

# Ophthalmology/lecture 1

**Dr.Zena K.Khalil**

## **Introduction for ophthalmology**

Ophthalmology is the branch of medicine which deals with the diseases of the eye and their treatment. The word ophthalmology comes from the Greek roots ophthalmos meaning eye and logos meaning word; ophthalmology literally means "The science of eyes."

## **History of ophthalmology**

The eye, including its structure and mechanism, has fascinated scientists and the public since ancient times. Arab scientists are some of the earliest to have written about and drawn the anatomy of the eye, the earliest known diagram being in Hunain ibn Is-hâq's (Book of the Ten Treatises on the Eye). Earlier manuscripts exist which refer to diagrams which are not known to have survived. In fact, very few Græco-Roman diagrams of the eye are still in existence. Thus, it is not clear to which structures the texts refer, and what purpose they were thought to have.

Aristotle advanced such ideas with empiricism. He dissected the eyes of animals, and discovering three layers (not two), found that the fluid was of a constant consistency with the lens forming (or congealing) after death, and the surrounding layers were seen to be juxtaposed. He, and his contemporaries, further put forth the existence of three tubes leading from the eye, not one. One tube from each eye met within the skull.

Alexandrian studies extensively contributed to knowledge of the eye. In fact, no manuscripts from the region and time are known to have survived. From Celsius it is known that the lens had been recognised, and they no longer saw a fluid flowing to the brain through some hollow tube, Celsius failed to recognize the retina's role, and did not think it was the tissue that continued into the brain.

Rufus recognized a more modern eye, with conjunctiva, extending as a fourth epithelial layer over the eye. Rufus was the first to recognize a two chambered eye with one chamber from cornea to lens (filled with water), the other from lens to retina (filled with an egg-white-like substance). Galen dissected the optic nerve, and saw it was solid, He also knew of the tear ducts.

After Galen a period of speculation is again noted by Arab scientists to place the lens in the middle of the eye.

Understanding of the eye had been so slow to when Fabricius and his successors correctly placed the lens and developed the modern notion of the structure of the eye. They reinstated the correct curvatures of the lens and cornea, as well as stating the ciliary body as a connective structure between the lens and the choroid.

The seventeenth and eighteenth century saw the use of hand-lenses , microscopes , preparations for fixing the eye for study and later the freezing of the eye .This allowed for detailed study of the eye and an advanced model. In 1722 Leeuwenhoek noted the existence of rods and cones though they were not properly discovered until in 1834 by use of a microscope.

The first ophthalmic hospital in 1805 - now called Moorfields Eye Hospital in London, England was a transforming event in modern ophthalmology. Clinical developments at Moorfields and the founding of the Institute of Ophthalmology .



## Ophthalmology/lecture 2

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### **Eye examination**

Eye examination is a series of tests performed by an ophthalmologist (medical doctor), optometrist, or orthoptist assessing vision and ability to focus on and discern objects, as well as other tests and examinations pertaining to the eyes. Health care professionals often recommend that all people should have periodic and thorough eye examinations as part of routine primary care, especially since many eye diseases are asymptomatic. Eye examinations may detect potentially treatable blinding eye diseases, ocular manifestations of systemic disease, or signs of tumours or other anomalies of the brain., the eye examination consists of an external examination, followed by specific tests for visual acuity, pupil function, extraocular muscle motility, visual fields, intraocular pressure and ophthalmoscopy through a dilated pupil.

### **Basic examination**

**Visual acuity :**Visual acuity is the eye's ability to detect fine details and is the quantitative measure of the eye's ability to see an in-focus image at a certain distance. The standard definition of normal visual acuity (20/20 or 6/6 vision) is the ability to resolve a spatial pattern separated by a visual angle of one minute. The terms 20/20 and 6/6 are derived from standardized sized objects that can be seen by a "person of normal vision" at the specified distance.

**Refraction:** In physics, "refraction" is the mechanism that bends the path of light through the eye. Refractive error is an optical abnormality in which the shape of the eye fails to bring light into sharp focus on the retina, resulting in distorted vision. Examples of refractive error are myopia, hyperopia, and astigmatism, and correcting the error with glasses, contact lenses, or refractive surgery. A refraction procedure consists of two parts: objective and subjective.

**Objective refraction :** An objective refraction is a refraction obtained without receiving any feedback from the patient, using a retinoscope or auto-refractor. To perform a retinoscopy, the doctor projects a streak of light into a pupil. A series of lenses are flashed in front of the eye. By looking through the retinoscope, the doctor can study the light reflex of the pupil. Based on the movement and orientation of this retinal reflection.

An auto-refractor is a computerized instrument that shines light into an eye. The light travels through the front of the eye, to the back and then forward through the front again. The information bounced back to the instrument gives an objective measurement of refractive error without asking the patients any questions.

**Subjective refraction:** A subjective refraction requires responses from the patient. Typically, the patient will wear a trial frame and look at an eye chart. The eye care professional will change lenses and other settings while asking the patient for feedback on which set of lenses give the best vision.

**Cycloplegic refraction :** Sometimes, eye care professionals prefer to obtain a cycloplegic refraction, especially when trying to obtain an accurate refraction in young children who may skew refraction measurements by adjusting their eyes with accommodation. Cycloplegic eye drops are applied to the eye to temporarily paralyze the ciliary muscle of the eye.

**Pupil function :** An examination of pupillary function includes inspecting the pupils for equal size (1 mm or less of difference may be normal), regular shape, reactivity to light, and direct and consensual accommodation. These steps can be easily remembered with the mnemonic *PERRLA* (*D+C*): Pupils Equal and Round; Reactive to Light and Accommodation (Direct and Consensual).

**A swinging-flashlight test:** The swinging-flashlight test is the most useful clinical test available to a general physician for the assessment of optic nerve anomalies. This test detects the afferent pupil defect. It is conducted in a semidarkened room. In a normal reaction to the swinging-flashlight test, both pupils constrict when one is exposed to light. As the light is being moved from one eye to another, both eyes begin to dilate, but constrict again when light has reached the other eye.

If there is an efferent defect in the left eye, the left pupil will remain dilated regardless of where the light is shining, while the right pupil will respond normally. If there is an afferent defect in the left eye, both pupils will dilate when the light is shining on the left eye, but both will constrict when it is shining on the right eye. This is because the left eye will not respond to external stimulus (afferent pathway), but can still receive neural signals from the brain (efferent pathway) to constrict.

**Ocular motility :** Ocular motility should always be tested, especially when patients complain of double vision or physicians suspect neurologic disease. First, the doctor should visually assess the eyes for deviations that could result from strabismus, extraocular muscle dysfunction, Saccades are assessed by having the patient move his eye quickly to a target at the far right, left, top and bottom. This tests for saccadic dysfunction whereupon poor ability of the eyes to "jump" from one place to another may .

**Visual field (confrontation) testing :**Testing the visual fields consists of confrontation field testing in which each eye is tested separately to assess the extent of the peripheral field. To perform the test, the individual occludes one eye while fixated on the examiner's eye with the non-occluded eye. The patient is then asked to count the number of fingers that are briefly flashed in each of the four quadrants. Common problems of the visual field include scotoma (area of reduced vision), hemianopia (half of visual field lost),.

**External examination :** External examination of eyes consists of inspection of the eyelids, surrounding tissues and palpebral fissure. The conjunctiva and sclera can be inspected by having the individual look up, and shining a light while retracting the upper or lower eyelid. The position of the eyelids are checked for abnormalities such as ptosis which is an asymmetry between eyelid positions.

### **Slit-lamp :**

Close inspection of the anterior eye structures are often done with a slit lamp which is a table mounted microscope with a special adjustable illumination source attached. A small beam of light that can be varied in width, height, incident angle, orientation and colour, is passed over the eye, this light beam is narrowed into a vertical "slit", during slit-lamp examination. The examiner views the illuminated ocular structures, through an optical system that magnifies the image of the eye and the patient is seated while being examined, and the head stabilized by an adjustable chin rest. This allows inspection of all the ocular media, from cornea to vitreous, Fluorescein staining before slit lamp examination may reveal corneal abrasions.



### **Intraocular pressure ;**

Intraocular pressure (IOP) can be measured by Tonometry devices. The eye can be thought of as an enclosed compartment through which there is a constant circulation of fluid that maintains its shape and internal pressure. Tonometry is a method of measuring this pressure using various

instruments. The normal range is 10-21 mmHg.



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**Retinal examination :** Examination of retina (fundus examination) is an important part of the general eye examination. Dilating the pupil using special eye drops greatly enhances the view and permits an extensive examination of peripheral retina., in which case best results are obtained with the room darkened and the patient looking towards the far corner. The appearance of the optic disc and retinal vasculature are also recorded during fundus examination.

A red reflex can be seen when looking at a patient's pupil through a direct ophthalmoscope. This part of the examination is done from a distance of about 50 cm and is usually symmetrical between the two eyes. An opacity may indicate a cataract.

**Eye exams for children :**Children should have their first eye exam at 6 months old. If a parent suspects something is wrong an ophthalmologist can check even earlier.

Early eye exams are important because children need the following basic visual skills for learning: Near vision ,Distance vision: Tumbling E chart, Landolt C chart, Eye movement, Accommodation (focusing skills),Peripheral vision .

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## Practical

### How to deal with the patient

1-Asks questions to obtain the following information about the patient:

- Identification and demographics: name, age, height, weight.
- The "chief complaint (CC)" – the major health problem or concern, and its time course (e.g. chest pain for past 4 hours).
- History of the present illness (HPI) – details about the complaints, enumerated in the CC. (Also often called 'History of presenting complaint' or HPC.)
- Past medical history (PMH) (including major illnesses, any previous surgery/operations (sometimes distinguished as "Past Surgical History" or PSH), any current ongoing illness, e.g. diabetes).
- Review of systems (ROS) Systematic questioning about different organ systems
- Family diseases – especially those relevant to the patient's chief complaint.
- Childhood diseases – this is very important in pediatrics.
- Social history (medicine) – including living arrangements, occupation, marital status, number of children, drug use (including tobacco, alcohol, other recreational drug use), recent foreign travel, and exposure to environmental pathogens through recreational activities or pets.
- Regular and acute medications (including those prescribed by doctors, and others obtained over-the-counter or alternative medicine)
- Allergies – to medications, food, latex, and other environmental factors
- Sexual history, obstetric/gynecological history.

### 2-Examination

- A- Medical sign is a characteristic that may be detected by a patient, especially a physician, before or during a physical examination of a patient. For example elevated blood pressure, a clubbing of the ends of fingers
- B- Symptom is a characteristic that may be detected by any one , For example eye redness or change the face color .
- C- Slit lamp is an instrument consisting of a high-intensity light source that can be focused to shine a thin sheet of light into the eye.. The lamp facilitates an examination of the eyelid, sclera, conjunctiva, iris, natural crystalline lens, and cornea.
- D- Measurement of intraocular pressure (IOP) in case of trauma or corneal ulcer. Many people with glaucoma have no symptoms and do not know they have the condition. All children who have had cataract surgery should also have their IOP measured at every follow-up visit. This examination done by using :

- Tonometer, either Goldmann (used on slit lamps)
- Applanation prism
- Local anaesthetic drops
- Fluorescein strips
- Clean cotton wool or gauze swabs.

E- Ophthalmoscopy : is a test that allows a health professional to see inside the fundus of the eye and other structures using an ophthalmoscope or funduscope



It is of two major types:

- Direct ophthalmoscopy : that produces unreversed, image of approximately 15 times magnification.
- Indirect ophthalmoscopy : that produces a reversed, direct image of 2 to 5 times magnification.

Each type of ophthalmoscopy has a special type of ophthalmoscope:

- The *direct ophthalmoscope* is an instrument about the size of a small flashlight (torch) with several lenses that can magnify up to about 15 times. This type of ophthalmoscope is most commonly used during a routine physical examination.
- An *indirect ophthalmoscope*, constitutes a light attached to a headband, in addition to a small handheld lens. It provides a wider view of the inside of the eye. and, it allows a better view of the fundus of the eye, even if the lens is clouded by cataracts. An indirect ophthalmoscope can be either monocular or binocular. It is used for peripheral viewing of the retina.



Features	Direct ophthalmoscopy	Indirect ophthalmoscopy
<i>Condensing lens</i>	Not Required	Required
<i>Examination distance</i>	As close to patient's eye as possible	At an arm's length
<i>Image</i>	Virtual, erect	Real, inverted
<i>Illumination</i>	Not as bright; not useful in hazy media	Bright; useful for hazy media
<i>Area of field in focus</i>	About 2 disc diameters	About 8 disc diameters
<i>Stereopsis</i>	Absent	Present
<i>Accessible fundus view</i>	Slightly beyond equator	Up to peripheral retina
<i>Examination through hazy media</i>	Not possible	Possible

- F- Retinoscopy: is a technique to obtain an objective measurement of the refractive error of a patient's eyes. The examiner uses a retinoscope to shine light into the patient's eye and observes the reflection (reflex) of the patient's retina. While moving the streak or spot of light across the pupil the examiner observes the relative movement of the reflex or manually places lenses over the eye (using a trial frame and trial lenses) to "neutralize" the reflex.
- G- A visual field test or perimetry : is an eye examination that can detect dysfunction in central and peripheral vision which may be caused by various medical conditions such as glaucoma, stroke, pituitary disease, brain tumours or other neurological disease

## Methods of stimulus presentation

Static perimetry : Static perimetry tests different locations throughout the field one at a time. First, a dim light is presented at a particular location. If the patient does not see the light, it is made gradually brighter until it is seen. The minimum brightness required for the detection of a light stimulus is called the "threshold" sensitivity level of that location This procedure is then repeated at several other locations, until the entire visual field is tested.

Threshold static perimetry is generally done using automated equipment. It is used for rapid screening and follow up of diseases involving deficits such as scotomas, loss of peripheral vision and more subtle vision loss. Perimetry testing is important in the screening, diagnosing, and monitoring of various eye, retinal, optic nerve and brain disorders.

Kinetic perimetry :Kinetic perimetry uses a mobile stimulus moved by an examiner (perimetrist) such as in Goldmann kinetic perimetry. First, a single test light of constant size and brightness is used. The test light is moved towards the center of vision from the periphery until it is first detected by the patient. This repeated by approaching the center of vision from different directions. Repeating this enough will establish a boundary of vision for that target. The procedure is repeated using different test lights that are larger or brighter than the original test light.

H-Ultrasound waves : Higher frequency waves penetrate less into tissue but have better resolution . in order to calculate corrective lens power requirements and detection of retinal detachment .

A-Scan and B-scan. In A-scan, or time-amplitude scan, sound waves are generated at 8 MHz and converted into spikes that correspond with tissue interface zones. In B-scan, or brightness amplitude scan, sound waves are generated at 10 MHz.



I-A keratometer or ophthalmometer, is a diagnostic instrument for measuring the curvature of the anterior surface of the cornea, particularly for assessing the extent and axis of astigmatism. A keratometer uses the relationship between object size (O), image size (I), the distance between the reflective surface and the object (d), and the radius of the reflective surface (R). If three of



these variables are known (or fixed),  $R=2d \ I/O$

J-SYNOPTOPHORE: It is an instrument which compensates for the angle of squint and allows the stimuli to be presented to both eyes simultaneously. • It is an ophthalmic instrument which is used for diagnosing the imbalance of the eye muscle and treating them by orthoptic methods.

It is used to investigate the potential for binocular function in the presence of a manifest squint. • Specifically used in children (from 3 years of age). .Also used to detect suppression and

## WHAT IS A SYNOPTOPHORE??



- It is an instrument which compensates for the angle of squint and allows the stimuli to be presented to both eyes simultaneously.
- It is an ophthalmic instrument which is used for diagnosing the imbalance of the eye muscle and treating them by orthoptic methods.

K- Optical Biometer :The device provides six essential values for cataract surgery very quickly, and the auto tracking and auto shot capabilities make acquisition speedy and straightforward.



- 3D auto tracking/auto shot
- Rapid measurement
- IOL power calculation
-

## Ophthalmology/lecture 3

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Disorders of the eyelid : is any abnormal condition that affects the eyelids. Eyelids consist of thin folds of skin, muscle, and connective tissue. The eyelids protect the eyes and spread tears over the front of the eyes. The inside of the eyelids are lined with the conjunctiva of the eyelid (the palpebral conjunctiva), and the outside of the lids are covered with the body's thinnest skin

**Stye** :A stye is an infection of one of the three types of eyelid glands near the lid margins, at the base of the lashes. usually caused by bacterial staphylococcal infections. The symptoms are pain and inflammation in one or more localized regions near the eyelid margin.



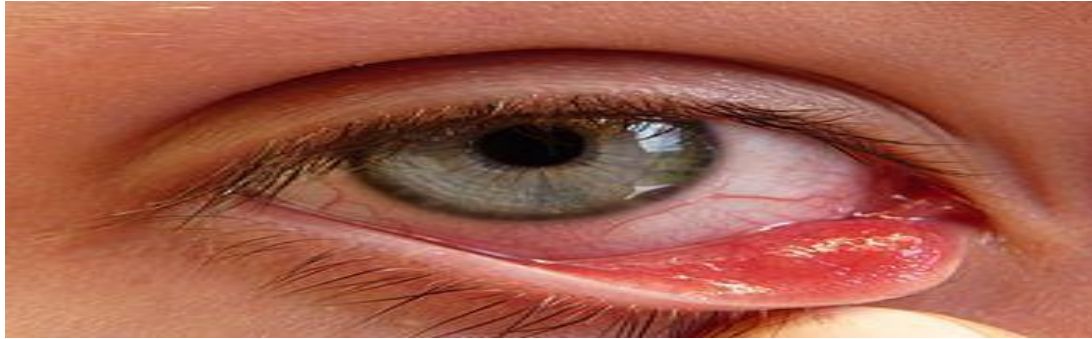
**Blepharitis** :Blepharitis is the inflammation of the eyelid margins, often with scales and crust. It can lead to eyelash loss, chalazia, styes, ectropion, corneal damage, excessive tearing, and chronic conjunctivitis. some cases of blepharitis are caused by bacterial infection and some by head lice, but in some cases, the cause is unclear. It may also be caused by an over-production of oil by the meibomian glands. Blepharitis can be a chronic condition that begins in early childhood and can last throughout life. Symptoms can include itching, burning, a feeling that something is in the eye, inflammation, and scales or matted, hard crusts surrounding the eyelashes.



Conjunctivitis, possible problems from allergies

**Chalazion** :A chalazion is an enlargement of a meibomian gland (an oil-producing gland in the eyelid), usually not associated with an infectious agent. More likely, the gland opening is clogged. Initially, a chalazion may resemble a stye, but it usually grows larger. A chalazion may also be located in the middle of the lid and be internal. About 25% of chalazia will disappear spontaneously, but warm compresses may speed the process. Chloramphenicol ointment may be used as well. Because chalazia are inside the lid, topical medications are generally of no benefit. Medication may need to be injected by the doctor into the chalazion or if that doesn't help the

chalazion may need to be excised. If what appears to be a chalazion recurs on the same site as any previous one, the possibility of sebaceous gland carcinoma should be investigated by biopsy.



**Entropion** :is a condition in which the margin of the eyelid is inverted in to the eye placing the eyelashes in direct contact with the eye causing sever discomfort usually results from aging, but sometimes can be due to a congenital defect, a spastic eyelid muscle, or a scar on the inside of the lid from surgery, injury, or disease. It is accompanied by excessive tearing, redness, and discomfort

**Ectropion** :the eyelid margin turns outwards and away from the eyeball ,the usual cause of ectropion is aging. It also can be due to a spastic eyelid muscle or a scar, as in entropion. It also can be the result of allergies. Symptoms are excessive tearing and hardening of the eyelid conjunctiva. Both entropion and ectropion can be surgically corrected. Prior to surgery, the lower lid of entropion can be taped down to keep the lashes off the eye, and both can be treated with lubricating drops to keep the cornea moist.



**Eyelid edema :** Eyelid edema is most often caused by allergic reactions, for example, allergies to eye makeup, eyedrops or other drugs, or plant allergens such as pollen. Trichinosis, a disease caused by eating undercooked meat, also causes eyelid edema. However, swelling can also be caused by more serious causes, such as infection, and can lead to orbital cellulitis which can threaten vision. Symptoms can include swelling, itching, redness, or pain.

Patients with swollen eyelids should contact their eye doctor. A severely swollen lid can press on the eye and possibly increase the intraocular pressure. An infection needs to be ruled out. Or, something as simple as an allergy to nail polish and then touching the eyes can cause swelling. The best treatment for allergic eyelid edema is to find and remove the substance causing the allergy. When that is not possible, as in the case of plant allergens, cold compresses and immunosuppressive drugs such as corticosteroid creams are helpful. However, steroids can cause cataracts and increase intraocular pressure and patients must be very careful not to get the cream in their eyes. This should not be done unless under a doctor's care. For edema caused by



trichinosis, the trichinosis must be treated.

**Eyelid tumors :** Tumors found on the eyelids are caused by the same conditions that cause these tumors elsewhere on the body. They are usually painless and may or may not be pigmented. Some possible causes include AIDS (Kaposi's sarcoma) or increased exposure to ultraviolet (UV) rays which may lead to skin cancer. Cancerous tumors should be removed upon discovery, and noncancerous tumors should be removed before they become big enough to interfere with vision or eyelid function. Eyelid tumors require special consideration because of their sensitive location. It is important that treatment not compromise vision, eye movement, or eyelid movement. Accordingly, eyelid reconstruction will sometimes accompany tumor excision.

**Diagnosis :** An instrument called a slit lamp is generally used to magnify the structures of the eyes. The doctor may press on the lid margin to see if oil can be expressed from the meibomian glands. The doctor may invert the lid to see the inside of the lid. Biopsy is used to diagnose cancerous tumors.

**Prognosis :** The prognosis for styes and chalazia is good to excellent. With treatment, blepharitis, ectropion, and entropion usually have good outcomes. The prognosis for nonmalignant tumors, basal cell carcinoma, and squamous cell carcinoma is good once they are properly removed. Survival rate for malignant melanoma depends upon how early it was discovered and if it was completely removed. Sebaceous carcinomas are difficult to detect, so poor outcomes are more frequent. All of these eyelid disorders, if not treated, can lead to other, possibly serious vision problems—dry eye, astigmatism, or even vision loss.

## Ophthalmology/lecture 2

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### Practical

#### MADAROSIS

Also known as milphosis, is the abnormal loss of eyelashes (Ciliary Madarosis). It could be caused by inflammation (blepharitis), alopecia, tumors, endocrine disorders, congenital disorders, drugs and toxins, or wrong applied make up or extensions.



#### BLEPHARITIS

Is the chronic inflammation of the eyelids. It can be due to infection (staphylococcus, herpes, fungus, and others), seborrhea, trauma (plucking, rubbing, allergy (specially to cosmetics).



#### TRICHIASIS

In this condition the eyelashes are reversed positioned, growing back to the ocular globe. Causes could be infections, inflammations, autoimmune conditions, congenital defects, and trauma (burns or injury).



#### DEMODEX FOLLICULORUM

These are parasites, face mites, who lives in the eyelashes follicles. They eat sebaceous secretions and dead cells, and they reproduce inside the follicle. With a length of 0.1 to 0.4 mm., they can infest the eyelids.



#### CRAB LICE

These are parasitic insects which infest pubic zones and other areas, including eyelashes. They use to feed with human blood, and the treatment with Permethrin and Pyrethrins is hard, and should be completed with fine-teeth combs and washings.



#### STYE

It could be an infection of sebaceous glands at the base of the eyelashes or an infection of the sweat glands. It's not a chronic condition, and usually disappears in one week without treatment, or 4 days with antibiotics.



#### TRICHOTILLOMANIA

It is a psychological disorder based in the compulsion of pulling out one's head, and results in hair loss and skin damages. It's a chronic condition very difficult to treat.



#### TRICHOPHAGIA

Around a 15% of sufferers of trichotillomania eat their hair. This is a serious psychological disorder, which could lead to the complete loss of eyelashes and serious digestive problems.



## Ophthalmology/lecture 4

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**Conjunctiva disorders** The conjunctiva is the membrane that lines the eyelid and loops back to cover the sclera (the tough white fiber layer covering the eye), right up to the edge of the cornea (the clear layer in front of the iris and pupil). The conjunctiva helps protect the eye by keeping small foreign objects and infection-causing microorganisms out and by contributing to the maintenance of the tear film. Conjunctivitis is a common condition in which a part of the eye called the conjunctiva is inflamed. The conjunctiva is a thin, transparent membrane that lines and protects the whites of the eyes and the eyelids.

Infectious conjunctivitis can be spread from one person to another through contact with any object, but is very common among young children, especially those in day care settings.

### Types Of Conjunctivitis

**1-Bacterial conjunctivitis** is a common type of pink eye, caused by bacteria that infect the eye through various sources of contamination. The bacteria can be spread through contact with an infected individual, exposure to contaminated surfaces or through other means such as sinus or ear infections.

The most common types of bacteria that cause bacterial conjunctivitis include *Staphylococcus aureus*, *Haemophilus influenzae*, *Streptococcus pneumoniae* and *Pseudomonas aeruginosa*. Bacterial conjunctivitis usually produces a thick eye discharge or pus and can affect one or both eyes.

As with any bacterial infection, antibiotics are required to eliminate the bacteria. Treatment of bacterial conjunctivitis is typically accomplished with topical antibiotic eye drops and/or eye ointments. The treatment usually takes from one to two weeks, depending on the severity of the infection.

**2-Viral conjunctivitis** is another common type of pink eye that is highly contagious, because airborne viruses can be spread through sneezing and coughing. Viral conjunctivitis also can accompany common viral upper respiratory infections such as measles, the flu or the common cold.

Viral conjunctivitis usually produces a watery discharge. Typically the infection starts in one eye and quickly spreads to the other eye.

Unlike with bacterial infections, antibiotics will not work against viruses. No eye drops or ointments are effective against the common viruses that cause viral conjunctivitis. But viral conjunctivitis which means it will go away by itself after a short time.

Treatment of viral conjunctivitis usually involves supportive therapies, such as eye drops, that help reduce the symptoms: for example, vasoconstrictors to whiten the eye, decongestants to



reduce the surface swelling and antihistamines to reduce occasional itching. Treatments usually are continued for one to two weeks, depending on the severity of the infection.

**3-Gonococcal and chlamydial conjunctivitis** are bacterial forms related to infections from sexually transmitted diseases including gonorrhea and chlamydia. Newborn babies may be exposed when they pass through the birth canal of an infected mother.

**4-Neonatal conjunctivitis** found in newborn babies can cause blindness when left untreated.

**5-Allergic conjunctivitis** caused by eye allergies is very common. Eye allergies, like other types, can be triggered by allergens including pollen, animal dander and dust mites.

The most common symptom of allergic conjunctivitis is itchy eyes, which may be relieved with special eye drops containing antihistamines to control allergic reactions. These eye drops are available both over the counter and by prescription.

Avoiding the allergen is also important in the treatment of allergic conjunctivitis. Allergic conjunctivitis can be seasonal or perennial (year-round), depending on the allergen causing the reaction.

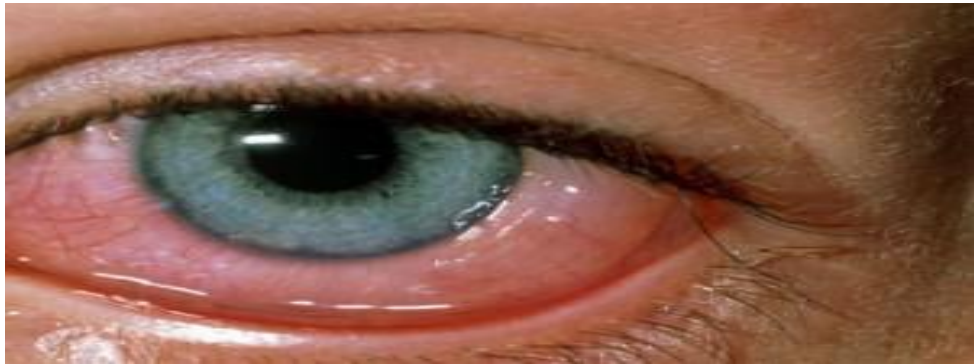
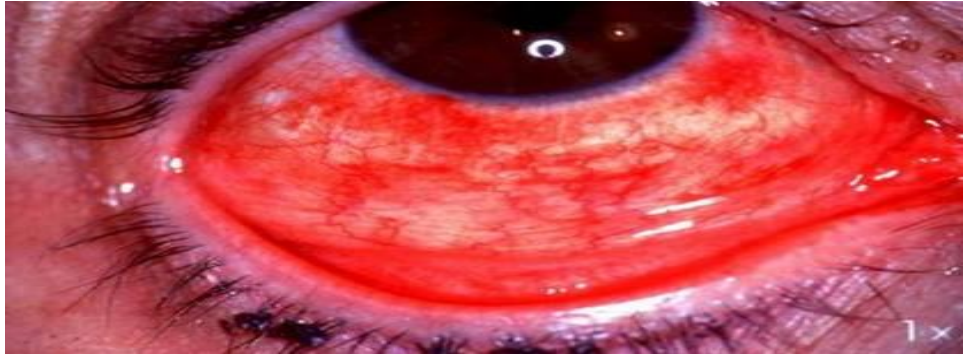
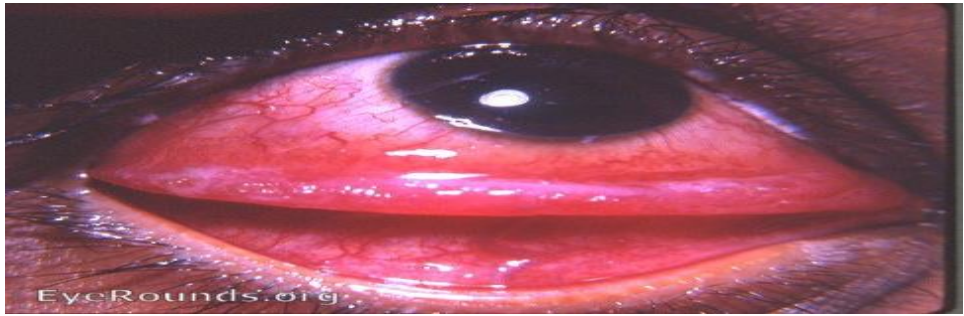
**6-Giant papillary conjunctivitis (GPC)** usually involves both eyes and often affects soft contact lens wearers. This condition may cause contact lens intolerance, itching, a heavy discharge, tearing and red bumps on the underside of the eyelids.

You'll need to stop wearing your contact lenses, at least for a little while. Your eye doctor may also recommend that you switch to a different type of contact lens, to reduce the chance of the conjunctivitis coming back.

**Non-infectious conjunctivitis** from eye irritation causing pink eye symptoms that can result from many sources, including smoke, diesel exhaust, perfumes and certain chemicals.

Symptoms of conjunctivitis :Pink eye ,Irritated eye ,Eye discharge ,Swollen eyelid ,Reddened eye .An eye examination includes testing pupil response to light, visual acuity or sharpness of vision, checking the sharpness of peripheral vision, and testing the pressure inside the eye. The outer eye is examined using a slit lamp, and the inner eye is examined using an ophthalmoscope. A culture and sensitivity test may be performed on discharge from the affected eye. This involves taking a sample of the discharge, growing it in a laboratory, and examining it to determine the type of microorganism that is causing an infectious conjunctivitis.

Treatments Warm washing - to remove crusting and discharge , Eye ointments , Eye drops .The first step in treating conjunctivitis is prevention. Prevention measures include avoiding touching the eyes, which can transmit an infectious virus or bacteria from the hands into the eyes. It is also key to wash hands frequently with soap and water for at least 15 seconds, especially after having contact with anyone with conjunctivitis .





**What Is Pinkeye?** Pinkeye -- also called conjunctivitis -- is redness and inflammation of the clear membranes covering the whites of the eyes and the membranes on the inner part of the eyelids. Pinkeye is most often caused by a virus or by a bacterial infection, although allergies, chemical agents, and underlying diseases can also play a role.

**Is Pinkeye Contagious?** Viral and bacterial pinkeye are extremely contagious. It's easily spread through poor hand washing or by sharing an object (like a towel) with someone who has it. It can also spread through coughing and sneezing. Kids diagnosed with infectious pinkeye should stay out of school or day care for a short period of time. Allergic pinkeye (caused by seasonal pollens, animal dander, cosmetics, and perfumes) and chemical pinkeye (from chemicals or liquids, including bleach and furniture polish) are not contagious.

**Symptom:** Eye Redness, Swollen, Red Eyelids, Lots of Tearing ,Itchy or Burning Eyes  
,Sensitivity to Light

#### Pinkeye Diagnosis



A doctor can often diagnose pinkeye just by its distinguishing signs and symptoms. However a slit lamp exam may be required. In some cases, a swab of the discharge from the eye is sent to a lab to determine the cause.

## Ophthalmology/lecture 5

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**Trachoma** is an infectious disease caused by bacterium *Chlamydia trachomatis*. The infection causes a roughening of the inner surface of the eyelids. This roughening can lead to pain in the eyes, breakdown of the outer surface or cornea of the eyes, and eventual blindness. Untreated, repeated trachoma infections can result in a form of permanent blindness when the eyelids turn inward.

The bacteria that cause the disease can be spread by both direct and indirect contact with an affected person's eyes or nose. Indirect contact includes through clothing or flies that have come into contact with an affected person's eyes or nose. Children spread the disease more often than adults. Poor sanitation, crowded living conditions, and not enough clean water and toilets also increase spread.

Efforts to prevent the disease include improving access to clean water and treatment with antibiotics to decrease the number of people infected with the bacterium. This may include treating, all at once, whole groups of people in whom the disease is known to be common. Washing, by itself, is not enough to prevent disease but may be useful with other measures.

Treatment options include oral azithromycin and topical tetracycline. Azithromycin is preferred because it can be used as a single oral dose. After scarring of the eyelid has occurred, surgery may be required to correct the position of the eyelashes and prevent blindness.

Globally, about 80 million people have an active infection. In some areas, infections may be present in as many as 60–90% of children. Among adults, it more commonly affects women than men – likely due to their closer contact with children.

### **Signs and symptoms**

The bacterium has an incubation period of 5 to 12 days, after which the affected individual experiences symptoms of conjunctivitis, or irritation similar to "pink eye." Blinding endemic trachoma results from multiple episodes of reinfection that maintains the intense inflammation in the conjunctiva. Without reinfection, the inflammation will gradually subside.

The conjunctival inflammation is called “active trachoma” and usually is seen in children, especially pre-school children. It is characterized by white lumps in the undersurface of the upper eyelid (conjunctival follicles or lymphoid germinal centres) and by non-specific inflammation and thickening often associated with papillae. Follicles may also appear at the junction of the cornea and the sclera (limbal follicles). Active trachoma will often be irritating and have a watery discharge. Bacterial secondary infection may occur and cause a purulent discharge.

The later structural changes of trachoma are referred to as “cicatricial trachoma”. These include scarring in the eyelid (tarsal conjunctiva) that leads to distortion of the eyelid with buckling of the lid (tarsus) so the lashes rub on the eye (trichiasis). These lashes will lead to corneal opacities and scarring and then to blindness. Linear scar present in the Sulcus subtarsalis is called Arlt's line (named after Carl Ferdinand von Arlt). In addition, blood vessels and scar tissue can invade the upper cornea (pannus). Resolved limbal follicles may leave small gaps in pannus (Herbert's Pits).

Most commonly children with active trachoma will not present with any symptoms as the low-grade irritation and ocular discharge is just accepted as normal. However, further symptoms may include:

- Eye discharge
- Swollen eyelids
- Trichiasis (turned-in eyelashes)
- Swelling of lymph nodes in front of the ears
- Sensitivity to bright lights
- Increased heart rate
- Further ear, nose and throat complications.

The major complication or the most important one is corneal ulcer occurring due to rubbing by concentrations, or trichiasis with superimposed bacterial infection.

## Diagnosis

McCallan in 1908 divided the clinical course of trachoma into 4 stages

<b>Stage 1 (Incipient trachoma)</b>	<b>Stage 2 (Established trachoma)</b>	<b>Stage 3 (Cicatrising trachoma)</b>	<b>Stage 4 (Healed trachoma)</b>
Hyperaemia of palpebral conjunctiva	Appearance of mature follicle & papillae	Scarring of palpebral conjunctiva	Disease is cured or is not markable
Immature follicle	Progressive corneal pannus	Scars are easily visible as white bands	Sequelae to cicatrisation cause symptoms

## WHO classification

The World Health Organization recommends a simplified grading system for trachoma. The Simplified WHO Grading System is summarized below:

Trachomatous inflammation, follicular (TF)—Five or more follicles of  $>0.5$  mm on the upper tarsal conjunctiva

Trachomatous inflammation, intense (TI)—Papillary hypertrophy and inflammatory thickening of the upper tarsal conjunctiva obscuring more than half the deep tarsal vessels

Trachomatous scarring (TS)—Presence of scarring in tarsal conjunctiva.

Trachomatous trichiasis (TT)—At least one ingrown eyelash touching the globe, or evidence of epilation (eyelash removal) . Corneal opacity (CO)—Corneal opacity blurring part of the pupil margin

## Management

### Antibiotics

Antibiotic selection: Azithromycin (single oral dose of 20 mg/kg) or topical tetracycline (one percent eye ointment twice a day for six weeks). Azithromycin is preferred because it is used as a single oral dose. Although it is expensive, it is generally used as part of the international donation program organized by Pfizer through the International Trachoma Initiative. Azithromycin can be used in children from the age of six months and in pregnancy. As a community-based antibiotic treatment, some evidence suggests that oral azithromycin was more effective than topical tetracycline; however, there was no consistent evidence that supported oral or topical antibiotics as being more effective. Antibiotic treatment reduces the risk of active trachoma in individuals infected with chlamydia trachomatis.

## **Surgery**

Surgery: For individuals with trichiasis, a bilamellar tarsal rotation procedure is warranted to direct the lashes away from the globe. Evidence suggests that usage of a lid clamp and absorbable sutures would result in reduced lid contour abnormalities and granuloma formation post-surgery. Early intervention is beneficial as the rate of recurrence is higher in more advanced disease.

## **Lifestyle measures**

Facial cleanliness: Children with grossly visible nasal discharge, ocular discharge, or flies on their faces are at least twice as likely to have active trachoma as children with clean faces. Intensive community-based health education programs to promote face-washing can significantly reduce the prevalence of active trachoma, especially intense trachoma (TI). If an individual is already infected washing one's face is strongly encouraged, especially a child, in order to prevent re-infection. Some evidence exists that washing the face combined with topical tetracycline might be more effective in reducing severe trachoma compared to topical tetracycline alone. The same trial found no statistically significant benefit of eye washing alone or in combination with tetracycline eye drops in reducing follicular trachoma amongst children.

National governments in collaboration with numerous non-profit organizations implement trachoma control programs using the WHO-recommended SAFE strategy, which includes:

- Surgery to correct advanced stages of the disease;
- Antibiotics to treat active infection, using azithromycin
- Facial cleanliness to reduce disease transmission;
- Environmental change to increase access to clean water and improved sanitation.

## **Prognosis**

If not treated properly with oral antibiotics, the symptoms may escalate and cause blindness, which is the result of ulceration and consequent scarring of the cornea. Surgery may also be necessary to fix eyelid deformities.



### Ophthalmology/lecture 3

**Dr.Zena K.Khalil**

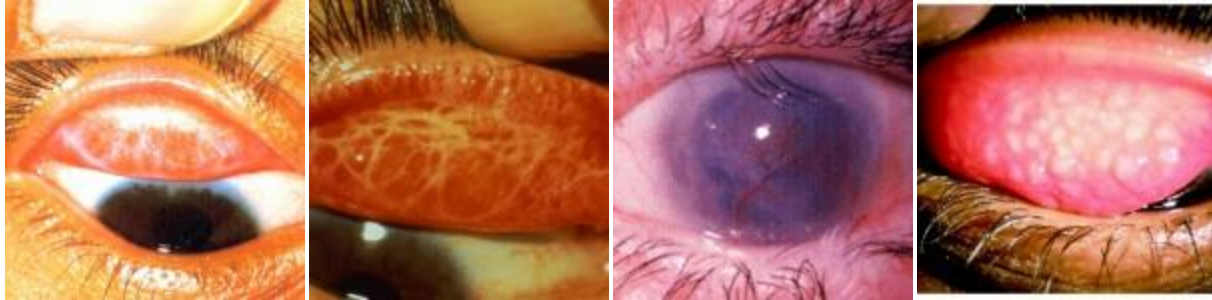
#### *Practical*

Trachoma is medically known as granular conjunctivitis which is a bacterial eye infection. Bacterium *Chlamydia trachomatis* is said to cause this infection and this is chronic taking long time to cure. The infection is transmitted to mothers who take care of their infected children. Some women may also get this infection through day nursery. Trachoma may cause corneal abrasions or even scarring and in rare cases it may cause loss of vision permanently.

**Symptoms :** Some of the common signs of trachoma are fluid like discharge from the eyes and cloudy cornea. The eyes become swollen due to the inflammation of the lymph nodes and for some children the eyelashes turn inward making it difficult to open the eyes. The lymph nodes of the ears may also develop swelling. The white part of the eyes may become reddish and painful. The first symptom begins to appear only after 10-12 days of bacterial infection. It develops as a slow process starting in the form of inflammation of the eyelids lining and underlying tissues. If left untreated, it can cause permanent scarring on the eyes.

**Diagnoses :** Your doctor or ophthalmologist may perform eye examination through which scarring on the eyelids become evident.





**Treatment** : Powerful antibiotics like erythromycin and doxycycline are prescribed for trachoma eye infection. In severe cases surgery is done for preventing long term effects of scarring. In short the medical care given for trachoma is described as “SAFE” where “S” means surgical care, “A” means antibiotics, “F” means facial cleanliness and “E” means environmental improvement. World Health Organization recommends giving azithromycin ointment for treating trachoma but it is expensive. It is easy to use this medicine in the form of oral pills or eye drops. This drug is far effective when compared with tetracycline in removing the symptoms and it has less side effects. For some people there may be gastric problems and rash formation when high dosage of azithromycin is taken. Surgery is done on to correct the loss of vision and recommended for individuals who have trichiasis, failing which it can cause blindness. By doing surgery, the eyelid rotation is limited which in turn reduces the process of scarring of cornea.

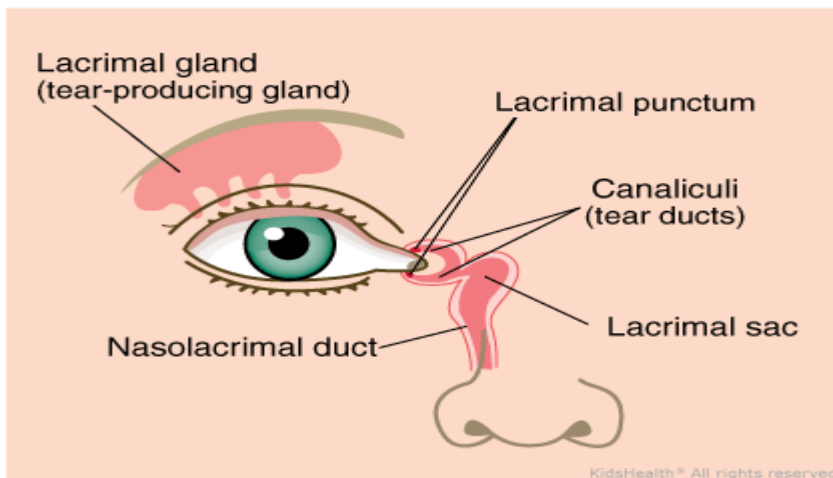
## Ophthalmology/lecture 6

Dr.Zena K.Khalil

### Lacrimal apparatus

The **lacrimal apparatus** is the physiological system containing the orbital structures for tear production and drainage. It consists of:

- The lacrimal gland, which secretes the tears, and its excretory ducts, which convey the fluid to the surface of the human eye;
- The lacrimal canaliculi, the lacrimal sac, and the nasolacrimal duct, by which the fluid is conveyed into the cavity of the nose, emptying anterioinferiorly to the inferior nasal conchae from the nasolacrimal duct;
- The innervation of the lacrimal apparatus involves the a sympathetic supply through the carotid plexus of nerves around the internal carotid artery.



**Nasolacrimal duct obstruction (NLDO)** is the obstruction of nasolacrimal duct and may be either congenital or acquired. Obstruction of the nasolacrimal duct leads to the excess overflow of tears called epiphora

### Sign and symptoms

Excessive tearing is the most common complaint of patients with NLDO, followed by acute or chronic infections. Pain at the side of the nose suggests dacryocystitis NLDO is found to be more common with increasing age and more common in females

**Cause : Involutional stenosis**

Involutional stenosis is probably the most common cause of NLD obstruction in older persons. It affects women twice as frequently as men. Although the inciting event in this process is

unknown, clinicopathologic study suggests that compression of the lumen of the NLD is caused by inflammatory infiltrates and edema. This may be the result of an unidentified infection or possibly an autoimmune disease.

**Dacryolith :** Dacryoliths or cast formation, within the lacrimal sac can also produce obstruction of the NLD.

**Sinus disease :** Sinus disease often occurs in conjunction with other instances may contribute to the development of NLD obstruction. Patients should be asked about previous sinus surgery,

**Trauma :** Naso-orbital fractures may involve the NLD. Early treatment by fracture reduction with stenting of the entire lacrimal drainage system should be considered.

**Inflammatory disease :** Granulomatous disease, including sarcoidosis, granulomatosis with polyangiitis, and midline granuloma, may also lead to NLD obstruction.

**Lacrimal plugs :** As with similar cases of canalicular obstruction, dislodged punctal and canalicular plugs can migrate to and occlude the NLD.

**Neoplasm :** Neoplasm should be considered in any patient presenting with NLD obstruction. In patients with an atypical presentation, including younger age and male gender, further workup is appropriate. Bloody punctal discharge or lacrimal sac distension above the medial canthal tendon is also highly suggestive of neoplasm.

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**Congenital :** Congenital nasolacrimal duct obstruction, or dacryostenosis, occurs when the lacrimal duct has failed to open at the time of birth, most often due to an imperforate membrane at the valve of Hasner. Around 6% of infants have CLDO, usually experiencing a persistent watery eye even when not crying. If a secondary infection occurs (Dacryocystitis), purulent (yellow / green) discharge may be present.

Most cases resolve spontaneously, with antibiotics reserved only if conjunctivitis occurs. Lacrimal sac massage has been proposed as helping to open the duct, though this is not always successful. The aim of massage is to generate enough hydrostatic pressure (downward, toward the nose) to "pop" open any obstruction. Additional massage may then be performed up toward the lacrimal punctum, in order to express any infectious material out of the nasolacrimal sac. When discharge or crusting is present, the lids should be gently cleaned using cooled pre-boiled water or saline.

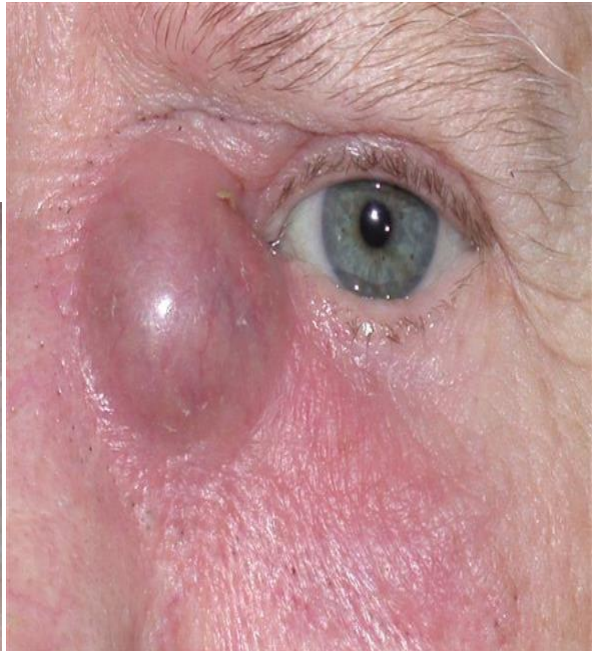
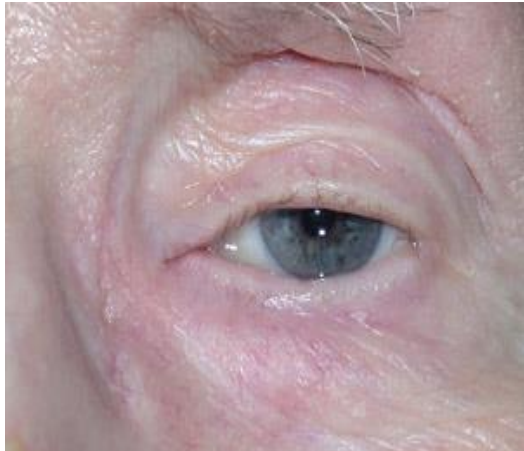
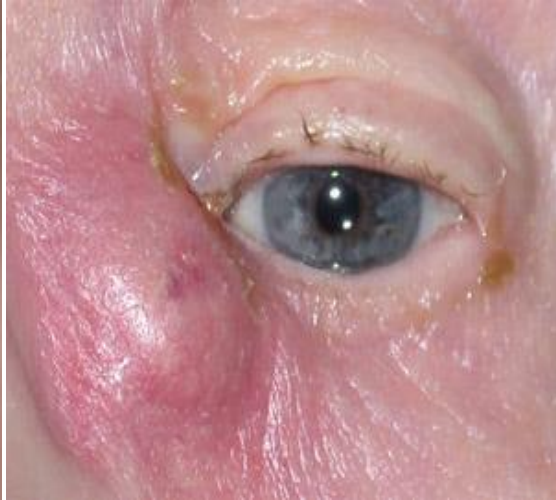
Ophthalmologist is indicated if symptoms are still present at 12 months, or sooner if significant symptoms or recurrent infections occur. Nasolacrimal duct probing may be performed in the office setting (usually from 4 to 8 months of age) or under general anesthesia in an operating room for older patients. The success rate of probing is higher for younger children. A silastic tube or stent may be employed along with probing to maintain tear duct patency.

Diagnosis :

Dye disappearance test :The dye disappearance test (DDT) is useful for assessing the presence or absence of adequate lacrimal outflow, especially in unilateral cases. It is more heavily relied upon in children, in whom lacrimal irrigation is impossible without deep sedation. Using a drop of sterile 2% fluorescein solution or a moistened fluorescein strip, the examiner instills fluorescein into the conjunctival fornices of each eye and then observes the tear film, preferably with the cobalt blue filter of the slit lamp. Persistence of significant dye and, particularly asymmetric clearance of the dye from the tear meniscus over a 5-minute period indicate an obstruction. If the DDT result is normal, severe lacrimal drainage dysfunction is highly unlikely. Variations of the DDT are the Jones tests.

Irrigation test : In irrigation test, a lacrimal irrigation cannula is passed into the punctum and advanced through the canaliculus to the lacrimal fossa. Clear water or saline is then irrigated through the cannula. If fluid passes into the nose without reflux out of the opposite canaliculus, the system is patent. If no fluid passes but it all comes back through either punctum, nasolacrimal duct obstruction is present.





## Ophthalmology/lecture 7

### Dr.Zena K.Khalil

Disease of cornea : **Injuries** After minor injuries or scratches, the cornea usually heals on its own. Deeper injuries can cause corneal scarring, resulting in a haze on the cornea that impairs vision. If you have a deep injury, or a corneal disease or disorder, you could experience:

- Pain in the eye
- Sensitivity to light
- Reduced vision or blurry vision
- Redness or inflammation in the eye
- Headache, nausea, fatigue

**Allergies** : The most common allergies that affect the eye are those related to pollen, particularly when the weather is warm and dry. Symptoms in the eye include redness, itching, tearing, burning, stinging, and watery discharge, although usually not severe enough to require medical attention. Antihistamine decongestant eyedrops effectively reduce these symptoms. Rain and cooler weather, which decreases the amount of pollen in the air, can also provide relief.

**Keratitis** : Keratitis is an inflammation of the cornea. Noninfectious keratitis can be caused by a minor injury, or from wearing contact lenses too long.. Infectious keratitis can be caused by bacteria, viruses, fungi or parasites. Often, these infections are also related to contact lens wear, especially improper cleaning of contact lenses or overuse of old contact lenses that should be discarded. Minor corneal infections are usually treated with antibacterial eye drops. If the problem is severe, it may require more intensive antibiotic or antifungal treatment to eliminate the infection, as well as steroid eye drops to reduce inflammation.

**Dry eye** : Dry eye is a condition in which the eye produces fewer or lower quality tears and is unable to keep its surface lubricated.

The main symptom of dry eye is usually a scratchy feeling or as if something is in your eye. Other symptoms include stinging or burning in the eye, episodes of excess tearing that follow periods of dryness, discharge from the eye, and pain and redness in the eye.

**corneal dystrophies** : A corneal dystrophy is a condition in which one or more parts of the cornea lose their normal clarity due to a buildup of material that clouds the cornea.

These diseases:

- Are usually inherited
- Affect both eyes
- Progress gradually
- Don't affect other parts of the body, and aren't related to diseases affecting other parts of the eye or body
- Happen in otherwise healthy people.

Corneal dystrophies affect vision in different ways. Some cause severe visual impairment, while a few cause no vision problems and are only discovered during a routine eye exam. Other dystrophies may cause repeated episodes of pain without leading to permanent vision loss. Some of the most common corneal dystrophies include keratoconus, Fuchs' dystrophy, lattice dystrophy, and map-dot-fingerprint dystrophy.



**Keratoconus :** Keratoconus is a progressive thinning of the cornea. It is the most common corneal dystrophy in the U.S., affecting one in every 2,000 Americans. It is most prevalent in teenagers and adults in their 20s.

Keratoconus causes the middle of the cornea to thin, bulge outward, and form a rounded cone shape. This abnormal curvature of the cornea can cause double or blurred vision, nearsightedness, astigmatism, and increased sensitivity to light.

The causes of keratoconus aren't known, but research indicates it is most likely caused by a combination of genetic susceptibility along with environmental and hormonal influences. About 7 percent of those with the condition have a history of keratoconus in their family. Keratoconus is diagnosed with a slit-lamp exam. Your eye care professional will also measure the curvature of your cornea.

Keratoconus usually affects both eyes. At first, the condition is corrected with glasses or soft contact lenses. As the disease progresses, you may need specially fitted contact lenses to correct the distortion of the cornea and provide better vision.

In most cases, the cornea stabilizes after a few years without causing severe vision problems. A small number of people with keratoconus may develop severe corneal scarring or become unable

to tolerate a contact lens. For these people, a corneal transplant may become necessary.



**Fuchs' Dystrophy :** Fuchs' dystrophy is a slowly progressing disease that usually affects both eyes and is slightly more common in women than in men. It can cause your vision to gradually worsen over many years, but most people with Fuchs' dystrophy won't notice vision problems until they reach their 50s or 60s.

Fuchs' dystrophy is caused by the gradual deterioration of cells in the corneal endothelium; the causes aren't well understood. Normally, these endothelial cells maintain a healthy balance of fluids within the cornea. Healthy endothelial cells prevent the cornea from swelling and keep the cornea clear. In Fuchs' dystrophy, the endothelial cells slowly die off and cause fluid buildup and swelling within the cornea. The cornea thickens and vision becomes blurred.

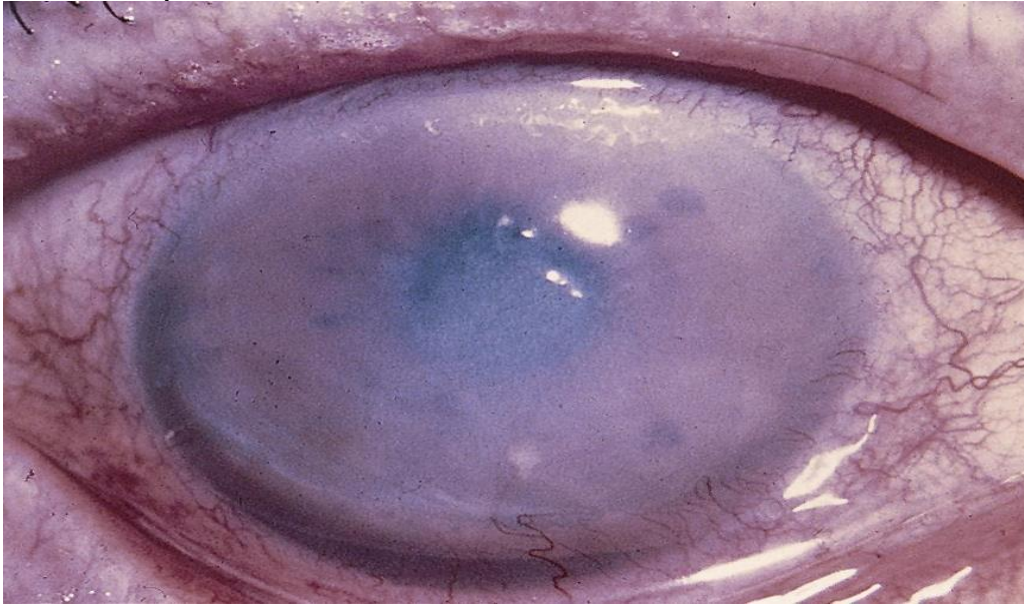
As the disease progresses, Fuchs' dystrophy symptoms usually affect both eyes and include:

- Glare, which affects vision in low light
- Blurred vision that occurs in the morning after waking and gradually improves during the day
- Distorted vision, sensitivity to light, difficulty seeing at night, and seeing halos around light at night
- Painful, tiny blisters on the surface of the cornea
- A cloudy or hazy looking cornea

The first step in treating Fuchs' dystrophy is to reduce the swelling with drops, ointments, or soft contact lenses. If you have severe disease, your eye care professional may suggest a



corneal transplant.



### **Lattice Dystrophy**

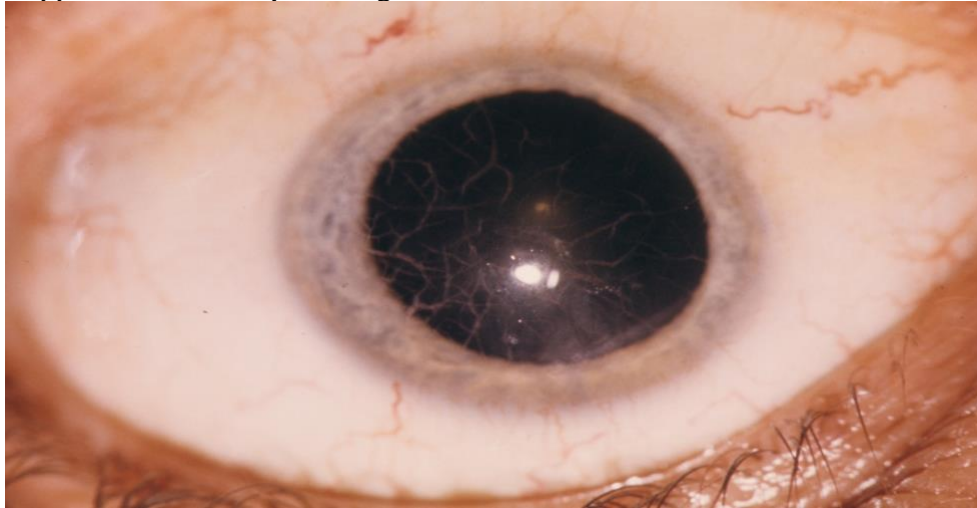
Lattice dystrophy gets its name from a characteristic lattice-like pattern of deposits in the stroma layer of the cornea. The deposits are made of amyloid, an abnormal protein fiber. Over time, the deposits increase and the lattice lines grow opaque, take over more of the stroma, and gradually converge to impair vision.

Although lattice dystrophy can occur at any time in life, it most commonly begins in childhood between the ages of 2 and 7. In some people, amyloid deposits can accumulate under the epithelium of the cornea. This can erode the epithelium, and cause a condition known as recurrent epithelial erosion. This erosion alters the cornea's normal curvature and causes temporary vision problems. It can also expose the nerves that line the cornea and cause severe pain.

To ease this pain, an eye care professional may prescribe eye drops and ointments to reduce the friction of the eyelid against the cornea. In some cases, an eye patch may be used to immobilize the eyelid. The erosions usually heal within days, although you may have some pain for the next six to eight weeks.

By age 40, some people with lattice dystrophy have scarring under the epithelium that can impact vision to such an extent that the most effective treatment will be a corneal transplant. Although the early results of corneal transplantation are typically good, lattice dystrophy may

reappear later and require long-term treatment.



### **Map-Dot-Fingerprint Dystrophy**

Map-Dot-Fingerprint dystrophy, also known as epithelial basement membrane dystrophy, occurs when the basement membrane develops abnormally and forms folds in the tissue. The folds create gray shapes that look like continents on a map. There also may be clusters of opaque dots underneath or close to the maplike patches. Less frequently, the folds form concentric lines in the central cornea that resemble small fingerprints.

Symptoms include blurred vision, pain in the morning that lessens during the day, sensitivity to light, excessive tearing, and a feeling that there's something in the eye.

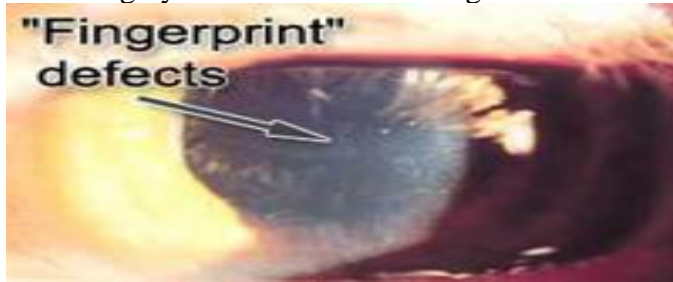
Map-dot-fingerprint dystrophy usually occurs in both eyes and affects adults between the ages of 40 and 70, although it can develop earlier in life. Typically, map-dot-fingerprint dystrophy will flare up now and then over the course of several years and then go away, without vision loss. Some people can have map-dot-fingerprint dystrophy but not experience any symptoms.

Others with the disease will develop recurring epithelial erosions, in which the epithelium's outermost layer rises slightly, exposing a small gap between the outermost layer and the rest of the cornea. These erosions alter the cornea's normal curvature and cause blurred vision. They may also expose the nerve endings that line the tissue, resulting in moderate to severe pain over several days.

The discomfort of epithelial erosions can be managed with topical lubricating eye drops and ointments. If drops or ointments don't relieve the pain and discomfort, there are outpatient surgeries including:

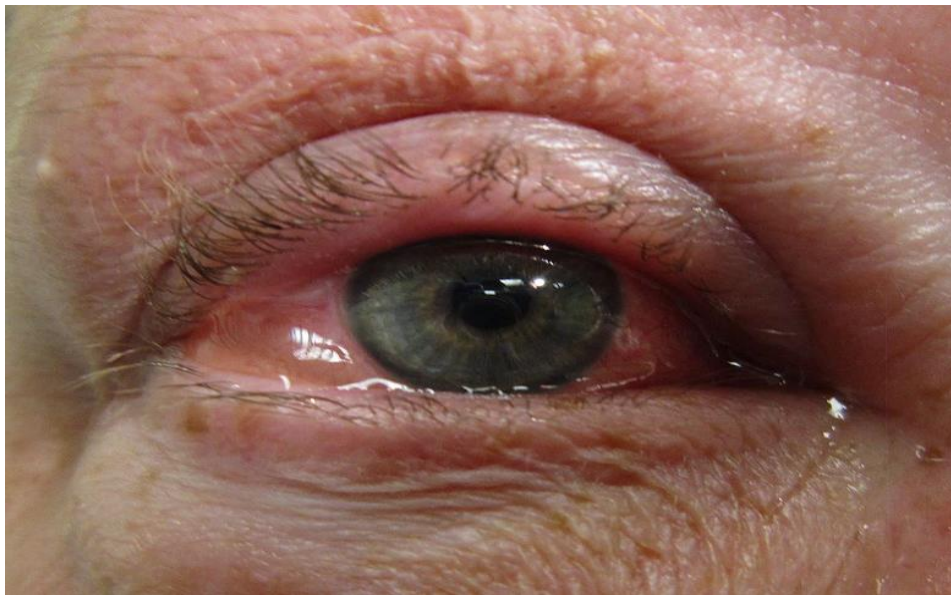
- Anterior corneal puncture, which help the cells adhere better to the tissue
- Corneal scraping to remove eroded areas of the cornea and allow healthy tissue to regrow

- Laser surgery to remove surface irregularities on the cornea



### **Herpes Zoster (Shingles)**

Shingles is a reactivation of the varicel-lazoster virus, the same virus that causes chickenpox. If you have had chickenpox, the virus can live on within your nerve cells for years after the sores have gone away. In some people, the varicel-lazoster virus reactivates later in life, travels through the nerve fibers, and emerges in the cornea. If this happens, your eye care professional may prescribe oral anti-viral treatment to reduce the risk of inflammation and scarring in the cornea. Shingles can also cause decreased sensitivity in the cornea.



## Ophthalmology/lecture 8

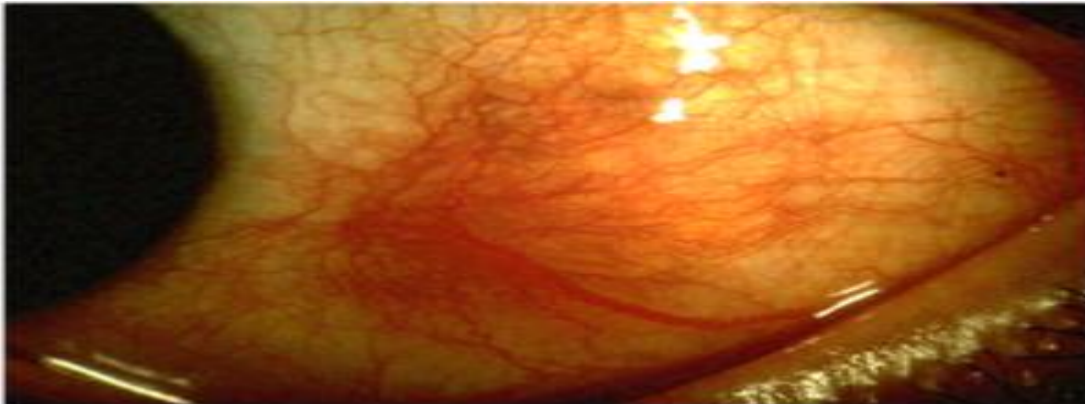
**Dr.Zena K.Khalil**

**Scleritis** is a serious inflammatory disease that affects the white outer coating of the eye, known as the sclera. The disease is often contracted through association with other diseases of the body, such as granulomatosis with polyangiitis or rheumatoid arthritis. There are three types of scleritis: diffuse scleritis (the most common), nodular scleritis, and necrotizing scleritis (the most severe).

Symptoms of scleritis include:

- Redness of the sclera and conjunctiva, sometimes changing to a purple hue
- Severe ocular pain, which may radiate to the temple or jaw. The pain is often described as deep or boring.
- Photophobia and tearing
- Decrease in visual acuity, possibly leading to blindness

The pain of episcleritis is less severe than in scleritis. In hyperemia, there is a visible increase in the blood flow to the sclera (hyperaemia), which accounts for the redness of the eye. Unlike in conjunctivitis, this redness will not move with gentle pressure to the conjunctiva. Scleritis is usually not infectious and, therefore, is not contagious. Infectious scleritis occurs primarily in eyes that have had surgery or trauma. The peak incidence of scleritis is in people aged 40-50 years old. Women are more commonly affected than men



Diagnosis : Scleritis is best detected by examining the sclera in daylight; retracting the lids helps determine the extent of involvement. Other aspects of the eye exam visual acuity testing, slit lamp examination may be normal. Other tests CT scans, MRIs, and ultrasonographies can be helpful, but do not replace the physical examination.

Treatment : In very severe cases of necrotizing scleritis, eye surgery must be performed to repair damaged corneal tissue in the eye and preserve the patient's vision. For less severe cases, nonsteroidal anti-inflammatory drugs, such as ibuprofen, are prescribed for pain relief. Scleritis

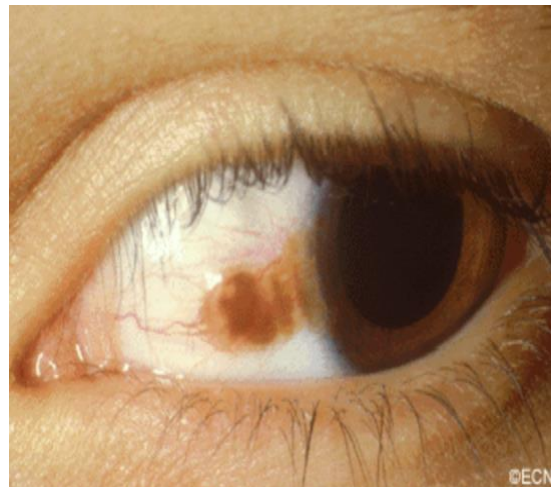
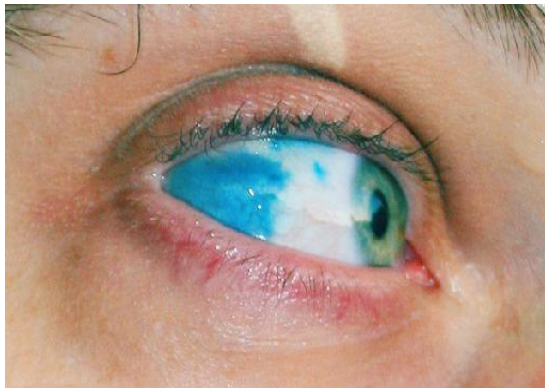
itself is treated with an oral medication containing corticosteroids and an eye solution. In some cases, antibiotics are prescribed. Simply using eye drops will not treat scleritis. In more aggressive cases of scleritis, chemotherapy (such as systemic immunosuppressive therapy with such drugs as cyclophosphamide or azathioprine) may be used to treat the disease. If not treated, scleritis can cause blindness .



### **Pigmented Abnormalities**

- **Blue sclera**
- **Melanotic**

The thinning of the sclera that can be seen in newborns and young children, can give rise to a *bluish tinge* due to the appearance of the underlying uvea and choroid through the transparent sclera. *Melanotic* pigmentation of the sclera is often seen in the pigmented races as a normal occurrence. Technically, this is not congenital, as it appears following birth. Small cuffs of melanin can be seen surrounding the vascular channels. When this normal pigmentation is associated with a neural vascular bundle it is known as an *Axentfeld's loop* .



## Ophthalmology/lecture 4

Dr.Zena K.Khalil

### Practical

#### Lens disorders:

Any disorder involving the lens of the eye. The lens of the eye focuses the light directed from the pupil onto the retina where nerves carry the images to the brain. The lens can change shape depending on the distance of the object being looked at. Examples of lens disorders includes cataracts, myopia and astigmatism

**Symptoms of Lens disorders** Vision problems ,Eye pain ,Eye pruritus ,Eye swelling

#### Causes of Types of Lens disorders:

Cataracts Diabetic lens osmosis Refractive disorders Myopia Hyperopia Astigmatism Diabetic Eye Disease

Cataract: any opacity in lens called cataract either Congenital or. Acquired  
Cong. if insult during pregnancy Developmental after birth up to adolescent age  
Particular area of lens affected, other area remain clear

#### ETIOLOGY OF CATARACT

- Hereditary; autosomal dominant
- Maternal infections; rubella, toxoplasma, CMV
- Drug induced; steroids, thalidomide



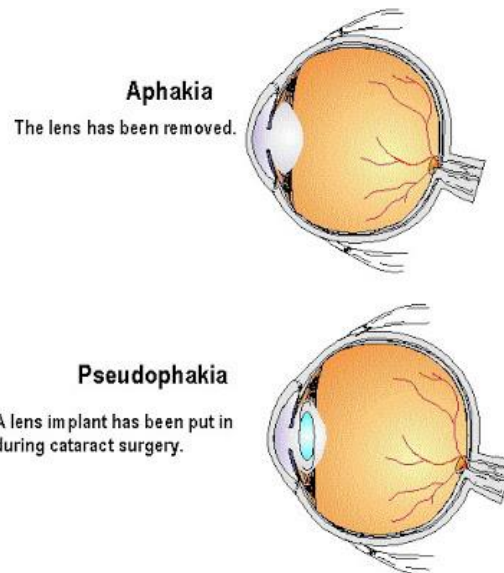
- Radiation exposure
- Metabolic disorders; galactosemia
- Birth trauma
- Malnutrition; Vit D

Types of cat . a-capsular cat. B-nuclear cat. C-cortical cat. D- Christmas tree cat .

TREATMENT OF CONG CATARACT : a-Observation: stationary opacities,visionnot affected b-Iridectomy optical;forcentral nuclear cat.c-Surgery

STAGES OF MATURATION : •Lamellar separation •Incipient cataract •Immature ataract  
•Mature cataract •Hyper mature cataract; morgagnian, sclerotic  
•Lens induced glaucoma; phacolytic , phacomorphic, phacoanaphylactic

Examination : •Visual acuity testing •Refraction •Distant direct examination  
•Iris shadow •Slit lamp examination and IOP check •Dilated fundus examination  
Aphakia :Refractive state Condition with absent lens in pupillary area ,Could be  
dislocated posteriorly



**ECTOPIA LENTIS** :•Lens not fully in its place; partially displaced from ptellar fossa,  
•Dislocation: lens totally displaced from its place.  
•Could be anterior or posterior dislocation  
•Can cause glaucoma, astigmatism, uniocular diplopia

## Ophthalmology/lecture 9

**Dr.Zena K.Khalil**

**Glaucoma** is a group of eye diseases which result in damage to the optic nerve and vision loss. The most common type is open-angle glaucoma with less common types including closed-angle glaucoma and normal-tension glaucoma. Open-angle glaucoma develops slowly over time and there is no pain Side vision may begin to decrease followed by central vision resulting in blindness if not treated.<sup>1</sup> Closed-angle glaucoma can present gradually or suddenly.<sup>1</sup> The sudden presentation may involve severe eye pain, blurred vision, mid-dilated pupil, redness of the eye, and nausea. Vision loss from glaucoma, once it has occurred, is permanen

### Signs and symptoms

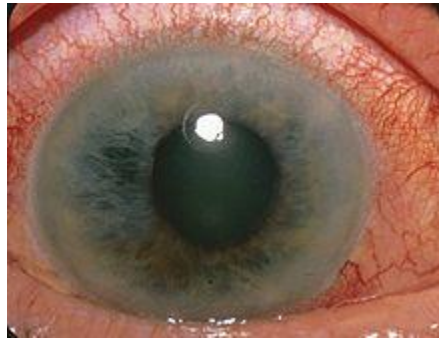


Photo showing conjunctival vessels dilated at the corneal edge (ciliary flush, circumcorneal flush) and hazy cornea characteristic of acute angle closure glaucoma

Open-angle glaucoma is painless and does not have acute attacks, thus the lack of clear symptoms make screening via regular eye check-ups important. The only signs are gradually progressive visual field loss, and optic nerve changes (increased cup-to-disc ratio on fundoscopic examination).

About 10% of people with closed angles present with acute angle closure characterized by sudden ocular pain, seeing halos around lights, red eye, very high intraocular pressure (>30 mmHg), nausea and vomiting, suddenly decreased vision, and a fixed, mid-dilated pupil. It is also associated with an oval pupil in some cases

causes of glaucoma: ocular hypertension (increased pressure within the eye) is the most important risk factor in most glaucomas, but in some populations, only 50% of people with primary open-angle glaucoma actually have elevated ocular pressure

No clear evidence indicates vitamin deficiencies cause glaucoma in humans. It follows, then, that oral vitamin supplementation is not a recommended treatment for glaucoma. Caffeine increases intraocular pressure in those with glaucoma, but does not appear to affect normal individuals



family history is a risk factor for glaucoma. The relative risk of having primary open-angle glaucoma (P.O.A.G.) is increased about two- to four-fold for people who have a sibling with glaucoma. Glaucoma, particularly primary open-angle glaucoma, is associated with mutations in several genes. Other factors can cause glaucoma, known as "secondary glaucoma", including prolonged use of steroids (steroid-induced glaucoma); conditions that severely restrict blood flow to the eye, such as severe diabetic retinopathy and central retinal vein occlusion (neovascular glaucoma); ocular trauma (angle-recession glaucoma); and inflammation of the middle layer of the pigmented vascular eye structure

Diagnosis :Screening for glaucoma is usually performed as part of a standard eye examination performed by optometrists and ophthalmologists. Testing for glaucoma should include measurements of the intraocular pressure via tonometry, anterior chamber angle examination or gonioscopy, and examination of the optic nerve to look for any visible damage to it, or change in the cup-to-disc ratio and also rim appearance and vascular change. A formal visual field test should be performed. The retinal nerve fiber layer can be assessed with imaging techniques such as optical coherence tomography, scanning laser polarimetry, and/or scanning laser ophthalmoscopy

**Primary angle closure glaucoma** is caused by contact between the iris and trabecular meshwork, which in turn obstructs outflow of the aqueous humor from the eye. This contact between iris and trabecular meshwork (TM) may gradually damage the function of the meshwork until it fails to keep pace with aqueous production, and the pressure rises. In over half of all cases, prolonged contact between iris and TM causes the formation of synechiae (effectively "scars").

These cause permanent obstruction of aqueous outflow. In some cases, pressure may rapidly build up in the eye, causing pain and redness (symptomatic, or so-called "acute" angle closure). In this situation, the vision may become blurred, and halos may be seen around bright lights. Accompanying symptoms may include a headache and vomiting.

**Primary open-angle glaucoma** is when optic nerve damage results in a progressive loss of the visual field. This is associated with increased pressure in the eye. Not all people with primary open-angle glaucoma have eye pressure that is elevated beyond normal, but decreasing the eye pressure further has been shown to stop progression even in these cases.

The increased pressure is caused by trabecular meshwork blockage. Because the microscopic passageways are blocked, the pressure builds up in the eye and causes imperceptible very gradual vision loss. Peripheral vision is affected first, but eventually the entire vision will be lost if not treated.

Treatment can involve glaucoma surgery, lasers or medication, depending on the severity. Eye drops with medication aimed at lowering IOP usually are tried first to control glaucoma.

## Ophthalmology/lecture 5

Dr.Zena K.Khalil

### Practical

**Optic Nerve Disorders** : The Optic Nerve, which contains 1.2 million fibers each, carries the neural impulses created by the retina to the brain to enable us to see. Disorders of the optic nerve are caused either by developmental (genetic or abnormal development) or acquired factors (trauma or disease). Optic nerve disorders will always impact vision in some way and can affect one or both eyes.

**Optic nerve atrophy** : is a condition that affects the optic nerve, which carries impulses from the eye to the brain. (Atrophy means to waste away or deteriorate.) The Optic Nerve will appear pale in color



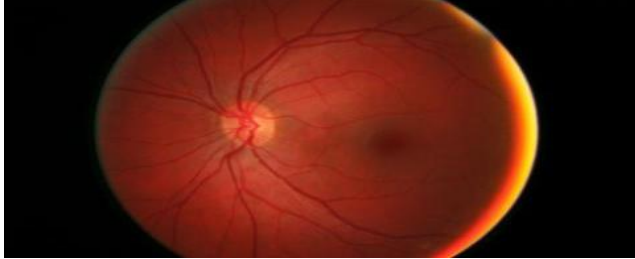
Causes :

- Glaucoma.
- Stroke of the optic nerve, known as anterior ischemic optic neuropathy.
- A tumor that is pressing on the optic nerve.
- Optic neuritis, an inflammation (swelling) of the optic nerve caused by multiple sclerosis.
- A hereditary condition in which the person experiences loss of vision first in one eye.
- Improper formation of the optic nerve, which is a congenital problem (the person is born with it).

**Optic neuritis**: is an inflammation of the nerve that can cause serious problems, including intense headaches and loss of vision.

Infections such as Lyme disease, measles and mumps can cause optic neuritis, as can other disorders, such as lupus or diabetes . Although the exact causes of

optic neuritis are incompletely understood, there is a strong association with other conditions characterized by an autoimmune response, in which the immune system attacks a person's own cells. Optic neuritis is often the first sign of the autoimmune disease multiple sclerosis (MS)



### **Symptoms and Diagnosis**

Symptoms of optic neuritis can include any of the following:

- Pain in or behind the eye, especially as the eyes move
- Vision loss or severe impairment
- Loss of color vision (faded colors)
- Flashing lights

Some of the tests and procedures that can help to establish the diagnosis include the following:

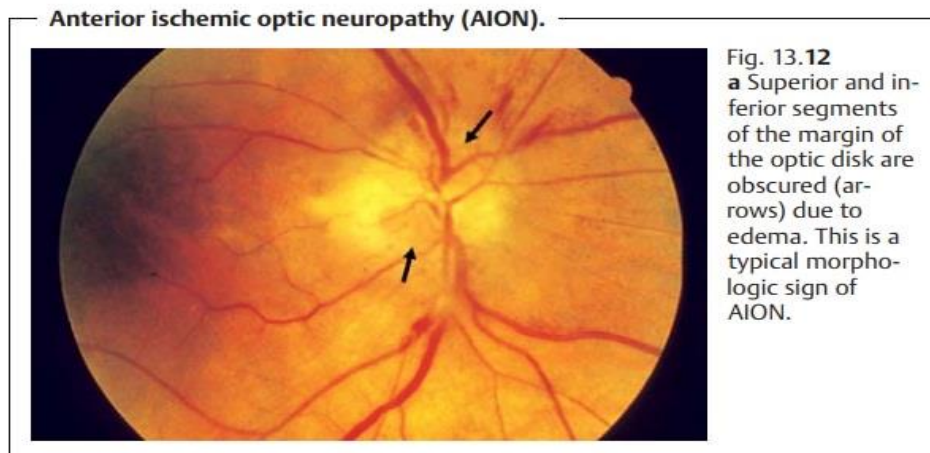
- **Eye exams** – Your doctors will evaluate how well you see, including:
  - Standard eye exam
  - Your ability to perceive colors
  - How quickly your pupils respond to a bright light (the response of the affected eye will be slower than the unaffected eye when a bright light is shined on it)

- **Magnetic resonance imaging** (MRI) of the brain and the orbits (sockets) of the eye
- **A blood test** is available to check for the presence of antibodies that are associated with neuromyelitis optica.

### Treating Optic Neuritis

Treatment of optic neuritis is directed at reducing the damaging immune response and inflammation. Generally patients are given a 3-day intravenous course of high doses of the anti-inflammatory agent prednisone. This treatment may speed the recovery of clear vision. The lower doses of steroids that are often used to reduce inflammation

**Ischemic Optic Neuropathy (ION)** : is when blood does not flow properly to your eye's optic nerve, eventually causing lasting damage to this nerve. With ION, you suddenly lose your vision in one or both of your eyes. ION is caused by swelling of arteries in your head (temporal arteritis), your ophthalmologist may have you take steroid (prednisone) pills. This medicine may prevent ION from developing in your other eye. There is no treatment to improve vision loss from ION. However, your ophthalmologist may suggest useful tools and techniques to help you see with low vision.



### Low Vision Treatment for Optic Nerve Disorders

Generally, magnification and illumination control are used to enhance visual functioning for individuals with optic nerve disorders.

**Reading :** Strong reading glasses, optical and electronic magnifiers, and software to enlarge text on computer screens can all be helpful to read.

**Illumination control :** Proper lighting that increases contrast but reduces glare can be very helpful in many circumstances. Specially tinted wrap-around sunglasses that reduce brightness but increase contrast are often helpful out of doors. These are also available in versions that fit over prescription eyewear that may also be required.

**Distance Vision :** Conventional eyeglasses, while maximizing the focus on the back of the eye, may no longer provide adequate vision for seeing at a distance. The only options are to move close or to use telescopic devices to bring things closer optically. Telescopic devices can be either handheld or spectacle mounted (bioptics). They can be very helpful to improve distance vision for TV, signs, the classroom, recognizing faces and social engagement, and even for driving.

## Ophthalmology/lecture 6

**Dr.Zena K.Khalil**

**Practical**

### **Retinal Holes and Tears**

A retinal hole is a small break or defect in the light-sensitive retina that lines the inside of the back of the eye. Retinal holes can occur anywhere in the retina. When a hole develops in the macula lutea (the most sensitive part of the central retina), it's called a macular hole.

retinal holes and tears may cause problems if they allow fluid to seep behind the retina.

**The risk of retinal holes and tears include::**

- Nearsightedness
- Eye injuries
- Cataract or certain other types of eye surgery

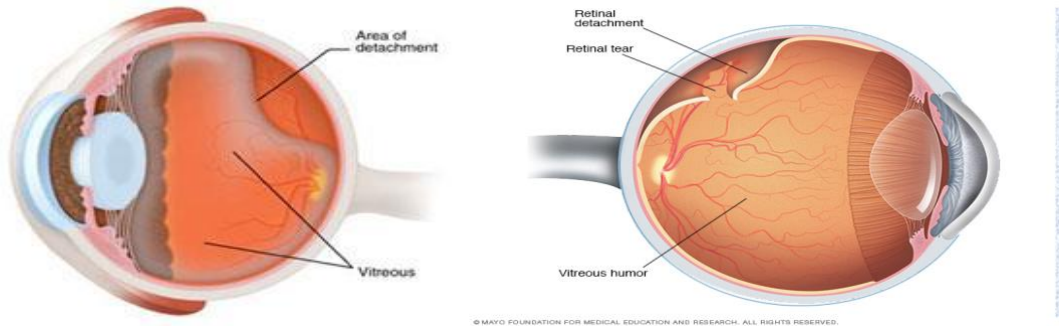
**symptoms may include:**

- Cloudy, blurry, or wavy vision
- A dark shadow in your peripheral vision

The main types of treatment are:

- Laser photocoagulation. Highly focused beams of light seal the tissue around the hole or tear. The procedure is generally quick and painless. Your eyes are dilated for this procedure. You can go home right after the procedure. Your vision may be blurred for a few hours

- Cryopexy. An instrument called a cryoprobe is used to freeze the tissue around the hole and secure it to the inside of the eyeball. You will be given local anesthesia. You can go home after the procedure. Your eye will be red for a few days after cryopexy. You may need to use eye drops
- Diathermy. This is similar to cryopexy except that heat from an electric current is applied through a needle to seal a hole or tear



**Retinal detachment** : is an emergency situation in which the retina at the back of the eye pulls away from its normal position.

Retinal detachment separates the retinal cells from the layer of blood vessels that provides oxygen and nourishment. The longer retinal detachment goes untreated, the greater your risk of permanent vision loss in the affected eye.

Warning signs of retinal detachment may include one or all of the following:

- 1- the sudden appearance of floaters and flashes
- 2-reduced vision. (peripheral) vision

**types of retinal detachment:**

- **Rhegmatogenous** These types of retinal detachments are the most common. They are caused by a hole or tear in the retina that allows fluid to pass through and collect underneath the retina, pulling the retina away from underlying tissues. The areas where the retina detaches lose their blood supply and stop working, causing you to lose vision.
- **Tractional.** This type of detachment can occur when scar tissue grows on the retina's surface, causing the retina to pull away from the back of the eye. Tractional

detachment is typically seen in people who have poorly controlled diabetes or other conditions.

- **Exudative.** In this type of detachment, fluid accumulates beneath the retina, but there are no holes or tears in the retina. Exudative detachment can be caused by age-related macular degeneration, injury to the eye, tumors or inflammatory disorders.

## Risk factors

- Aging — retinal detachment is more common in people over age 50
- Previous retinal detachment in one eye
- Family history of retinal detachment
- Extreme nearsightedness (myopia)
- Previous eye surgery, such as cataract removal
- Previous severe eye injury

**Treatment of retinal detachment:** The type of surgery your surgeon recommends will depend on several factors, including how severe the detachment is.

- **Injecting air or gas into your eye.** In this procedure, called pneumatic retinopexy, the surgeon injects a bubble of air or gas into the center part of the eye (the vitreous cavity). If positioned properly, the bubble pushes the area of the retina containing the hole or holes against the wall of the eye, stopping flow of fluid into the space behind the retina. Your doctor also uses cryopexy during the procedure to repair the retinal break.

Fluid that had collected under the retina is absorbed by itself, and the retina can then adhere to the wall of your eye. You may need to hold your head in a certain position for up to several days to keep the bubble in the proper position. The bubble eventually will reabsorb on its own.

- **Indenting the surface of your eye.** This procedure, called scleral buckling, involves the surgeon sewing (suturing) a piece of silicone material to the white of your eye (sclera) over the affected area. This procedure indents the wall of the eye and relieves some of the force caused by the vitreous tugging on the retina.

If you have several tears or holes or an extensive detachment, your surgeon may create a scleral buckle that encircles your entire eye like a belt. The buckle is placed in a way that doesn't block your vision, and it usually remains in place permanently.

- **Draining and replacing the fluid in the eye.** In this procedure, called vitrectomy .The surgeon removes the vitreous along with any tissue that is tugging on the retina. Air, gas or silicone oil is then injected into the vitreous space to help flatten the retina.

Eventually the air, gas or liquid will be absorbed, and the vitreous space will refill with body fluid. If silicone oil was used, it may be surgically removed months later.

## Ophthalmology/lecture 10

**Dr.Zena K.Khalil**

Eye injury : Physical or chemical injuries of the eye can be a serious threat to vision if not treated appropriately and in a timely fashion. The most obvious presentation of ocular (eye) injuries is redness and pain of the affected eyes. Intraocular foreign bodies do not cause pain because of the lack of nerve endings in the vitreous humour and retina that can transmit pain sensations . Sand, flying pieces of wood, metal, glass and stone are notorious for causing much of the eye trauma. Sporting balls such as cricket ball, tennis ball, squash ball, shuttlecock, and other high speed flying objects can strike the eye. The eye is also susceptible to trauma in a fistfight. The games of young children such as bow-and-arrows, firecrackers can lead to eye trauma. Road traffic accidents with head and facial trauma may also have an eye injury , shards of glasses embedded in tissues, orbital fractures, severe hematoma and penetrating open-globe injuries with prolapse of eye contents. Other causes of intraocular trauma may arise from workplace tools or even common household implements .



## Effects :

- **Closed globe injury** or **Non-penetrating trauma**: The eye globe is intact.
- **Penetrating trauma**: The globe integrity is disrupted by a full-thickness entry wound and may be associated with prolapse of the internal contents of the eye. Such injuries are often referred to as a Globe fracture or a Globe rupture
- **Perforating trauma**: The globe integrity is disrupted in two places due to an entrance and exit wound (through and through injury). This is a quite severe type of eye injury.
- **Blowout fracture of the orbit** is caused by blunt trauma, classically described for fist or ball injury, leading to fracture due to sudden increased pressure on the orbital contents.
- **Muscular Entrapment** Fracture of the orbital bones can lead to muscular entrapment limiting gaze in one direction.

## Symptoms of Eye Trauma

Symptoms of eye trauma may include:

- Pain
- Trouble seeing
- Cuts to the eyelid
- One eye not moving as well
- One eye sticks out
- Blood in the clear part of the eye
- Unusual pupil size or shape
- Something embedded in the eye
- Something under the eyelid that cannot be easily removed

Blunt trauma can cause bleeding inside the eye which is called a hyphema. The blood in the eye can cause increased pressure, which can result in permanent vision loss. This needs to be evaluated urgently and requires frequent eye drops and often daily follow up. Fractures of the bones around the eye usually occur from blunt trauma, such as a sports injury or a fall with injury to the nose and cheekbone (blow-out fracture). Fractures are often detected by x-rays or a CT scan which also help determine if tissues/muscles surrounding the eye are trapped in the fractures. These injuries often require prompt surgical treatment to prevent long-term complications such as double vision, loss of vision, and abnormal appearance.

### Treatments for Eye Trauma

Every eye injury should be given medical attention; do not touch, rub or try to remove any object in the eye. If the eye has been cut or there is an object in the eye, rest a protective shield – such as a paper cup – on the bone around your eye. Make sure there is no pressure on the eye itself. Seek immediate, professional medical attention.

In minor cases of trauma, such as a black eye from a sports injury, applying cold to the affected area can help bring swelling down, and allow the affected area to heal faster. However, even in cases where trauma seems minor, every eye injury should be given medical attention.

The best way to avoid eye trauma is to prevent it by using protective eyewear while doing things that may put them at risk. Activities include home repair, yard work, cleaning, cooking, and playing sports. In most cases of injury, people report not properly protecting their eyes – which shows that proper precautions may prevent an eye injury.

What to Do: Routine Irritations (sand, dirt, and other foreign bodies on the eye surface)

- Wash your hands thoroughly before touching the eyelids to examine or flush the eye.
- Do **not** touch, press, or rub the eye itself, and do whatever you can to keep your child from touching it (a baby can be swaddled to prevent this).
- Do **not** try to remove any foreign body except by flushing. Other methods can scratch the surface of the eye, especially the cornea.
- Tilt your child's head over a basin or sink with the affected eye down and gently pull down the lower lid. Encourage your child to open the eyes as wide as possible. For an infant or small child, it's helpful to have a second person hold the child's eyes open while you flush.

- Gently pour a steady stream of lukewarm water (do **not** heat the water) from a pitcher or faucet over the eye.
- Flush for up to 15 minutes, checking the eye every 5 minutes to see if the foreign body has been flushed out.
- Because a particle can scratch the cornea and cause an infection, the eye should be examined by a doctor if irritation continues after flushing.
- A foreign body that remains after flushing probably will require removal by a trained medical professional.

### **Embedded Foreign Body (an object penetrates or enters the globe of the eye)**

If an object, such as a piece of glass or metal, is sticking out of the eye, take the following steps:

- Call for emergency medical help or bring the child to the emergency room.
- Cover the affected eye with a small cup taped in place. The point is to keep all pressure off the eye.

Keep your child (and yourself) as calm and comfortable as possible until help arrives.

Chemical Exposure :

- Many chemicals, even those found around the house, can damage an eye. If your child gets a chemical in the eye and you know what it is, look on the product's container for an emergency number to call for instructions.
- Flush the eye (see Routine Irritations) immediately with lukewarm water for 15 to 30 minutes. If both eyes are affected, flush them in the shower.
- Call for emergency medical help.

Call your local poison control center for specific instructions. Be prepared to give the exact name of the chemical, if you have it. However, do **not** delay flushing the eye first.

**Black Eyes:** A black eye is often a minor injury. But this bruising also can be the result of a significant eye injury or head trauma. A visit to the doctor or an eye specialist might be needed to rule out serious injury, particularly if you're not sure what caused the black eye.

For a black eye:

- Apply cold compresses intermittently: 5 to 10 minutes on, 10 to 15 minutes off. If you use ice, make sure it's covered with a towel or sock to protect the delicate skin on the eyelid.
- Use cold compresses for 24 to 48 hours, then switch to applying warm compresses intermittently. This will help the body reabsorb the leakage of blood and may help reduce discoloration.

- Prop the child's head with an extra pillow at night, and encourage him or her to sleep on the uninjured side of the face (pressure can increase swelling).
- Call your doctor, who may recommend an in-depth evaluation to rule out damage to the eye and if you see any of these problems:
  - increased redness
  - drainage from the eye
  - lasting eye pain
  - any changes in vision
  - any visible abnormality of the eyeball
  - visible bleeding on the white part (sclera) of the eye, especially near the cornea

## **Ophthalmology/lecture 11**

**Dr.Zena K.Khalil**

**Common Drugs Use in Ophthalmology :** these drugs can be classified according to the Route of Administration in to A- Local which include

1- Topical 2- Intravitreous 3- Subconjunctival 4-Subtenon  
5- Retrobulbar and 6- Intracameral

B-Systemic

According to Form: 1- Solution and Suspension : Most commonly used

Advantages :Easily instilled,Less interfere to vision ,Fewer potential complications

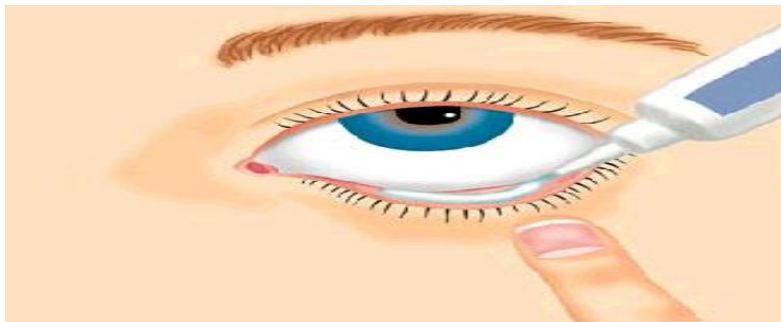
Disadvantages : Short ocular contact time ,Imprecise and inconsistent delivery

,Frequent contamination ,Possibilities of ocular injury with the dropper tip

Suspension Must be re--suspended by shaking to provide an accurate dosage of drug

2- Ointment : Consist of petrolatum and mineral oil ,this type will increase contact time but it Disturb vision

3- Gel : polymer--based aqueous gels , Drug release occurs by diffusion and by the erosion of the gel surface



### **Factors that determine the amount of medication to penetrate the cornea**

- Drug concentration , Viscosity , Lipid/water solubility , pH , Surfactants
- Reflex tearing . • Preservative

A-Anesthesia : topical /1- Cornea, conjunctiva 2-Irritate 15 sec 3-Duration 15 min used in FB removal, IOP measurement

Examples Tetracaine hydrochloride (Tetracaine) 0.5%

Benoxinate hydrochloride (Novesine) 0.4 %

Local anesthesia / as Lidocaine hydrochloride (Xylocaine) 1-2% for 1-2 h

B-Mydriatics :stimulate the dilator muscle For retinal examination , surgery

Example : Phenylephrine hydrochloride (Neosynephrine) 10% 2--3 hr.

C-Mydriatics :Inhibit constrictor m.and ciliary m. contraction

Examples : Atropine sulfate 1% for 2 wk ,Scopolamine hydrobromide 0. 25% for 3--5 days .

D-Mydriatics and Cycloplegics : Atropine sulfate ,Cyclopentolate HCl ,,

Tropicamide , Phenylephrine HCl

E-Antibiotics : there are 1- Antibacterial 2- Antiviral 3- Antifungal 4- Ant parasitic. These antibiotics used either single or combination such as Polymyxin B +Gramicidin +Neomycin .

F- Antihistamine + Vasoconstrictors / Pheniramine maleatet and Naphazoline HCl + AntazolineHCl and Tetrahydrozoline HCl

H- Corticosteroid : these are Anti—inflammation Suppress immune system and tissue reaction , Precaution in treatment of infection especially viral and fungal infection .

Side effects : Glaucoma ,Cataract, Exacerbation of infection, Ptosis ,Scleral melting

Examples /Dexamethazone 0.1% ,Prednisolone acetate 0. 5%, 1% ,Fluorometholone 0.1%

I- Artificial Tear which used as Supplement or Increase contact time or For dry eye, CL wearer

## Ophthalmology Lecture /12

Vision impairment or vision loss, is a decreased ability to see to a degree that causes problems not fixable by usual means, such as glasses. Some also include those who have a decreased ability to see because they do not have access to glasses or contact lenses. Visual impairment is often defined as a best corrected visual acuity of worse than either 20/40 or 20/60. The term blindness is used for complete or nearly complete vision loss. Visual impairment may cause people difficulties with normal daily activities such as driving, reading, socializing, and walking. The most common causes of visual impairment globally are uncorrected refractive errors (43%), cataracts (33%), and glaucoma (2%). Refractive errors include near sighted, far sighted, presbyopia, and astigmatism. Cataracts are the most common cause of blindness. Other disorders that may cause visual problems include age related macular degeneration, diabetic retinopathy, corneal clouding, childhood blindness, and a number of infections. Visual impairment can also be caused by problems in the brain due to stroke, premature birth, or trauma among others. Cataracts : cataract is responsible for >65% cases of blindness Cataracts: is the congenital and pediatric pathology that describes the opacity of the crystalline lens, which is most commonly caused by intrauterine infections, metabolic disorders, and genetically transmitted syndromes. Cataracts are the leading cause of child and adult blindness that doubles in prevalence with every ten years after the age of 40. Consequently, today cataracts are more common among adults than in children. That is, people face higher chances of developing cataracts as they age. Nonetheless, cataracts tend to have a greater financial and emotional toll upon children as they must undergo expensive diagnosis, long term rehabilitation, and visual assistance. Also, according to the Saudi Journal for Health Sciences, sometimes patients experience irreversible amblyopia after pediatric cataract surgery because the cataracts prevented the normal maturation of vision prior to operation. Despite the great progress in treatment, cataracts remain a global problem in both economically developed and developing countries.

**Glaucoma :** Glaucoma is a congenital and pediatric eye disease characterized by increased pressure within the eye or intraocular pressure (IOP). Glaucoma causes visual field loss as well as severs the optic nerve. Early diagnosis and treatment of glaucoma in patients is imperative because glaucoma is triggered by non-specific levels of IOP In addition, often pediatric glaucoma differs greatly in cause and management from the glaucoma developed by adults. Currently, the best sign of pediatric glaucoma is an IOP of 21 mm Hg or greater present within a child. One of the most common causes of pediatric glaucoma is cataract removal surgery, which leads to an incidence rate of about 12.2% among infants and 58.7% among 10-year-olds.

**Infections :** Childhood blindness can be caused by conditions related to pregnancy, such as congenital rubella syndrome and retinopathy of prematurity. Leprosy and onchocerciasis each blind approximately 1 million individuals in the developing world.

The number of individuals blind from trachoma has decreased in the past 10 years from 6 million to 1.3 million, putting it in seventh place on the list of causes of blindness worldwide.

Central corneal ulceration is also a significant cause of monocular blindness worldwide,

Eye injuries, most often occurring in people under 30, are the leading cause of monocular blindness (vision loss in one eye) throughout the United States. Injuries and cataracts affect the eye itself, while abnormalities such as optic nerve hypoplasia affect the nerve bundle that sends signals from the eye to the back of the brain, which can lead to decreased visual acuity.

Cortical blindness results from injuries to the occipital lobe of the brain that prevent the brain from correctly receiving or interpreting signals from the optic nerve. Symptoms of cortical blindness vary greatly across individuals and may be more severe in periods of exhaustion or stress. It is common for people with cortical blindness to have poorer vision later in the day.

Genetic defects : People with albinism often have vision loss to the extent that many are legally blind, though few of them actually cannot see. Leber's congenital amaurosis can cause total blindness or severe sight loss from birth or early childhood.

Poisoning :Rarely, blindness is caused by the intake of certain chemicals. A well-known example is methanol, which is only mildly toxic and minimally intoxicating, and breaks down into the substances formaldehyde and formic acid which in turn can cause blindness, an array of other health complications, and death. When competing with ethanol for metabolism, ethanol is metabolized first, and the onset of toxicity is delayed. Methanol is commonly found in methylated spirits, denatured ethyl alcohol, to avoid paying taxes on selling ethanol intended for human consumption. Methylated spirits are sometimes used by alcoholics as a desperate and cheap substitute for regular ethanol alcoholic beverages.

Other

- Amblyopia: is a category of vision loss or visual impairment that is caused by factors unrelated to refractive errors or coexisting ocular diseases. Amblyopia is the condition when a child's visual systems fail to mature normally because the child either suffers from a premature birth, measles, congenital nubella syndrome, vitamin A deficiency, or meningitis. If left untreated during childhood, amblyopia is currently incurable in adulthood because surgical treatment effectiveness changes as a child matures.<sup>[42]</sup> Consequently, amblyopia is the world's leading cause of child monocular vision loss, which is the damage or loss of vision in one eye.<sup>[41]</sup> In the best case scenario, which is very rare, properly treated amblyopia patients can regain 20/40 acuity.<sup>[41]</sup>
- Corneal opacification
- Degenerative myopia
- Diabetic retinopathy: is one of the manifestation microvascular complications of diabetes, which is characterized by blindness or reduced acuity. That is, diabetic retinopathy describes the retinal and vitreous hemorrhages or retinal capillary
- Retinitis pigmentosa



- Retinopathy of prematurity: The most common cause of blindness in infants worldwide. In its most severe form, ROP causes retinal detachment, with attendant visual loss. Treatment is aimed mainly at prevention, via laser therapy.
- Stargardt's disease
- Uveitis: refers to a complex category of ocular diseases that can cause blindness if either left untreated or improperly diagnosed. The current challenge of accurately diagnosing uveitis is that often the cause of a specific ocular inflammation is either unknown or multi-layered.<sup>[45]</sup> Consequently, about 3–10% uveitis victims in developed countries, and about 25% of victims in the developing countries, become blind from incorrect diagnosis and from ineffectual prescription of drugs, antibiotics or steroids. In addition, uveitis is a diverse category of eye diseases that are subdivided as granulomatous (or tumorous) or non-granulomatous anterior, intermediate, posterior or pan uveitis.
- Xerophthalmia, often due to vitamin A deficiency, is estimated to affect 5 million children each year; 500,000 develop active corneal involvement, and half of these go blind.

## Diagnosis

It is important that people be examined by someone specializing in low vision care prior to other rehabilitation training to rule out potential medical or surgical correction for the problem and to establish a careful baseline refraction and prescription of both normal and low vision glasses and optical aids. Only a doctor is qualified to evaluate visual functioning of a compromised visual system effectively

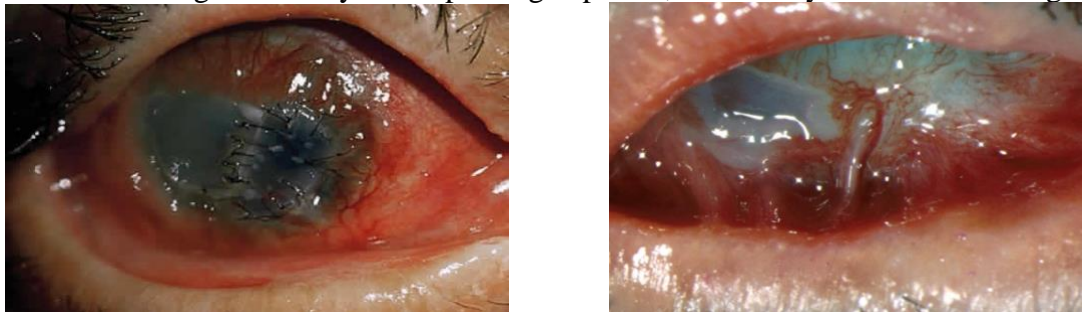
## Ophthalmology/lecture 7

Dr.Zena K.Khalil

### Practical

Burns to the Eye : The eyelids close quickly in a reflex reaction to protect the eyes from harm. However, irritating or harmful chemicals still sometimes get onto the surface of the eye, causing burns. The most dangerous chemical burns involve strong acids or alkaline, Which tend to be more serious than acid burns. Alkali substances are most commonly found in lime products, concrete, plaster and mortar, oven and drain cleaners, dishwasher detergent. Burns may involve liquids, which splash, or powdered material, which can blow into the eyes. Severe chemical burns transparent on the front surface of the eye (cornea), especially alkaline injuries, can lead to scarring, perforation of the eye, infection, and blindness.

Burns to the eye are very painful , a person tends to keep the eyelids closed. Closed eyelids keep the substance against the eye for a prolonged period, which may worsen the damage.



Chemical burns : A chemical burn of the eye is treated immediately, even before medical personnel arrive. The eye is opened and flushed with water or saline. When burns are caused by strong acids or alkali or other severely caustic substances, the eye should be irrigated continuously for at least 30 minutes . Irrigation can be continued where it began, in an ambulance, or in an emergency department. Because pain may make it difficult for the person to keep the injured eye open, another person may have to hold the eyelid open while the eye is irrigated.

A doctor or other health care practitioner can instill an anesthetic drop in the eye to make it much easier to keep the injured eye open. In an emergency department, doctors often use a special irrigating device that looks like a large contact lens. The device is placed under the eyelids and connected to a bag of sterile saline. The saline drips out of the device and irrigates the eye. After irrigation, the doctor examines the surface of the eye and the inside of the eyelid and removes any substance still embedded in the tissue. The inside of the eyelid is also swabbed to remove

any tiny particles that may not be visible. A doctor may instill a drop of a drug (such as cyclopentolate or homatropine) that dilates the pupil, relaxing the muscles of the iris and preventing them from having painful spasms. Topical antibiotics are used to lubricate the eye and prevent infection. Corticosteroid drops (such as prednisolone) may also be given by an ophthalmologist for a limited period of time.

Although anesthetic eye drops relieve pain, they may also slow healing and are usually not given after the initial irrigation. Pain can be treated with acetaminophen or, if severe, acetaminophen with oxycodone. If the cornea is burned, an antibiotic ointment is put in the eye.

Severe burns need to be treated by an ophthalmologist within 24 hours to preserve vision and prevent serious complications. In more severe burns, other topical and/or oral drugs such as vitamin C may also be used. Severe burns require frequent eye examinations. Some chemical burns are so severe that surgery is required and even with the best treatment the eye can become blind or visually impaired.

**Thermal burns :** Damage due to thermal burns occurs at the time of injury. Most commonly, the causes are boiling liquid, molten metal, flames, gasoline explosions, steam and hot tar. The extent of damage and impact on vision depend on the degree of the heat agent, area and duration of contact, as well as conductance of the tissue. If the burn is caused by a flame, the eyelashes and lids are mainly affected because of the speed of the protective blink response. When the eye is not protected, severe thermal ocular lesions are mainly associated with grade III cutaneous burns. The treatment options include a combination of local antibiotherapy, instillation of artificial tears, application of an occlusive dressing. Common complications include retractile palpebral scars.

**Radiation burns :** Sources of ultraviolet (UV) radiation are varied, and include those which are highly directional from the sun. The amount of UV radiation varies with the time of day, angle of the sun, cloud cover and changes in the reflecting surfaces. Excessive exposure to UV radiation is associated with the development of pterygia, ocular neoplasms, photokeratitis, age-related cataracts and irreversible damage to the retina. Preventive measures include wearing protective eyewear with UV-blocking tints. Infrared (IR) radiation causes superficial punctate keratitis to the cornea, which has been reported to secondarily induce an increase in intraocular pressure. When sufficient IR is absorbed by the iris, this can lead to pupillary miosis, aqueous flare (because of a breakdown in the blood aqueous barrier), hyperaemia and post synechiae. IR on the lens produces anterior subcapsular opacities which first appear as discrete "whitish dots", and can lead to a network-like whitish opacity with sufficient exposure. This does not migrate towards the equator or post capsule, but fades and disappears within six weeks. Laser IR can also cause chorioretinitis and retinal pigment epithelium thermal injury. To avoid the effects of IR on the ocular structures, protective wear, such as helmets and shields with filters, should be worn, particularly by glass blowers and steel workers. Neutral grey to yellow tints, which provide protection against most optical radiation, are recommended. Metallic oxide incorporated into glass absorbs 95% of UV and IR. Reflective filters vacuum-coated onto the front surface of the lens reflect unwanted IR.

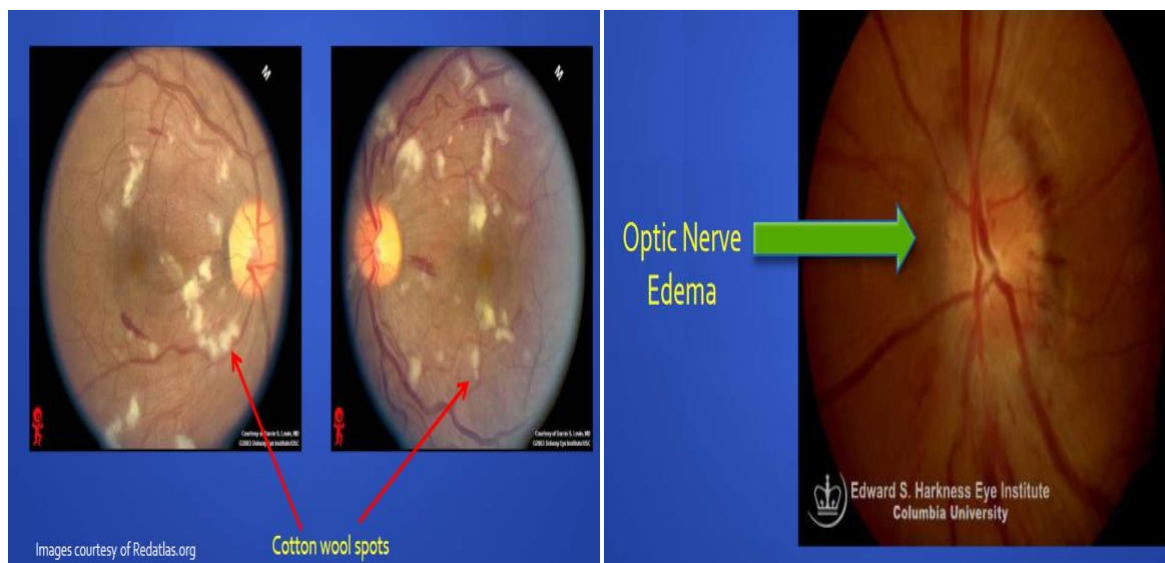
## Ophthalmology/lecture 8

Dr.Zena K.Khalil

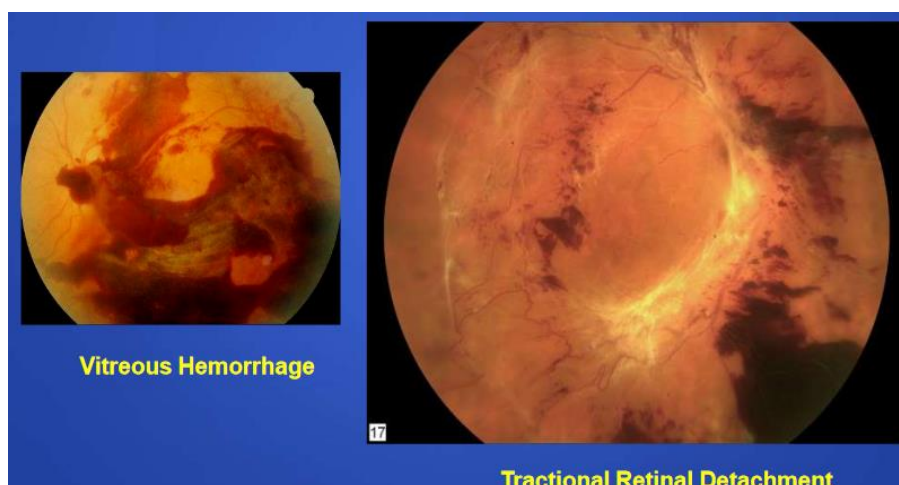
### Practical

#### Systemic disease affecting the eyes

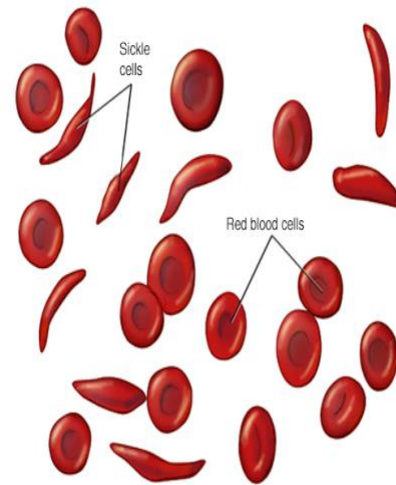
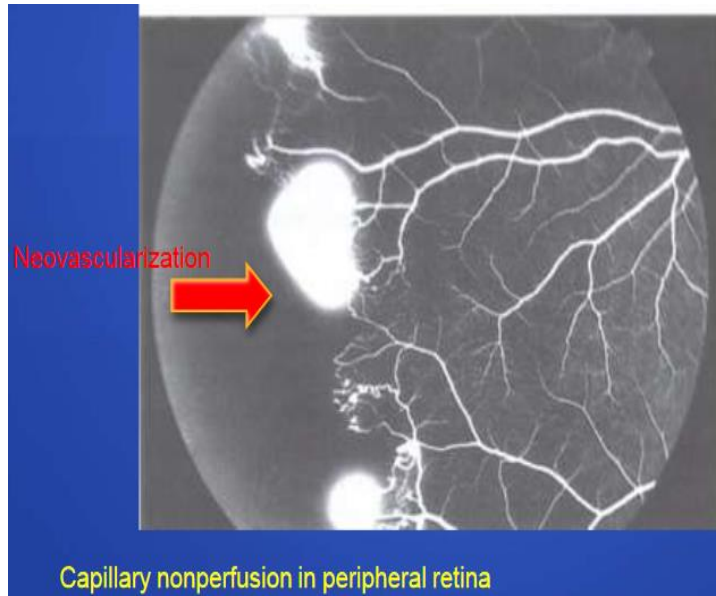
1-Hypertension : Affecting heart, kidneys, brain and eye it may cause damage to retina, choroid, and optic nerve. Ocular findings : Arteriolar narrowing ,Cotton Wool spots , Retinal hemorrhages ,Optic nerve swelling (edema) ,Retinal ischemia and neovascularization .



2-Diabetic Retinopathy : There are two types Non -Proliferative diabetic retinopathy (NPDR ) and Proliferative Diabetic Retinopathy (PDR) both of them can cause these complications Macular edema (capillary leakage) , Macular ischemia (capillary occlusion) and Sequelae from ischemia -induced neovascularization



3- Sickle Cell Disease : It is a genetic disease there is a peripheral retinal nonperfusion – ISCHEMIA = Neovascularization → Hemorrhage & Tractional Retinal Detachment, there is high risk for elevated intraocular pressure due to sickling of RBCs require aggressive medical and sometimes surgical operation needed to prevent optic nerve damage



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4- Thyroid Eye disease : The ocular findings are Proptosis (exophthalmos) ,Lid Retraction Thyroid stare ,Corneal exposure (dry eye, corneal ulcer) ,Diplopia (due to eye muscle restriction) and Optic Nerve compression (optic neuropathy)



## Ophthalmology/lecture 9

Dr.Zena K.Khalil

### Practical

#### Ocular Motility Disturbances

The term ocular motility disturbance refers to any abnormal eye alignment or difficulty in controlling eye movements.

**Strabismus** is a condition where the two eyes are not facing in the same direction. It is a relatively common condition in children and may be present at birth. However, strabismus in adults may occur as the result of brain injury (including stroke and traumatic brain injury) or injury to the eye itself, Symptoms may include: eyes that do not point in the same direction (including crossed eyes) double vision, and poor depth perception.

**Amblyopia** is a condition in which your brain fails to process the information from one of your eyes. This may occur because one of your eyes is misaligned (strabismus) and incorporating that information would cause double vision. It may also occur if one of your eyes has much better vision than the other, and the brain selects the clearer image.

**Nystagmus**, sometimes called dancing eyes, is characterized by fast, uncontrollable eye movements. This may be present at birth. In adults, it may be caused by any of the following:

- Damage to brain tissue from stroke, trauma or infection
- Certain drugs, such as the drug used to control seizures, phenytoin
- Excess alcohol intake
- Vitamin deficiency
- Diseases and conditions that affect the brain, such as brain tumors or multiple sclerosis (MS)

#### Treating Ocular Motility Disturbances

Treatment of ocular motility disorders vary based on the type of disorder and on the individual. It is extremely beneficial to catch these problems as early as possible, especially in children, so they have the best chance of regaining unimpaired vision.

For adults with strabismus, your doctor may suggest a series of steps to improve your vision:

- Glasses to correct vision
- Eye muscle exercises
- Surgery on eye muscles to correct the direction the eye points

**For adults with amblyopia, treatment would involve correcting any underlying vision problems that caused the brain to edit out the information from that eye, such as strabismus, near- or far-sightedness, and cataracts. To force the brain to recognize the information from the affected eye, eye patches and/or drops to blur the vision in the better eye help to achieve the shift to using both eyes. There are no specific treatments for nystasmus, although spontaneous recovery may occur if the underlying causes resolve.**

## Ophthalmology Lecture /13

Dr.Zena K.Khalil

**Dry eye syndrome (DES):** Our eyes need tears to stay healthy and comfortable. If your eyes do not produce enough tears, it is called dry eye. Dry eye is also when your eyes do not make the right type of tears or tear film.

**How the Tears Work :**When you blink, a film of tears spreads over the eye. This keeps the eye's surface smooth and clear. The tear film is important for good vision.

The tear film is made of three layers:

- An oily layer
- A watery layer
- A mucus layer

Each layer of the tear film serves a purpose.

**The oily layer is the outside of the tear film. It makes the tear surface smooth and keeps tears from drying up too quickly. This layer is made in the eye's meibomian glands.**

**The watery layer is the middle of the tear film. It makes up most of what we see as tears. This layer cleans the eye, washing away particles that do not belong in the eye. This layer comes from the lacrimal glands in the eyelids.**

**The mucus layer is the inner layer of the tear film. This helps spread the watery layer over the eye's surface, keeping it moist. Without mucus, tears would not stick to the eye. Mucus is made in the conjunctiva.**

Normally, our eyes constantly make tears to stay moist. If our eyes are irritated, or we cry, our eyes make a lot of tears. But, sometimes the eyes don't make enough tears if something affects one or more layers of the tear film. In those cases, we end up with dry eyes.

## Causes

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### Increased Evaporation

The most common cause of dry eye is increased evaporation of the tear film, typically as a result of Meibomian gland dysfunction.



The meibomian glands are two sets of oil glands that line the upper and lower eyelids and secrete the oily outer layer of the tear film--the lipid layer. These glands often become clogged due to inflammation caused by blepharitis , preventing an even distribution of oil. The result is an unstable lipid layer that leads to increased evaporation of the tear film.

### **Decreased tear production**

The lacrimal gland does not produce sufficient tears to keep the entire conjunctiva and cornea covered by a complete layer. This usually occurs in people who are otherwise healthy. Increased age is associated with decreased tearing.

In many cases, aqueous deficient dry eye may have no apparent cause . Other causes include congenital alacrima, xerophthalmia, lacrimal gland ablation, and sensory denervation.

In rare cases, it may be a symptom of collagen vascular diseases, including relapsing polychondritis, rheumatoid arthritis, granulomatosis with polyangiitis, and systemic lupus erythematosus. Sjögren syndrome and other autoimmune diseases are associated with aqueous tear deficiency.

Drugs such as sedatives, diuretics, tricyclic antidepressants, antihypertensives, oral contraceptives, antihistamines, nasal decongestants, atropine, and pain relieving such as morphine can cause or worsen this condition, Infiltration of the lacrimal glands by tumors, or postradiation fibrosis of the lacrimal glands can also cause this condition.

### **Additional causes**

Aging is one of the most common causes of dry eyes because tear production decreases with age. Several classes of medications have been hypothesized as a major cause of dry eye, especially in the elderly. Particularly, anticholinergic medications that also cause dry mouth are believed to promote dry eye. Dry eye may also be caused by thermal or chemical burns, or (in epidemic cases) by adenoviruses. A number of studies have found that diabetics are at increased risk for the disease.

About half of all people who wear contact lenses complain of dry eyes. There are two potential connections between contact usage and dry eye. Traditionally, it was believed that soft contact lenses, which float on the tear film that covers the cornea, absorb the tears in the eyes.

The connection between a loss in nerve sensitivity and tear production is also the subject of current research.

Dry eye also occurs or becomes worse after LASIK and other refractive surgeries, in which the corneal nerves which stimulate tear secretion are cut during the creation of a corneal flap. Dry eye caused by these procedures usually resolves after several months, but it can be permanent.

An eye injury or other problem with the eyes or eyelids, such as bulging eyes or a drooping eyelid can cause DED

Abnormalities of the mucin tear layer caused by vitamin

A deficiency, trachoma, keratoconjunctivitis, mucocutaneous disorders and certain topical medications are also causes of keratoconjunctivitis sicca.

Persons with keratoconjunctivitis sicca have elevated levels of tear nerve growth factor (NGF). It is possible that this ocular surface NGF plays an important role in ocular surface inflammation associated with dry eyes.

## Signs and symptoms

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Typical symptoms of dry eye syndrome are **dryness, burning and a sandy-gritty eye irritation** that gets worse as the day goes on. Symptoms may also be described as **itchy, stinging or tired eyes**. Other symptoms are **pain, redness, a pulling sensation, and pressure behind the eye**. There may be a **feeling that something, such as a speck of dirt, is in the eye**. The resultant damage to the **eye's surface increases discomfort and sensitivity to bright light**. Both eyes usually are affected. There may also be **a stringy discharge from the eyes**.

One may experience **excessive tearing such as if something got into the eye**. These reflex tears will not necessarily make the eyes feel better since they are the watery tears that are produced in response to injury, irritation, or emotion which lack the lubricating qualities necessary to prevent dry eye.

Because blinking coats the eye with tears, symptoms are worsened by activities in which the rate of blinking is reduced due to prolonged use of the eyes. These activities include prolonged reading, computer usage, driving, or watching television. Symptoms increase in windy, dusty or smoky (including cigarette smoke) areas, in dry environments high altitudes including airplanes, on days with low humidity, and in areas where an air conditioner (especially in a car), fan, heater, or even a hair dryer is being used. Symptoms reduce during cool, rainy, or foggy weather and in humid places, such as in the shower.

Most people who have dry eyes experience mild irritation with no long-term effects. However, if the condition is left untreated or becomes severe, it can produce complications that can cause eye damage, resulting in impaired vision or (rarely) in the loss of vision.

## Ophthalmology Lecture /14

Dr.Zena K.Khalil

**Macular degeneration**, also known as **age-related macular degeneration** (AMD or ARMD): is a medical condition which may result in blurred or no vision in the center of the visual field. Early on there are often no symptoms. Over time, some people experience a gradual worsening of vision that may affect one or both eyes. While it does not result in complete blindness, loss of central vision can make it hard to recognize faces, drive, read, or perform other activities of daily life.

Macular degeneration typically occurs in older people. Genetic factors and smoking also play a role. It is due to damage to the macula of the retina.

The severity is divided into early, intermediate, and late types. The late type is additionally divided into "dry" and "wet" forms with the dry form making up 90% of cases.

Preventive efforts include exercising, eating well, and not smoking. There is no cure or treatment that returns vision already lost. In the wet form, anti-VEGF medication injected into the eye or less commonly laser coagulation or photodynamic therapy may slow worsening.

dietary supplements may slow the progression in those who already have the disease.

In 2015 it affected 6.2 million people globally. In 2013 it was the fourth most common cause of blindness after cataracts, preterm birth, and glaucoma. It most commonly occurs in people over the age of fifty and the most common cause of vision loss in this age group. About 0.4% of people between 50 and 60 have the disease, while it occurs in 0.7% of people 60 to 70, 2.3% of those 70 to 80, and nearly 12% of people over 80 years old.

### Signs and symptoms

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Normal vision



The same view with age-related macular degeneration

### Signs and symptoms of macular degeneration include:

- **Distorted vision** in the form of **metamorphopsia**, in which a grid of straight lines appears wavy and parts of the grid may appear blank: Patients often first notice this when looking at things like miniblinds in their home or telephone poles while driving. There may also be central **scotomas**, shadows or missing areas of vision
- Slow recovery of visual function after exposure to bright light (**photostress test**)
- Visual acuity decreasing (two levels or more), e.g.: 20/20 to 20/80
- Blurred vision: Those with non exudative macular degeneration may be asymptomatic or notice a gradual loss of central vision, whereas those with exudative macular degeneration often notice a rapid onset of vision loss (often caused by leakage and bleeding of abnormal blood vessels).
- Trouble discerning colors, specifically dark ones from dark ones and light ones from light ones

Macular degeneration by itself will not lead to total blindness. For that matter, only a small number of people with visual impairment are totally blind. In almost all cases, some vision remains, mainly peripheral. Other complicating conditions may lead to such an acute condition (severe stroke or trauma, untreated **glaucoma**, etc.), but few macular degeneration patients experience total visual loss.

The area of the macula comprises only about 2.1% of the retina, and the remaining 97.9% (the peripheral field) remains unaffected by the disease. Even

though the macula provides such a small fraction of the visual field, almost half of the visual cortex is devoted to processing macular information.

The loss of central vision profoundly affects visual functioning. It is quite difficult, for example, to read without central vision. Pictures that attempt to depict the central visual loss of macular degeneration with a black spot do not do justice to the devastating nature of the visual loss. This can be demonstrated by printing letters six inches high on a piece of paper and attempting to identify them while looking straight ahead and holding the paper slightly to the side. Most people find this difficult to do.

In addition, people with dry macular degeneration often do not experience any symptoms but can experience gradual onset of blurry vision in one or both eyes.

## Risk factors

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### Environment and lifestyle

**Smoking:** Smoking tobacco increases the risk of AMD by two to three times that of someone who has never smoked, and may be the most important modifiable factor in its prevention

**Hypertension** ([high blood pressure](#))

### Atherosclerosis

- **High cholesterol:** Elevated cholesterol may increase the risk of AMD
- **Obesity:** Abdominal [obesity](#) is a risk factor, especially among men
- **Fat intake:** Consuming high amounts of certain fats, including [saturated fats](#), [trans fats](#), and [omega-6 fatty acids](#),
- **Exposure to UV light :** from sunlight has been associated with an increased risk of developing AMD
- **Digital screen :** staring at the screen for a long time without pauses does increase [eye strain](#).

### Stages

In AMD there is a progressive accumulation of characteristic yellow deposits, called [drusen](#) (buildup of extracellular proteins and lipids), in the [macula](#) (a part of the retina), between the [retinal pigment epithelium](#) and the underlying [choroid](#). This accumulation is believed to damage the retina over time

#### Early AMD

Early AMD is diagnosed based on the presence of medium-sized drusen, about the width of an average human hair. Early AMD is usually asymptomatic.

#### Intermediate AMD

Intermediate AMD is diagnosed by large drusen and/or any retinal pigment abnormalities. Intermediate AMD may cause some vision loss, but, like early AMD, it is usually asymptomatic.

#### Late AMD

In late AMD, enough retinal damage occurs that, in addition to drusen, people will also begin to experience symptomatic central vision loss. The damage can either be the development of atrophy or the onset of neovascular disease. Late AMD is further divided into two subtypes based on the types of damage: Geographic atrophy and Wet AMD (also called Neovascular AMD).

### Dry AMD

Dry AMD (also called nonexudative AMD) is a broad designation, encompassing all forms of AMD that are not neovascular (wet AMD). Dry AMD patients tend to have minimal symptoms in the earlier stages; visual function loss occurs more often if the condition advances to geographic atrophy. Dry AMD accounts for 80–90% of cases and tends to progress slowly. In 10–20% of people, dry AMD progresses to the wet type.

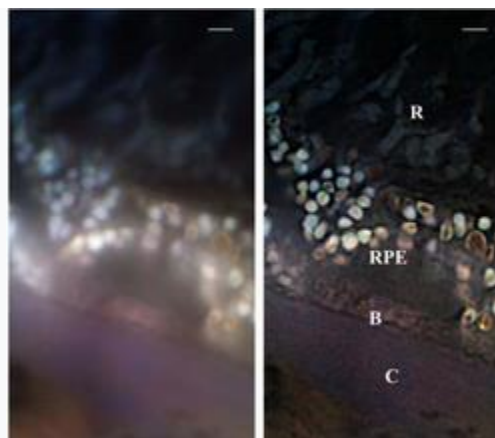
### Wet AMD

Neovascular or exudative AMD, the "wet" form of advanced AMD, causes vision loss due to abnormal blood vessel growth (choroidal neovascularization) in the choriocapillaris

### Geographic atrophy

also called atrophic AMD is an advanced form of AMD in which progressive and irreversible loss of retinal cells leads to a loss of visual function. There are multiple layers that make up the retina, and in geographic atrophy, there are three specific layers that undergo atrophy: the choriocapillaris, retinal pigment epithelium, and the overlying photoreceptors.

## Diagnosis



Super resolution microscopic investigation of human eye tissue affected by AMD

Diagnosis of age-related macular degeneration depends on signs in the [macula](#), not necessarily vision. Wet AMD is typically the advanced progression of dry AMD and will require additional diagnostic tools. Additionally, early diagnosis of wet AMD

Diagnosis of dry (or early stage) AMD may include the following clinical examinations as well as procedures and tests:

- The transition from dry to wet AMD can happen rapidly, and if it is left untreated can lead to legal blindness in as little as six months. To prevent this from occurring and to initiate preventive strategies earlier in the disease process, dark adaptation testing may be performed. A dark adaptometer can detect subclinical AMD at least three years earlier than it is clinically evident.
  - There is a loss of contrast sensitivity, so that contours, shadows, and color vision are less vivid. The loss in contrast sensitivity can be quickly and easily measured by a **contrast sensitivity** test
  - In dry macular degeneration, which occurs in 85–90 percent of AMD cases, drusen spots can be seen in **Fundus photography**
  - Using an **electroretinogram**, points in the macula with a weak or absent response compared to a normal eye may be found
  - **Optical coherence tomography** is now used by most ophthalmologists
- **Management**
- 
- Treatment of AMD varies depending on the category of the disease at the time of diagnosis. In general, treatment is aimed at slowing down the progression of AMD. As of 2018, there are no treatments to reverse the effects of AMD. Early-stage and intermediate-stage AMD is managed by modifying known risk factors such as smoking and atherosclerosis and making dietary modifications. For intermediate-stage AMD, management also includes **antioxidant** and **mineral** supplementation. Advanced-stage AMD is managed based on the presence of **choroidal neovascularization** (CNV): dry AMD (no CNV present) or wet AMD (CNV present). No effective treatments exist for dry AMD. The CNV present in wet AMD is managed with vascular endothelial growth factor (**VEGF**) inhibitors.