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2nd Edition

ADULT HEALTH NURSING-II

MEDICAL SURGICAL NURSING

Semester IV

As per the Revised INC Syllabus for BSc Nursing

MJ Kumari

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Unit 2

Nursing Management of Patient with Disorder of Eye

UNIT OUTLINE

- Review of Anatomy Physiology of the Eye
- History, Physical Assessment, Diagnostic Assessment
- Eye Disorders
- Refractive Errors
- Eyelids—Infection, Deformities
- Conjunctiva—Inflammation and Infection Bleeding
- Cornea—Inflammation and Infection
- Lens—Cataract
- Glaucoma
- Retinal Detachment
- Blindness
- Eye Banking, Eye Donation

REVIEW OF ANATOMY AND PHYSIOLOGY OF THE EYE

Vision is the one of the significance senses in human being. Eyes are primary vital organ for vision. Eyeballs are positioned in the orbital cavity. Eye occupy one-fifth of the space in the orbital volume and remaining space occupy by the blood vessels, extraocular muscles, fat, fascia, nerves and the lacrimal gland **(Figs. 2.1 and 2.2)**.

The Eyelids are a thin folding layer of skin situated over the eye. It primary function to covers and protects the eye. It comprises a row of eyelashes, which is act as shield to protect the eye from outside foreign bodies, dust particles, and perspiration. There are two important activities happen to protect the eye which are squinting and blinking. Squinting is closing the eye partially, shields the eye from excessive light, that can damage the internal structure such as the retina. Blinking is closing and opening the eye rapidly, spreads tears across eye and removes irritants from the cornea and conjunctiva. The eyelid contains several different types of glands including sebaceous glands, sweat glands, tear glands, and meibomian glands. The eyelids are known as the palpebrae.

The Eyelashes are the short stiff hairs, grow sideways the edge of the eyelids. It safe guard the eye from irritants and dust. In fact, it is act as the first line of defense protect

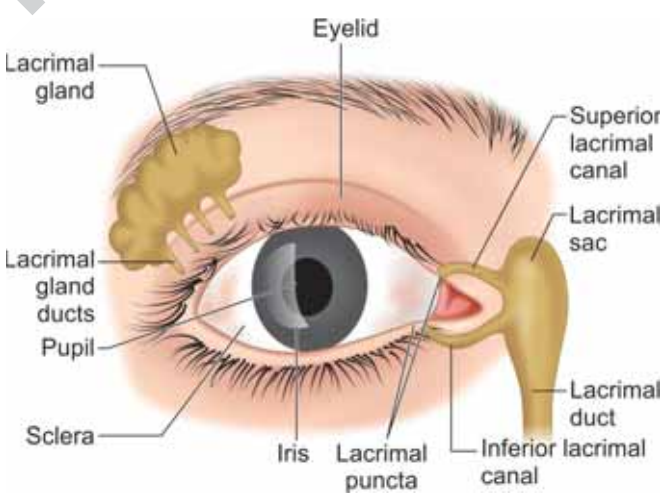


Fig. 2.1: External view of eye.

the eye from foreign objects ranging from pollen to a flying insect, wind, rain, and sunlight. The root of each eyelash is anchored to the root hair plexus, which transmit the impulses to the brain for blink immediately to the protective response. Eyelashes are linked to a network of capillaries and glands to aid in lubrication, nutrition and microbe defense.

Human sclera is white in color, it is basically the extension of the cornea backward, the collagen fibers of

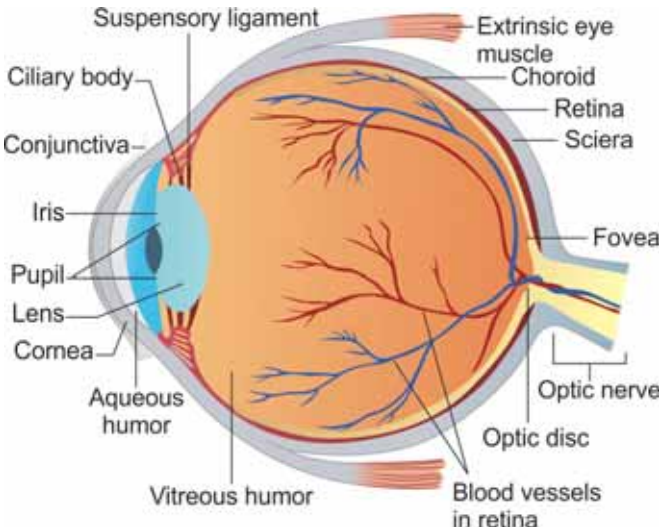


Fig. 2.2: Cross section of eye.

the cornea being, in effect, continuous with those of the sclera. It is an elastic, opaque, and resilient tissue of the eye. The sclera's main function is to safe guard the eye and maintain the shape of the eye ball. The sclera's white color appearance because of the scattering of all wavelengths of light by dense irregular bundles of collagen in sclera. In children, a bluish hue is observed because of the very thin sclera which allows the visibility of underlying choroid. In older age the sclera may appear slightly yellowish because of the deposition of fat. Sclera is thicker in males than in females. Sclera is thickest near the optic nerve, where it is approximately 1 mm in thickness and thinnest at the insertion of extra ocular muscles (0.3 mm).

Conjunctiva is a semi-transparent, thin mucous membrane, which is covers the inner surface of the eyelid and the white part of the eyeball. It covers the sclera and lines the inner surface of the eyelids. It is safe guarding and lubricating the eye by the production of mucus and tears. It prevents microbial entrance into the eye and plays a role in immune surveillance. It lines the inside of the eyelids and provides a covering to the sclera. Conjunctiva is divided into palpebral conjunctiva, fornices, and bulbar conjunctiva. This outermost layer covers the retina.

Cornea: It is a transparent tissue and an avascular. It is significant element of the ocular refractive system. It consists of five layers, three cellular layers comprising of epithelium, stroma, and endothelium and two interface layers consisting of Bowman's membrane and Descemet's membrane and it is continuous with the Sclera. The cornea acts as the eye's outermost lens. Its clarity is very essential to perform visual function. It acts like a window, which is controls and focuses the entry of light into the eye. The cornea contributes between 65–75% of the eye's total focusing power.

Tear gland is situated in the anterior position of the upper outer aspect of the orbit cavity of the eyeball, it is approximately 2 cm in length and an almond shape. It is continuously secreting watery, isotonic tear fluid on the surface of the eyeball, tear fluid otherwise known as lacrimal fluid. It is a secretes into the lateral aspect of the superior conjunctival fornix through the lacrimal ducts. It is forming multilayered tear film to lubricates, protects and supply nutrients to the conjunctiva and cornea. Lacrimal fluid drains via a duct into the nasal cavity. During emotion, lacrimal fluid secretes excess amount forms tears. It is containing salts and bacterial enzymes. It is act as lubrication in the conjunctiva to decrease friction between the eyeball and the eyelids, it is wash out the foreign particles, irritants, and chemical agents from the conjunctiva, it is preventing the dryness of the eyes. The tear film allows atmospheric oxygen to dissolve and diffuse into the cornea.

Iris is a circular in shape, and situated in front of the lens and behind the cornea and aqueous humor. It is main function to protect the internal organ of the eye. It is made up of a melanin pigmented muscular tissue layer, it is providing color to the eye such as brown, green, blue, etc. If a person has less melanin, it means the eye color appears light. If a person has more Melanin, this means the eye color appears darker. The iris vital function to regulate the amount of light enter into the retina in the back of the eye by increase or decrease the diameter of the pupil, dilation and constriction activity with the help of the involuntary circular and the radial muscles. If light is low cause dilate to maximize the available visual information, and if the light is very bright out, it constricts to prevent overwhelming the visual sensory apparatus. It has two sets of involuntary muscles: the Circular and the Radial Muscles which control the diameter of the Pupil.

The **Pupil** is an opening at the center of the iris that permits light to enter the eye. Increasing brightness causes pupillary constriction (miosis) while increasing darkness causes pupillary dilation (mydriasis). Pupillary abnormalities can be caused by a variety of conditions. Isocoria means that the pupils of both eyes are the same size. Generally, the normal size of a pupil is 2–4 mm in diameter in bright light and 4–8 mm in diameter in dim light.

The **choroid** is situated in middle between the sclera and the retina, it is highly the vascular layer of the eye. It is supplying oxygen and nutrients to the outer surface of the retina. The choroid is thickest in the back of the eye, it is approximately 0.2 mm, and narrows to 0.1 mm in the peripheral part of the eye. It contains the retinal pigmented

epithelial cells. The choroid forms the uveal tract, that is includes the iris and the ciliary body. The choroidal circulation, which accounts for 85% of the total blood flow in the eye.

Anterior chamber is otherwise called as anterior cavity. It is situated behind the cornea and in front of the iris. The cornea is the outer, transparent, dome-like structure that covers the iris, pupil, and the anterior chamber. It is filled with fluid called aqueous humor.

The aqueous humor is a transparent watery fluid and it is circulating in the anterior chamber. It is formed by the ciliary body. It is circulating into the posterior chamber, between the lens and iris and then flows forward through the pupil into the anterior chamber of the eye. It supplies oxygen and nutrients to the inner eye and exerts fluid pressure that helps maintain the shape of the eye.

The posterior chamber is a bigger area than the anterior chamber. The space is situating in front of the lens and behind the iris in the eye. Vitreous humor is filled in the posterior chamber. The posterior chamber is also referred to as the vitreous body as indicated in the diagram below—anatomy of the eye.

Vitreous humor: The vitreous chamber is positioned at the back of the eyeball. It is filled by the vitreous humor. It is colorless, transparent, clear, jelly-like fluid in the space between the retina and lens of the eye. It is the largest of the chambers and takes up around 80% of the eye. It consists of water and the rest is a mixture of collagen, proteins, salts and sugars. It exerts fluid pressure that keeps the retina layers pressed together to maintain the shape of the eye and to maintain sharp focus of images on the retina.

Ciliary muscles and ciliary body: The ciliary muscles are located inside the ciliary body. The ciliary body is a circular structure that is an extension of the iris, the colored part of the eye. The ciliary body produces the fluid in the eye called aqueous humor. It also contains the ciliary muscle, which continuously change the shape of the lens for near and distant vision. The suspensory ligaments or zonule is a ring of small fibers that hold the lens suspended in place. It connects the lens to the ciliary body and allows the lens to change shape.

The lens is a curved structure in the eye. It is located directly behind the iris. It is a biconvex transparent disc made of proteins called crystalline. It bends light and focuses in the retina to help see images clearly. The crystalline lens, a clear disk behind the iris, is flexible and changes shape to help see objects at varying distances.

The retina is the innermost layer, it is light sensitive portion of the eye. It is containing of nervous tissue that covers the inside of the back two-thirds of the eyeball. The retina contains photo receptors, it helps to sense light. These photo receptors are named as cones and rods. Cones helps to detect color and rods help to see in poor light. The retina contains nerve cells that transmit signals from the retina to the brain.

The fovea is a small depression in the retina near the optic disc. The fovea has a high concentration of cones. It is the part of the retina where visual acuity is greatest.

The optic nerve is situated behind the eyeball. It containing the axons of retina ganglion cell and it conducts impulses from the retina to the brain.

Optic disc is transmitting the impulses to the brain through the optic disc in the eye ball. It is called the blind spot because it contains no photoreceptors, hence any light that falls on it will not be detected.

Eye muscles are very strong and efficient, it is function together to move the eyeball in different directions. The main muscles of the eye are lateral rectus, medial rectus, superior rectus and inferior rectus.

The central artery and vein runs through the center of the optic nerve. The central artery supplies the retina while the central vein drains the retina.

HISTORY, PHYSICAL ASSESSMENT, DIAGNOSTIC ASSESSMENT

History Collection Related to Eye Disorders

- Collect information related to their personal and demographic data, present complaints for hospital visit, past history of eye problems, duration of the problems, medical history like diabetes, hypertension, heart diseases and respiratory problems, family history any eye disease like glaucoma, retinoblastoma or congenital eye diseases, diabetes and hypertension.
- Taking any medication medications. Any drug allergy, occupational history, exposure of pollutions and contact with infected person, and social history like smoking, and alcohol intake amount, duration and type.
- Collect detail present problems, its onset, duration, develops sudden or gradually, progress of problems, severity, problem with one eye or both eyes, any relevant associated symptoms, any similar problems in the past, and previous medical advice and any current medication.
- Collect information related to signs and symptoms like eye redness, sore, painful eye, watery discharge, any history of eye injury, any problem in vision, decreased distance vision in one or both eyes, vision problem develops suddenly or gradually. Ask about the ability to read the newspapers, any problem in near sight and

long sight. Any other specific eye symptom, such as double vision, swelling of an eyelid, watering or squint.
- Ask about past history of same eye problems, such as herpes simplex keratitis, allergic conjunctivitis, uveitis and recurrent corneal erosions, history of recurrence.
- History of same problems in the other eye is important in bilateral conditions such as uveitis, cataract.
- History of past injury in the eye, collect information related to occurrence of conditions such as cataract and retinal detachment.
- History of any eye surgery such as cataract extraction, muscle surgery, glaucoma, and retinal surgery, and any postoperative complication.
- For children, ask about vaccination history and the birth history like preterm, and birth injury.

Examination of Eye

- External examination of eye—iris, pupil, lens, and Intraocular pressure (IOP)
- Fundus examination
- Visual field examination

Examination of Iris

- Color of iris is light blue or green color, or dark brown. Heterochromia iridium is each iris in different color to one another.
- Iris color lighter than normal due to congenital heterochromia, atrophic patches in chronic uveitis, metastatic carcinoma.
- Iris color darker than normal due to iris nevi—appear as freckles, siderosis bulbi or ocular siderosis is due to chronic retention of an iron containing intraocular foreign body, lead pigmentary, degenerative process of the eye. Ocular melanocytosis is darkness of the iris sclera, and fundus due to excess melanocytes, hemosiderosis is form of iron overload disorder due to accumulation of hemosiderin in iris, malignant melanoma of iris, and lymphoma.
- Iris pattern occurs due to presence of collarette, crypts and radial striations on its anterior surface. It is disturbed in: (i) Acute iridocyclitis—muddy iris and (ii) Healed iridocyclitis—atrophy of iris. Persistent pupillary membrane is seen as abnormal congenital tags of iris tissue adherent to the collarette area.
- Nodules on the iris surface present due to granulomatous uveitis, melanoma, tuberculoma and gumma of iris.
- Rubeosis iridis due to new vessel formation on the iris caused by diabetic retinopathy, central retinal vein occlusion, chronic uveitis, chronic retinal detachment, retinoblastoma.
- Gap or hole present in the iris due to congenital coloboma or due to iridectomy (surgical coloboma).

Examination of Pupil

- Normally one pupil almost center of the iris, slightly nasal, size 3–4 mm depending upon illumination rarely more than one pupil (polycoria) by congenitally eccentric (corectopia). It abnormally very small (miosis) or abnormally large (mydriasis) anisocoria—it is a condition where there is difference between the size of two pupils.
- Normally circular shape, irregular narrow due to iridocyclitis. Festooned due to effect of mydriatics on posterior segment synechiae. Vertically oval/pear shaped/up drawn may be seen in postoperatively due to incarceration of iris or vitreous in the wound at 12 o'clock position.
- Normal color of pupil is greyish black.
- Aphakia (absence of lens in one or both eyes) jet black color.
- Immature senile cortical cataract—greyish white.
- Mature cortical cataract—pearly white.
- Hypermature cataract—milky white.
- Cataracta brunescens—brown.
- Cataracta nigra—brownish black.
- Leukocoria—white reflex in pupil.
- Glaucoma—greenish hue.
- Iridocyclitis—dirty white exudates.
- Pupil reacts briskly and constricts in direct light. Abnormal pupillary reactions are appear
  - Amaurotic pupil—focus direct light on both the eyes pupil reflex will be absent when light is focus in the affected eye. It occurs due to a lesion present in optic nerve and it may cause complete blindness of affected eye **(Fig. 2.3)**.
  - Efferent pathway defect—normally both eyes are reacted to light in same way. In efferent pathway defect cause damage pupil's ability to respond to light. Because the efferent pathway is sends signals from the brain to the eye muscles, to contract or relax. It results one eye may have a different or abnormal reaction.
  - Wernicke's hemianopic pupil—it occurs due to lesion of the optic tract. Light reflex is absent when light is thrown on temporal half of the retina of affected side and nasal half on the opposite side, light reflex is present when the light is thrown on nasal half of affected side and temporal half of opposite side.
  - Marcus gunn pupil—it occurs due to relative afferent pupillary defect by incomplete optic nerve lesion and severe retinal disease, when light is move from

In normal eye—contralateral pupil constrict

Contralateral pupil not constricted—in blind eye

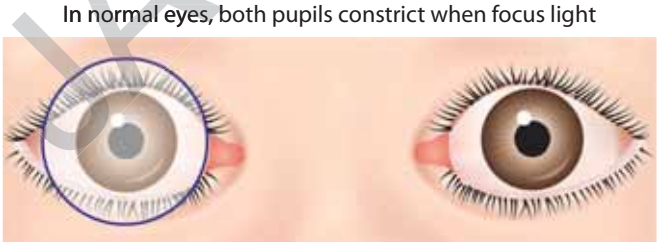
Fig. 2.3: Amaurotic pupil.

normal to abnormal eye, the affected pupil will dilate **(Fig. 2.4)**.

- Argyll Robertson pupil—bilateral small pupils which reduce in size on a near object, but do not constrict when exposed to bright light **(Fig. 2.5)**.
- Tonic pupil—it is pupil with slow and long-lasting construction to the light and near vision.

- **Examination of lens: Before perform lens examination dilate the pupils.** It done by using oblique illumination, slit-lamp biomicroscopy and distant direct ophthalmoscopy with fully dilated pupils. It is biconvex structure and clear color. Cataract lens appear opacity of the lens. Dislocation of lens is not present in its normal position it may be anterior dislocation—present in anterior chamber or posterior dislocation—

In normal eyes, both pupils constrict when focus light



Both pupils are dilating when light swung to the affect eye

Fig. 2.4: Marcus gunn pupil.

When, Argyll Robertson pupil is smaller than normal, pupils are smaller than normal, they do not constrict when exposed to light.

When, Argyll Robertson pupils constrict when focused on a near object

Fig. 2.5: Argyll Robertson pupil.

present in vitreous cavity either floating or fixed to the retina. Subluxation of lens is partially displaced from its position causes by trauma.

- **Intraocular pressure** measured by tonometry, normal IOP = 10–21 mm Hg, IOP <10 mm Hg means hypotony causes by ruptured globe, retinal/choroidal detachment, postoperative wound leak and IOP >21 mm Hg indicates glaucoma.
- **Fundus examination** useful to diagnose disorders of vitreous, optic nerve head, retina and choroid. Before perform the fundus examination, dilate the pupils by using 5% phenylephrine or 1% tropicamide eye drops.
- **Visual field examination:** Perimeters used to measure the field of vision. An individual's visual field measure by computer programed automated perimetry also. The patient will sit and look into a dome-shaped instrument. Inform the patient to look at an object in the middle of the dome throughout the test. There will be small flashes of light on the dome. The patient visual field map provide by the computer program after the test for each eye individually and it find blind spots (scotomas), optic nerve damage in glaucoma, central and peripheral retinal diseases, eyelid disorder in ptosis, and damage of visual pathways in brain (occipital cortex).
- **Corneal topography:** it helps to find the problems in corn like swelling, scarring, astigmatism, keratoconus. It is computerized test provide maps the curve of the cornea surface. It is very use test before surgery like cornea transplant, or a contact lens fitting.
- **Fluorescein angiogram:** Fluorescein is administered intravenously before the test. The blood vessel observes this dye and show the clear pathological changes inside the eye while doing the examination with help of special

filters to highlight the dye in the camera and take picture of the dye as it goes through the blood vessels in the back of the eye.

- **This test is useful** for studying and observing how blood moves in the retina. It helps diagnose diabetic retinopathy, retinal detachment, and macular degeneration, as well as circulation problems, swelling, leaking, and abnormal blood vessels.
- **Slit lamp examination:** The patient will sit in front of the instrument on the examination chair; inform the patient to keep their chin and forehead in the slit lamp appropriate place. A low-powered microscope, with a slit lamp, which is a high-intensity light use to examine the eyelids, conjunctiva, iris, lens, sclera, cornea, retina, optic nerve. They will look closely at the eyes. First examine the front areas of the eye and then perform the exam again with a different lens to examine the back of the eye. Eyes may be sensitive to light for a while afterward, especially if the pupils were dilated.
- **Visual acuity (VA):** It helps to provide a baseline recording of visual acuity, refractive error, any changes in vision, to measure the outcomes of cataract or other surgery. It is uses to measure of the ability of the eye to distinguish shapes and the details of objects at a given distance. The patient will be asked to remove glasses or contact lenses if used and stand or sit 20 feet (6 meters) from the eye chart. The patient will be asked to cover one eye with the palm of the hand, or a small paddle while read out loud the smallest line of letters the patient can see on the chart. Numbers, lines, or pictures are used for people who cannot read, especially children **(Fig. 2.6)**.

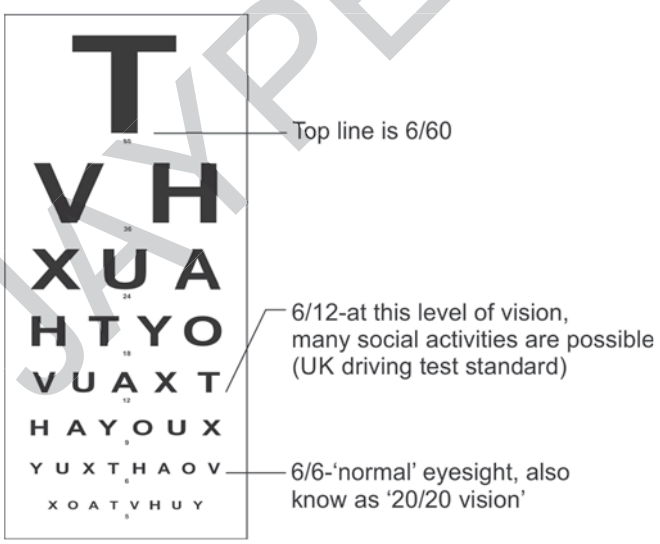


Fig. 2.6: Snellen's chart to measure the visual acuity.

Visual acuity is reported as a fraction which is numerator is distance from the subject to the chart. Denominator is size of the symbol the person can see at 20 feet. For example, 20/40. At 20 feet the eye sees at the a 20 feet distance what a normal eye sees at 40 feet.

Ophthalmoscopy: Advances are being made in digital imaging of the retina. Eye drops may be placed in the eye to dilate the pupils. Special magnifying lenses are used to examine the retina and optic nerve for damage.

REFRACTIVE ERRORS OF EYES

Refractive errors are vision problem, the patient unable to see the clear vision. It happen due to the shape of the eye focus the light is not correctly on the retina.

Types

- Myopia otherwise called as nearsightedness. It makes far-away objects look blurred.
- Hyperopia known as farsightedness. It makes nearby objects look blurry.
- Astigmatism can make far-away and nearby objects look blurry or distorted.
- Presbyopia is makes it hard to see things up close for middle-aged and older adults.

Causes

- Due to abnormal growth of eyeball—too long or too short eyeball length
- Abnormal shape of the cornea—the clear outer layer of the eye
- Older aging process of the lens—an inner part of the eye that is normally clear and helps the eye focus.

Management

- Refractive errors correct by eye glasses, it is the simplest and safest treatment for refractive errors. The right eyeglass lenses to give you the clearest possible vision.
- Contact lenses sit on the surface of eyes and correct refractive errors. The right lenses and show how to clean and wear them safely.
- Laser eye surgery, perform to change the shape of cornea to correct the refractive errors.

Factors Affecting Visual Acuity

- Optical factors—state of image forming mechanisms of eye.
- Retinal factors—fovea had better acuity
- **Stimulus factors:**
  - Size of the object
  - Color of the object

- Illumination
- Contrast
- Brightness
- Duration of exposure

Field of Vision

Field of vision is defined as all the surroundings visible when the vision is fixed. It is assessed by perimetry and confrontation method. In perimetry the blind spot—3 mm medial to and slightly above posterior pole. The scotoma is blind spots in regions other than optic disc

Normal refractive condition is ocular refractive system. The ocular refractive system is composed of the cornea, the aqueous humor, the lens and the vitreous. People can see object clearly, for the light rays sent out by object pass through eye refractive system, form images on retinal macula. Refractive condition is decided by the refractive power and length of ocular axis.

Emmetropia is the absence of refractive error. Vision is 20/20, the person able to see the object clearly with 20 feet distance at specific size. Patient not required vision correct treatment. Because nonaccommodated parallel light rays refracted by ocular refractive system accurately focus on the retina which is called emmetropia.

Ametropia: The refractive power and the length of the globe are not correlated so that parallel light rays refracted by ocular refractive system do not come to focus on the retina (fovea centralis). It including hypermetropia, myopia and astigmatism. It is the presence of refractive error.

Errors of Refraction (Fig. 2.7)

- **Myopia:** Near sightedness
  - Correction—concave lens
- **Hypermetropia:** Far sightedness
  - Uses accommodation
  - Correction—convex lens
- **Emmetropia:** Sharp normal vision

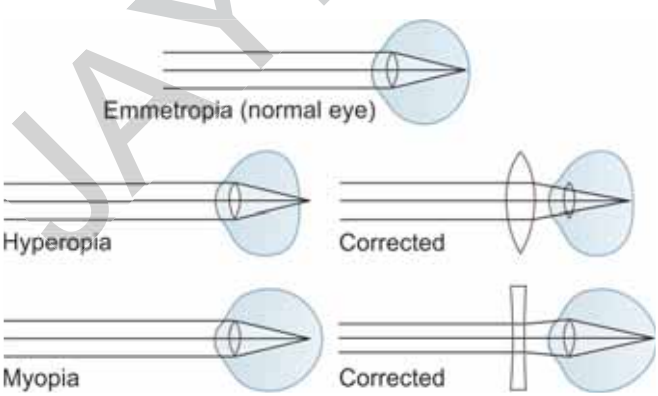


Fig. 2.7: Light focus in hyperopia and myopia.

MYOPIA

Myopia otherwise called as nearsighted, in this condition nearby objects are clear, and distant objects are blurry. Myopia often progresses throughout the teenage years when the body is growing rapidly. It is under nonaccommodated condition, parallel light rays refracted by ocular refractive system come to focus in front of the retina.

Myopia, occurs due to light entering into the eye focuses in front of the retina instead of directly on it. Eye ball is too long, distant objects focused in front of retina and image striking retina is blurred. It is happening due to long eye ball, cornea become sharper, than a normal eye. Myopia people typically visualize clearly in closer objects, but struggle to seeing distant objects. Myopia is more common in school age children who report having trouble seeing the chalkboard. Myopia is detected with a vision test and refraction.

Etiology

- **Axial myopia:** Axial of the eye is quite long, but the refractive power is normal.
- The eye longer than average
- Most high myopia is axial
- **Refractive myopia:** The axis is normal but the refractive power increases.

Classification

Based on function: ◆ Simple myopia ◆ Pathologic myopia	**Based on degree of myopia:** ◆ Mild: below -3D ◆ Moderate: from -3D to -6D ◆ High myopia: more than -6D
Based on refractive factor: ◆ Axis myopia ◆ Refractive myopia	**Based on accommodation:** ◆ Pseudomyopia (accommodative myopia) ◆ Nonaccommodative myopia ◆ Mixed myopia

Clinical Manifestations

- Distant objects are blurred
- Headaches
- Squinting
- Eye strain
- Eye fatigue when person try to see objects more than a few feet away
- Children with myopia often have trouble reading the blackboard at school.

Diagnostic Evaluations

- History collection related to myopia signs and symptoms.
- Eye examinations to know the level of refractory errors.

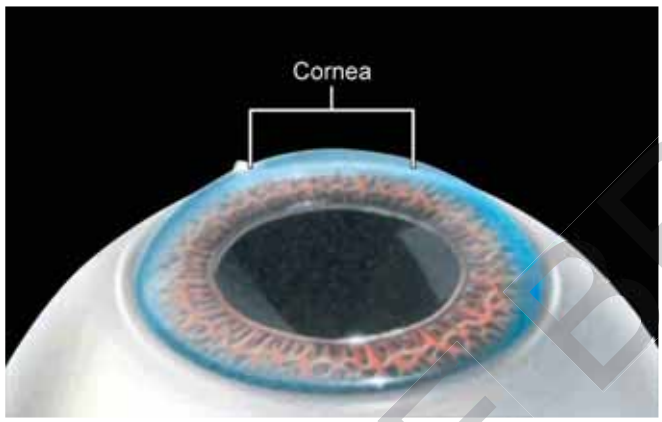
Management

- Eye glasses or contact lenses based on power of eye.
- **Photorefractive keratectomy:** Surgery uses a laser to sculpt the middle layer of the cornea's curve become flattens and lets light rays focus closer to or on retina.
- **Laser in-situ keratomileusis (LASIK):** The surgeon uses a laser or another tool to create a thin flap on the top layer of the cornea. They sculpt the cornea with another laser and moves the flap back into place **(Fig. 2.8)**.

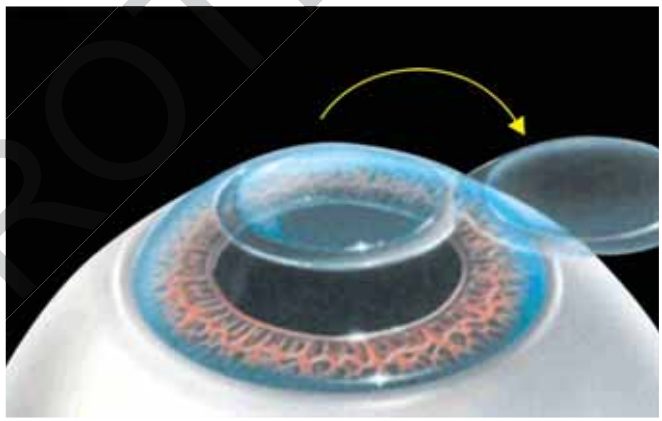
HYPERMETROPIA

Hypermetropia is close objects are seen more blurry than distant objects. It is more common in children than in adulthood. In mild hyperopia, distance vision is clear and near vision is blurry. In advanced hyperopia condition, the patient seeing objects blurred at all distances. It is the state in which the unaccommodated eye would focus the image behind the retina. Parallel light rays refracted by ocular refractive system focus behind the retina, not form clear image. Eyeball too short, lens too thin and too stiff. Nearby objects are focused behind retina. Image striking the fovea is blurred.

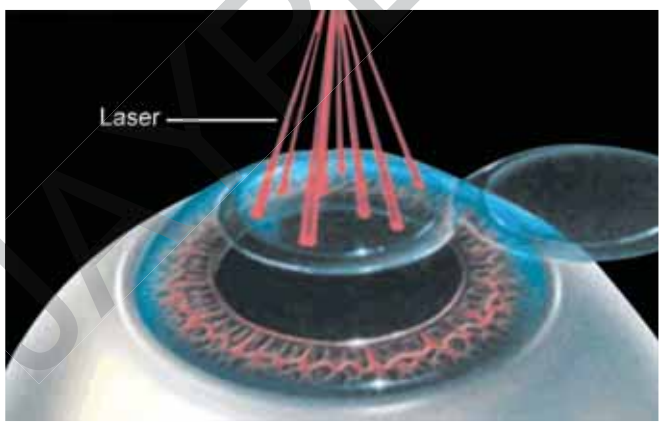
Hyperopia otherwise called as farsightedness, it occurs when light entering into the eye focuses behind the retina, instead of directly on it. It is caused due to flatter cornea, an eye ball shorter, than a normal eye. Generally, hyperopia affected people difficulty to visualize close objects, but



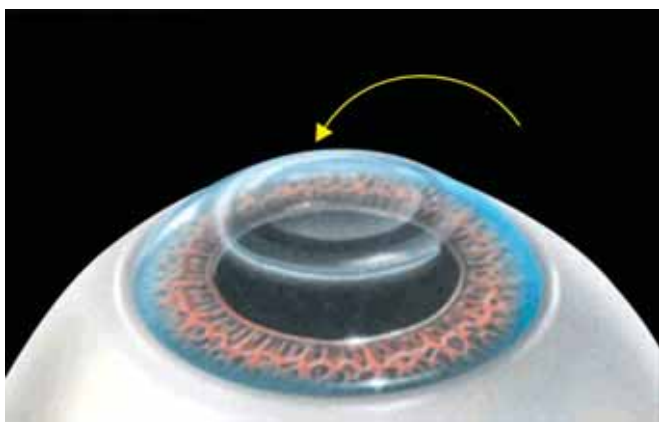
The cornea before it is cut.



The surgeon creates a corneal flap, it is a thin slice of the cornea. It is cut and flipped open like the cover of a book. There are two methods of cutting the flap by using blade and with blade, i. microkeratome, done by using a blade and, ii. femtosecond lasers, done by with blade.



Corneal flap cut and opened, an excimer laser is used to remove tissue from the center of the cornea to re-shape and correcting the patient's refractive error.



After correcting the cornea, the flap is replaced, and closing, it allows to heal naturally without stitches.

Fig. 2.8: Laser in-situ keratomileusis procedure.

may also have difficulty seeing far away as well. Young people with mild to moderate hyperopia are often able to visualize clearly because their natural lens can adjust and accommodate to increase the eye's focusing ability. But, as the eye gradually loses the ability to accommodate (beginning at about 40 years of age), blurred vision from hyperopia often becomes more apparent.

Etiology

- **Axial hypermetropia** is the commonest type. It is shown that ocular axis is short but refractive power is normal, but there is axial shortening of the eyeball.
- **Curvature hypermetropia** is curvature of the cornea, lens or both is increased flatter than the normal, resulting in change in refractive power of the eye.
- **Index hypermetropia** is occurs due to change in refractive index of the crystalline lens with age.
- **Positional hypermetropia** is results from posteriorly placed crystalline lens of the eye.
- **Absence of crystalline lens** either congenital absence or acquired leads to aphakia. There is high hypermetropia in aphakia.
- **Refractive hyperopia** is indicated that ocular axis is normal, but refractive power is weak.

Classification

Based on degree of hypermetropia	*Based on physiological factors*	*Based on pathological conditions*
◆ **Mild:** Less than +3D ◆ **Moderate:** +5D or less than +5D ◆ **High:** More than +5D	◆ Due to normal etiological conditions ◆ Imperfect emmetropization ◆ Hereditary factors	◆ Prenatal maldevelopment of eye ◆ Corneal or lenticular changes due to orbital inflammation ◆ Neurologic or pharmacologic bases causes

Types

Simple hypermetropia	It is more common type of hypermetropia and it is caused by hereditary. It includes axial and curvature hypermetropia due to biological variations in the development of the eye
Pathological hypermetropia	**Senile hypermetropia** occurs in old aged people because of developing curvature in the outer lens fibers
	Index hypermetropia is acquired eye disorder. It is very common young age people. It develops due to sclerosis of the cortex of crystalline lens, it cause refraction of the cortex is less than nucleus of the lens and dissimilarity results in formation of a central lens encircled by two converging menisci. It enhances the refracting power of the lens. With ageing, this differentiation decreased and the lens becomes more homogeneous with reduced converging power **Positional hypermetropia** occur due to posterior subluxation and it is partial dislocation of the lens **Aphakic hypermetropia** is the dislocation of the lens from its normal pupillary position in the eye. It caused by congenital and acquired condition. The eye is hypermetropic with marked defective vision for near and distance **Consecutive hypermetropia** is due to surgically overcorrected myopia or pseudo-phakia, it is eye with intraocular lens following removal of crystalline lens as in cataract surgery, with under-correction
Functional hypermetropia	It results from paralysis of accommodation and it is seen in patients with third intracranial nerve palsy and internal ophthalmoplegia

Clinical Manifestations

- Visual acuity in mild hyperopia may be compensated by accommodation, so far or near vision may be normal in mild hyperopia of juvenile.
- If the degree of hyperopia is large or accommodative power decreases with aging, both far and near vision decrease in different degrees, and near vision is much worse than far one.
- Asthenopia–long term near work, excessive accommodation often may induce asthenopia, its symptom is blurred vision, distending pain in superciliary arch.
- Esotropia due to excessive accommodation leading to more convergence which is easy to induce esotropia.

Diagnostic Evaluations

- Visual acuity finding shows changes in hypermetropia and power of accommodation.
- Cover test helps to find accommodative convergent squint. Due to altered accommodative convergence

(AC) and accommodation (A) balance (AC/A ratio), maintaining binocular vision becomes difficult.
- Eyelids examination helps to find blepharitis, stye or chalazion.
- Eyeball—size normal or small.
- Cornea—slightly smaller in size.
- Anterior chamber—shallow in high hypermetropia.
- Glaucoma due to size of the lens increased with ageing, and high risk to develop narrow angle closure glaucoma.
- Lens show backwards dislocated.
- Fundus examination helps to find small optic disc, look hyperemic with ill-defined margins. It is simulate papillitis. Vessels may be tortuous and may show abnormal branching.
- Scan ultrasonography or biometry use to see decreased anteroposterior length of the eyeball.

Signs and Symptoms

- Nearby objects are difficulty to see
- Blurred vision to see distance object
- Eye fatigue when reading
- Eye strain such as headaches, pulling sensation, burning

Management

- Use spectacles with convex lenses as per ordered.
- Contact lenses may be used for unilateral hypermetropia as ordered. It is used for cosmetic reasons also still the stabilize the eye's refractive power.

Surgical Management

- Hypermetropic laser assisted in-situ keratomileusis (LASIK)
- **Noncontact holmium:** YAG (yttrium aluminum garnet) is a synthetic crystal used for laser thermokeratoplasty. It creates multiple radially spread spots in the paracentral cornea, which leads to shrinkage of the collagen in the mid-peripheral stroma and subsequent steepening of the central cornea.
- **Hypermetropic photorefractive keratectomy (H-PRK)**—in this procedure, the cornea is shaped in to a sharper convex lens by creating a furrow-like ring zone in the corneal periphery.
- **Conductive keratoplasty**—it is done by radiofrequency, it is used to correct low hypermetropia with or without astigmatism.
- **Phakic intraocular lens (IOL) implants**—especially designed, foldable, convex, thin lenses implanted in the posterior chamber behind the iris and in front of the normal crystalline lens.
- **Refractive lens exchange**—foldable intraocular lens placed after extraction of clear lens.

PRESBYOPIA

Presbyopia, occurs mostly after 40 years of age, it causes due to aging of the lens in the eye. Because after 40 years of age, the lens becomes more rigid and does not flex as easily due to changes in the Len's protein making the lens harder, the muscle fibers surrounding the lens and less elastic over time. Because of these reasons, the eye loses it focusing ability and it make more difficult to read at close range. Presbyopia develops due to the less the lens natural flexibility.

The natural lens can no longer accommodate. With aging process, gradually decreased accommodative function, at about 40–45 years of age, difficulty takes place in near work and reading. With age, lens becomes less elastic and accommodation power becomes +2D at 50 years and 0D at 70 years of age. Person needs bifocal lens.

Signs and Symptoms

- Patient complaints of difficulty to read very fine print like phone book, medicine bottle.
- Difficulty visualizes clearly for close work and objects.
- Print seems to have less contrast.
- Eyes become easily fatigued when reading a book and computer screen, required brighter and more direct light for reading.
- Reading material must be held further away to see (for more)
- Fatigue and eyestrain when reading

Management

- Spectacles.
- Contact lenses for cosmetic reasons still the refractive power of the eye stabilizes.
- Eye surgery to correct the defects.

ASTIGMATISM

Normally the cornea is smooth and equally curved in all directions, and light entering the cornea is focused equally on all planes, or in all directions. Astigmatism is a develops in the cornea, and the eye is not completely round. In this condition cornea, become an asymmetric curvature and the front surface of the cornea is curved more in one direction than in another. This abnormality may result in vision that is much like looking into a distorted, wavy mirror. Commonly, astigmatism causes blurred vision at all distances.

Astigmatism means that the cornea is oval instead of spherical like a basketball. Most astigmatic corneas have two curves—a steeper curve and a flatter curve. This causes light to focus on more than one point in the eye, resulting in

blurred vision at distance or near. Astigmatism often occurs along with nearsightedness or farsightedness. Due to the difference of refractive power in every meridian of eye, so outside light rays can't focus on the retina to form clear image.

Etiology

Most common cause is that the radii of curvature of cornea and lens are different in each meridian, generally, their difference between two main meridians is biggest.

Physiological Astigmatism or Vertical Astigmatism

Types of Astigmatism

1. Curvature astigmatism (cornea)
2. Index astigmatism (lens malposition)
   - Parallel bars to determine the axis of cylindrical abnormalities
   - Irregular curvature in parts of the cornea or lens
   - Causes blurry image
   - This may be corrected by specially ground lenses which compensate for the irregularity or laser surgery.

Clinical Manifestations

- Blurry or distorted vision
- Eyestrain
- Headaches
- Trouble seeing at nigh

Treatment

Spherical correction is done first for one of the two planes of Astigmatism.

Additional cylindrical correction is done in the perpendicular plane.

Corrected glasses with cylindrical lens, surgically. The most common surgeries used to correct astigmatism are astigmatic keratotomy (procedures that involve placing a microscopic incision on the eye) and LASIK. The objective of these procedures is to reshape the cornea so it becomes more spherical or uniformly curved.

Alternative Therapies for Healthy Eye and Prevention of Eye Disorders

Strategies to Reduce Digital Eye Strain

- **20-20-20 Rule to reduce eye strain:** While using digital screen every 20 minutes, take break for 20-second, and see any objects away 20-feet.
- Every 20 minutes close eyes and relax for 20–30 seconds.
- Drink more water to hydrate the eyes. Drink green tea to improve tear secretion to prevent the dryness. Because green tea contains antioxidants.
- Blinking frequently to lubricate the eyes.
- Use artificial tears to remove the eye strain as order.
- Use an antiglare protective screen in the digital devices.
- Avoid too much brightness on the digital screen, view the letters size bigger, use black text with white background reduce the eye strain.

Ayurvedic Management for Refractive Error

- Progress of the myopia slow down.
- Advice to exposure to daylight 30 minutes in the morning and evening.
- Advice to follow yoga practice regularly to improve vision.
- Advice to reduce screen time in televisions, laptop, and mobile unnecessary.
- Add vitamin A supplements in diet.
- Avoid to stay in polluted area and work place.
- Avoid eating fast food, screen time, reading in lying down position, reading with moving vehicle, very late-night sleep, and late wake up will increase problem.
- Add balanced diet, use ghee in diet, eat more green vegetables, seasonal fruits, nuts, and drink more water.
- Adequate sleep at night helps to heal the problems.
- Ayurveda management commonly effective in the age group of five to thirteen. Because this age group able to reverse the changes before it become permanent after puberty.
- Ayurvedic approach helps to refreshing, strengthening eye muscles, enhance the lens elasticity and correct refractive errors.
- Avoid the root cause of the problems.
- Avoid eye straining.

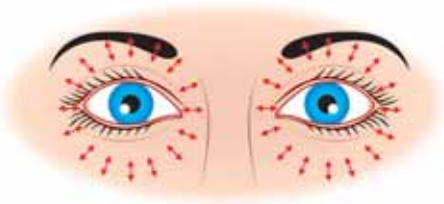
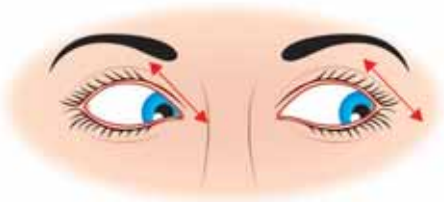
Siddha Home Remedies for Eye Problems

- Take rest period in between the screen time.
- Drink adequate water to prevent eye dryness.
- Avoid drink alcohol
- Stop using chemical and preservative makeup.
- Protect eyes against direct sunlight.
- Advice to apply lotus flowers paste on eyes to act as cooling herb.
- To avoid dark circles under the eyes by apply pure rose water by cotton ball under eye and on eye for 10 minutes.
- Close the eyes for some time by palm.
- Eat fresh fruits and vegetables such as carrot, milk, ghee in the diet helps in maintaining good ocular health.
- Avoid reading dull light.

- Using very hot and very cool water on the face and head affect the eyes.
- Apply almond, coconut or sesame oil around the eyes prevents dark circles.
- Simple eye exercise by moving eye ball right and left, upwards and downwards and rotating it in the clockwise and anticlockwise directions to maintains perfect eyesight.
- Yoga asanas, like Surya Namaskar asana, are very beneficial for the eyes as they boost blood circulation.

Yoga Eye Exercise to Improve the Eye Sight (Figs. 2.9 to 2.14)

Yoga eye exercise helps to improve the eye muscles strength, improve the blood circulation and correct the refractive error like hypermetropia and myopia. Yoga helps to return the normal function of the eyes. Always advice to practice the yoga eye exercise to follow for few months or regular practice to maintain normal eye vision. First splash the eyes with cold water for few times. Wash the hands thoroughly.

Yoga for eye	*Figures*
Palming exercise: Site comfortable position with head and spine straight position. Take deep breaths and relax. Rub the palms of the clean hands for some time. keep the warm palms over the closed eyes for some times. The palms' warmness moves to eye muscles and bathed with sooth darkness and relax. This exercise performs repeatedly for three time	 **Fig. 2.9:** Keep palm on closed eyes (palming exercise).
Blinking exercise: Site comfortable position with head and spine straight position. Take deep breaths and relax. Blink eyes for ten times continuously. Then close the eyes and relax for few seconds. Take deep breath and relax again. Perform the blinking repeatedly again for five times.	 **Fig. 2.10:** Blinking rapidly exercise.
Sideways looking exercise: Sit comfortable position and keep the legs straight in front of the body. Maintain the head in straight and fixed position. Keep the arms in thumbs up position with the eyes level. Take exhale while looking left and right thumbs and inhale while return to see the center of the eyebrows. Focus the eye sight in between the eyebrows and look the left thumb for few seconds and return to the space between the center space of the eyebrows and focus the eye sight right thumb and then again to the space between the center space of the eyebrows. Like this perform this exercise ten to twenty times. Finally close the eyes and provide eye rest for few minutes.	 **Fig. 2.11:** Sideways looking exercise.
Eye rotational viewing exercise: Sit in comfortable position and keep legs straight in front of the body. Place the lift hand on the left knee and right hand on the right knee. Keep the thumbs up position in the hand and keep it eye level. Move the thumb in clockwise and anticlockwise and follow the eye rotation the same ways. Perform the exercise five time. Advice to take inhalation while performing the upper arc rotation and exhale in the lower arc rotation of the eye. Finaly close the eyes and give rest to eyes for few seconds and relax.	 **Fig. 2.12:** Eye rotation exercise.

Looking up and down eye exercise: Sit in comfortable position and keep legs straight in front of the body. Place the lift hand on the left knee and right hand on the right knee. Keep the thumbs up position in the hand and keep it eye level. Follow the thumbs movement by looking the thumbs up and down the thumbs down and move the eye down movement, continuously follow the thumb movement up and down. Repeat the same for five times in each thumb. Advice to take inhalation while looking up and exhale while looking down. Finaly close the eyes and give rest to eyes for few seconds and relax.	 **Fig. 2.13:** Looking up and down eye exercise.
Nose tip gazing eye exercise: Keep thumbs up position in hand, look the tip of the thumb in both the eyes. Gradually bend the arm and bring the thumb towards tip of the nose and eyes also follow the thumb. And then gradually straight the arm, and eyes follow look the tip of the thumb. Advice to inhale while the arm bend the thumb brings towards the tip of the nose. And hold the breath till the thumb at the tip of the nose and exhale while arm straight the thumb away from the nose. Repeat the exercise five times.	 **Fig. 2.14:** Nose tip gazing eye exercise.

Note: Always advice the yoga for eye perform after consultation of the yoga experts.

EYELID DISORDERS

The eyelids are short folded thin curved sheets of areolar tissue layer, and at their free edge, they are attached with hair. The eyelids cover the front of the eye. They have three muscles: the orbicularis oculi, levator palpebrae superioris, and Muller's muscle. A thin sheet of dense connective tissue, the tarsal plate, is larger in the upper eyelid than in the lower eyelid. The eyelashes begin anterior to the grey line, and the ducts of the meibomian glands are positioned posterior to the grey line. The grey line is important in operations where the lid is split as it indicates the position of loose fibrous tissue between the orbicularis muscle and the tarsus.

Glands of the eyelid: Meibomian glands (Tarsal Glands) are modified sebaceous glands about 20–30 in number rooted in the tarsal plate. They are engaged vertically and open on the lid margin. Then, vertical incision is given while incising the chalazion and Zeis's glands. These are also known as modified sebaceous glands attached to the hair follicles is Moll's glands. These are modified sweat glands, which open in the hair follicles and directly in the lid margin and accessory lacrimal glands of Wolf ring. These are structure of the upper eyelid present near the upper border of the tarsal plate. Palpebral fissures the space between the two lids when the eye is open is known as the palpebral fissure or palpebral aperture **(Fig. 2.15)**.

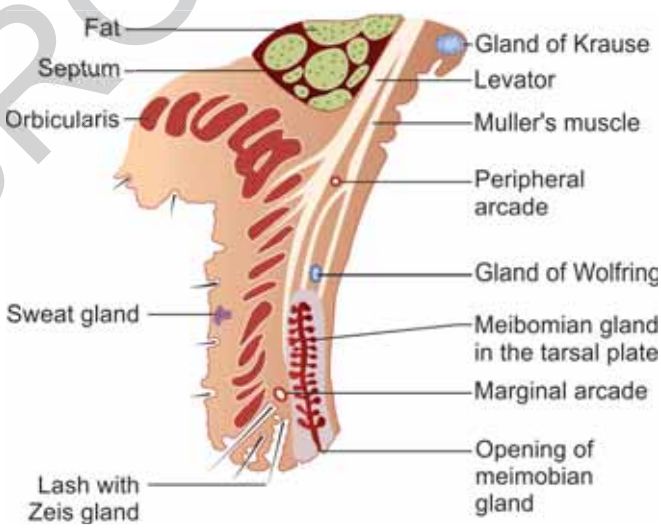


Fig. 2.15: Eyelid.

Congenital Anomalies

See **Table 2.1** and **Figures 2.16 to 2.23.**

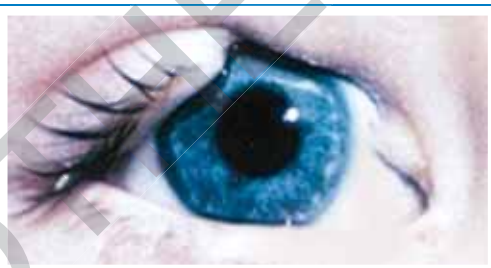
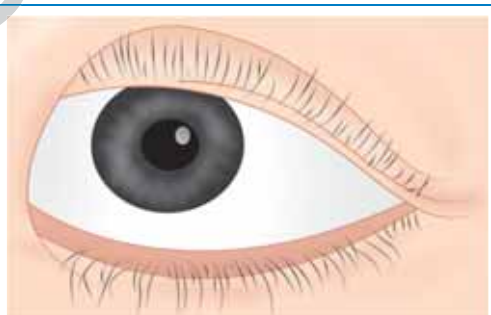
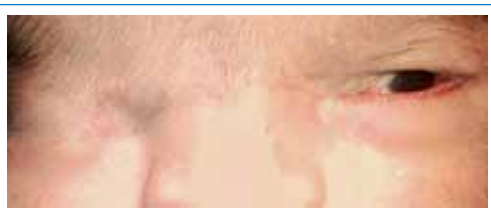
Edema of the Eyelids

Swelling of eyelids can be classified as:

Inflammatory Edema

- Inflammation of lid (dermatitis, stye, hordeolum)
- Inflammation of conjunctiva (conjunctivitis)
- Inflammation of lacrimal sac (acute dacryocystitis)
- Inflammation of lacrimal glands (acute dacryoadenitis)

Table 2.1: Congenital anomalies.

Congenital anomalies in eyelid	***Pictures***
Congenital ptosis is related with congenital weakness of levator palpebrae superioris. Its cause drooping of one or both upper eyelids since birth, lid wrinkle is reduced and sometime absent also and lid lag on downgaze, i.e., ptotic lid is higher than the normal. Its treatments by surgical procedure tarsoconjunctival mullerectomy used to functional opening of the upper eyelid ptosis. Another surgical procedure fasanella-servat operation performed to correct mild to moderate ptosis. Brow suspension surgical procedure to correct drooping of the upper eyelid in the improper poor and absent levator muscle function.	 **Fig. 2.16:** Congenital ptosis.
Congenital coloboma is a full thickness triangular gap in the tissues of the lid and it is generally occurring in the nasal side and in upper eyelid. It is rare congenital condition.	 **Fig. 2.17:** Congenital coloboma.
Epicanthus is most common congenital anomaly of the eyelids. It appeared like semicircular find of skin, it covers medial canthus. It is a bilateral condition which may disappear with development of nose.	 **Fig. 2.18:** Epicanthus.
Distichiasis is extra row of cilia present in the position of Meibomian gland. Generally, these cilia are directed backwards. It is treated by electroepilation and cryoepilation procedure to remove hair. Electroepilation is procedure to removing hair below skin's surface by using electrical devices, electric currents, or wax. It is giving temporary relief. Cryoepilation is a procedure hair removal by using extreme cold to destroy hair follicles. It provides permanent results.	 **Fig. 2.19:** Distichiasis.
Cryptophthalmos is rare congenital anomaly, it is failed to develop the lids over the eye. The eyeball hiding by the skin passes continuously from eyebrow. Surgically separate the fused eyelids. If surgery is not feasible use prosthetic eyelids.	 **Fig. 2.20:** Cryptophthalmos.

Contd...

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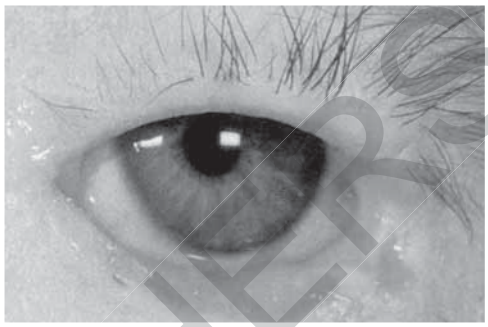
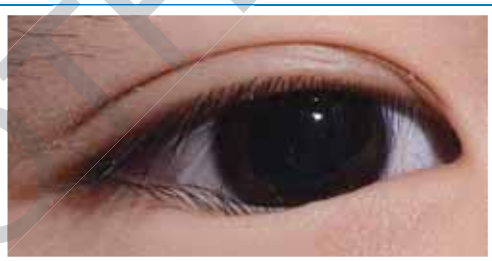
Congenital anomalies in eyelid	*Pictures*
Microblepharon is abnormally very **s**mall eyelids. Generally related with microphthalmos or anophthalmos. It is rarely inheriting the eyelids congenital disorder. Ablepharon is absent of eyelids.	 **Fig. 2.21:** Microblepharon.
Epiblepharon is a parallel fold of tissue rides above the lower eyelid margin. Generally, it is disappearing with growth of face.	 **Fig. 2.22:** Epiblepharon.
Euryblepharon is unilateral or bilateral horizontal widening of palpebral fissure due to inferior insertion of lateral canthal tendon. It is related with lateral canthal malposition and lateral ectropion. Generally, it occurs in lateral portion of lower eyelids. Poor lid closure with exposure keratitis.	 **Fig. 2.23:** Euryblepharon.

- Inflammation of eye ball (iridocyclitis)
- Solid edema of the lids—it is a chronic thickening of eyelids, it occurs due to recurrent attacks of erysipelas.

Passive Edema of the Lids

- Due to cavernous sinus thrombosis
- Head injury
- Congestive heart failure
- Renal failure, etc.

BLEPHARITIS

Blepharitis is a inflammation of the eyelids margins. It is appearing as simple hyperemia or as true inflammation.

Etiology

- Chronic conjunctivitis due to *Staphylococcus* infection.
- Living in poor environmental condition.
- Lack of personal hygiene especially poor hand hygiene,
- Parasites infection such as *Demodex folliculorum*, Phthiriasis palpebrarum, *Crab louse*, *Head louse* also cause blepharitis.

Types

Refer **Table 2.2**.

Pathophysiology

Generally patient reports whitish discharge and it accumulate in the margin of the eyelids. It causing mild discomfort, irritation, occasional watering and a history of falling of eyelashes. On removing these scales underlying surface is found to be hyperemic and greasy, there is no ulcers. Generally, the lashes are drop out and regrow quickly without distortion. Eyelid margin is thickened and the sharp posterior border tends to be rounded leading to epiphora, in long standing cases **(Fig. 2.24)**.

Table 2.2: Types of blepharitis.

◆ **Squamous blepharitis/seborrheic:** – It is caused by abnormal metabolism and seborrhea affect the scalp, eye brows and ears and is not nonulcerative – In the eyelashes, small white colored scales accumulate, which readily drop out and are replaced without distortion, not ulcerated – On removal of the scales, the underlying surface is hyperemic – The scales are slippery with less marked redness of the eyelids margin – Metabolic condition, often associated with dandruff of scalp – It treated by daily cleaning with baby shampoo. And Treat any supervening infection	◆ **Ulcerative blepharitis/*Staphylococcal:*** – It is an infective condition – It develops yellow crusts or dry brittle scales glue the lashes together, and develop small ulcers around the eyelashes – If try to removing the crusts, it cause bleeding – The eyelashes fall out being replaced by misdirected lashes – Usually ulcerative and is more serious due to the involvement of the base of hair follicles – Eyelids margins become redness with scales and eyelashes is easily pluck able – Permanent scarring can result – Clinical features are soreness, lacrimation, itching, redness of edges of lids, and photophobia – Its needs aggressive local treatment – Crusts must be removed first and loose, diseased lash epilated. – Done by thorough bathing of eye with 1:4 baby shampoo OR warm 3% bicarbonate of soda lotion – This softens the deposits, so they can be picked or rubbed off with a pledge of cotton wool – After removal, use Antibiotic drops based on sensitivity of the organism – After the infection resolves, a simple daily habit of swabbing the lid margins with a warm bland lotion must be established – Avoid rubbing of the eyes and fingering the lids with unwashed hands – Proper treatment ensures a speedy recovery
◆ **Anterior blepharitis:** It is occurs inflammation in the centered around the skin, eyelashes and lash follicles. Clinical features of anterior and posterior blepharitis (squamous): – Greasy soft scales – Dandruff like material – As sleeves around lashes – Associated with dandruff of scalp Clinical features of anterior and posterior blepharitis (*Staphylococcal*): – Hard, brittle scales – Fibrin exudation at base of lashes – Ulcerative lesions under the crusts – Bleeding on crust removal	◆ **Posterior blepharitis:** – It is occurring in the meibomian gland orifices, meibomian glands, tarsal plate and blepharon conjunctival junction in posterior – It causing tear film uncertainty and inferior punctate keratitis Commonly presents in two ways: – Meibomian seborrhea: In this condition oil droplets appearance seen at the meibomian gland openings which can be stated out like foam – Meibomitis: In this condition develop diffuse rounded posterior lid margin and thickening around meibomian glands opening. Eyelids massage expresses out an maintained, toothpaste like material – Cyst formation due to duct blockage may also be seen Treated by warm compression and lid massage and Simultaneous doxycycline or minocycline for 6 weeks.
◆ **Mixed:** A combination of the anterior and posterior blepharitis	

Differences between Squamous and Ulcerative Blepharitis

See **Table 2.3**.

Clinical Manifestations

- Soreness of the eye
- Redness of the eye
- Increase lacrimation
- Highly sensitivity to light (photophobia)
- Irritation
- Burning sensation of the eye
- Itching of the eyelid margins
- Scales on lid margin (hard or soft/both)
- Eyelid margin ulceration and redness.

Treatment

- Treatment based on the severity of the disease.
- Pharmacological management antibiotic agents—topical application like eye drops and ointments.
- Commonly prescribed eye drops, azithromycin, one drop at bed time for 1 week or more.

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