.
- Severe irritation in one eye consider covering both eyes to decrease eye movement.
- Remember to not increase the problem by spreading the infection.
- If Possible, obtain all eye medications that the patient has been using and transport with the patient.

## Treatment of Eye Trauma and Diseases

- Foreign Bodies:
- Do not allow the patient to rub eyes. If the foreign object is on the eye lid attempt to remove with the corner of a sterile gauze.
- If the foreign body remains, Irrigate the eye with sterile saline.
- If the object remains, continue to irrigate the eye.

## Treatment of Eye Trauma and Diseases

- Impaled objects:
- Do not attempt to remove.
- Secure the impaled object using cup or padding.
- Cover both eyes.
- Provide supportive care and consider pain management.

## Treatment of Eye Trauma and Diseases

- **Cuts of the eye and lid:**
- Do not attempt to wash out the eye.
- Never apply pressure to the injured eye or eyelid.
- Cover the injured eye with sterile gauze and cover the uninjured eye to decrease eye movement.
- Provide supportive care and consider pain management as needed.

## Treatment of Eye Trauma and Diseases

- **Contusions to the eye:**
- Immediately apply an ice compress to the eye to reduce pain and swelling.
- A black eye or blurred vision can be a sign of damage inside the eye.
- Strongly recommend transport and treatment for evaluation due to inability to examine the eye because of swelling or pain.
- Provide supportive care.

## Treatment of Eye Trauma and Diseases

- **Chemical burns:**
- Identify what the chemical is prior to any treatment.
- Brush off any dry chemical and remove clothing for decontamination.
- Irrigate the eye with sterile water immediately, using your fingers to keep the eye open as wide as possible for at least fifteen minutes. (Do not irrigate the eyes if the chemical is reactive with water. Phosphorus or elemental sodium)
- Do not spend time on scene looking for neutralizing agents. Begin irrigation with sterile water as soon as the chemical is identified.
- Have the patient roll the eyes as much as possible to wash out the eye.

## Treatment of Eye Trauma and Diseases

- Chemical burns:
- Do not use an eye cup, or bandage the eyes. Continue to irrigate the eye throughout transport.
- Consider pain management .
- Do not make yourself a victim by forgetting to decontaminate the whole patient.

## Treatment of Eye Trauma and Diseases

- Hyphema:
- Keep patients head elevated. Do not lie flat. Keep quiet with minimal activity until you are seen by a physician.
- Increase in activity could increase the risk of bleeding.
- All patients with this injury should seek medical care immediately.

## Eye Anatomy, Diseases, and Trauma

# Test

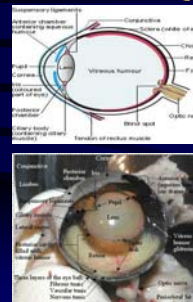
## Affects of Eye Trauma and Disease Question 1

- Sudden or gradual loss of vision can cause:
- Confusion
- Fear
- \_\_\_\_\_
- This does not take into consideration the possible pain that can be involved

## Affects of Eye Trauma and Disease Question 1

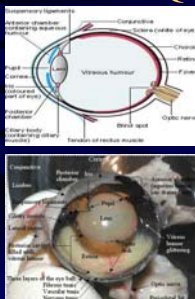
- Sudden or gradual loss of vision can cause:
- Confusion
- Fear
- **Disorientation**
- This does not take into consideration the possible pain that can be involved

## Affects of Eye Trauma and Disease Question 2



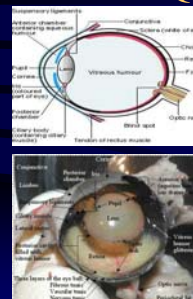
- Anterior Chamber:
- This is the space in the front portion of the eye between the cornea and the iris. This space is filled with \_\_\_\_\_.

## Affects of Eye Trauma and Disease Question 2



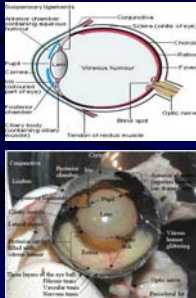
- Anterior Chamber:
- This is the space in the front portion of the eye between the cornea and the iris. This space is filled with **aqueous humour**.

## Affects of Eye Trauma and Disease Question 3



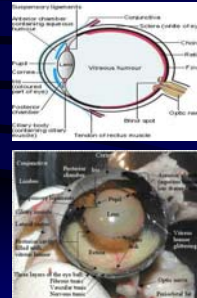
- Conjunctiva:
- The mucous membrane that is on the inside of the eyelids and on the surface of the eyeballs well as the sclera (the "white of the eye"). When the conjunctiva becomes irritated or inflamed, it is known as \_\_\_\_\_. One common type of conjunctivitis that many children experience is "pink eye".

## Affects of Eye Trauma and Disease Question 3



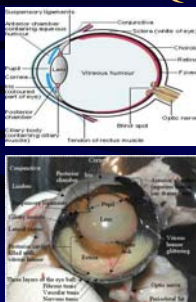
- Conjunctiva:
- The mucous membrane that is on the inside of the eyelids and on the surface of the eyeballs well as the sclera (the "white of the eye"). When the conjunctiva becomes irritated or inflamed, it is know as **conjunctivitis**. One common type of conjunctivitis that many children experience is "pink eye".

## Affects of Eye Trauma and Disease Question 4



- Iris:
- The "color" of our eyes. The iris responds to changing amounts of light by altering the \_\_\_\_\_ (bigger in less light and smaller in more light).

## Affects of Eye Trauma and Disease Question 4



- Iris:
- The "color" of our eyes. The iris responds to changing amounts of light by altering the **pupil size** (bigger in less light and smaller in more light).

## Affects of Eye Trauma and Disease Question 5

- Cellulitis:
- Cellulitis is a skin infection caused by \_\_\_\_\_. The infection extends into the tissues below the outer layer of skin (subcutaneous tissue). It most often develops anywhere the skin has been broken—often from a cut, burn, or an insect bite. The infection spreads from the skin to underlying tissues. In severe cases, it can spread quickly, within hours or days. Cellulitis is usually not contagious.



## Affects of Eye Trauma and Disease Question 5

- Cellulitis:
- Cellulitis is a skin infection caused by **bacteria**. The infection extends into the tissues below the outer layer of skin (subcutaneous tissue). It most often develops anywhere the skin has been broken—often from a cut, burn, or an insect bite. The infection spreads from the skin to underlying tissues. In severe cases, it can spread quickly, within hours or days. Cellulitis is usually not contagious.



## Affects of Eye Trauma and Disease Question 6

- Alkali Burn – Injury
- Alkali chemicals are \_\_\_\_\_ destructive then acidic chemicals because of their ability to adhere to the eye and penetrate tissues.



## Affects of Eye Trauma and Disease Question 6

- Alkali Burn – Injury
- Alkali chemicals are **more** destructive than acidic chemicals because of their ability to adhere to the eye and penetrate tissues.



## Affects of Eye Trauma and Disease Question 7

- You should only cover the eye that the impaled object is in to decrease the confusion for the patient

• TRUE/FALSE

## Affects of Eye Trauma and Disease Question 7

You should only cover the eye that the impaled object is in to decrease the confusion for the patient.

**FALSE**

## Affects of Eye Trauma and Disease Question 8

Regardless of what chemical the eyes are exposed to you should immediately irrigate with water.

TRUE/FALSE

## Affects of Eye Trauma and Disease Question 8

Regardless of what chemical the eyes are exposed to you should immediately irrigate with water.

**FALSE**

## Affects of Eye Trauma and Disease Question 9

You should strongly recommend all patients with eye/facial contusions seek immediate medical treatment.

TRUE/FALSE

Affects of Eye Trauma and Disease  
Question 9

You should strongly recommend all patients with eye/facial contusions seek immediate medical treatment.

**TRUE**

Affects of Eye Trauma and Disease  
Question 10

You should transport a patient with a hyphema in a supine position to reduce the amount of blood in the anterior chamber of the eye.

TRUE/FALSE

Affects of Eye Trauma and Disease  
Question 10

You should transport a patient with a hyphema in a supine position to reduce the amount of blood in the anterior chamber of the eye.

**FALSE**

**The END**

**Thanks for your  
Participation**