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MATRIC NO: 17/MHS01/248

DEPARTMENT: PHARMACOLOGY

COURSE: PHS212

1. WRITE SHORT NOTES ON ANY TWO EYE DEFECTS
2. MYOPIA (SHORT-SIGHTEDNESS):

Myopia occurs when the eyeball is too long, relative to the focusing power of the cornea and lens of the eye. This causes light rays to focus at a point in front of the [retina](https://www.allaboutvision.com/resources/retina.htm), rather than directly on its surface.

Nearsightedness can also be caused by the [cornea](https://www.allaboutvision.com/resources/cornea.htm) and/or lens being too curved for the length of the eyeball. In some cases, myopia occurs due to a combination of these factors. Myopia typically begins in childhood, and you may have a higher risk if your parents are nearsighted. In most cases, nearsightedness stabilizes in early adulthood but sometimes it continues to progress with age.

Nearsightedness can be corrected with [eyeglasses](https://www.allaboutvision.com/eyeglasses/), [contact lenses](https://www.allaboutvision.com/contacts/) or [refractive surgery](https://www.allaboutvision.com/visionsurgery/).

Good choices for eyeglass lenses for nearsightedness include [high-index lenses](https://www.allaboutvision.com/lenses/highindx.htm) (for thinner, lighter glasses) and lenses with [anti-reflective coating](https://www.allaboutvision.com/lenses/anti-reflective.htm). Also, consider [photochromic lenses](https://www.allaboutvision.com/lenses/photochromic.htm) to protect the eyes from UV rays and high-energy blue light and to reduce the need for a separate pair of prescription sunglasses outdoors.

Refractive surgery can reduce or even eliminate the need for glasses or contacts. The most common procedures are performed with an excimer laser.

* In [PRK](https://www.allaboutvision.com/visionsurgery/prk.htm) the laser removes a layer of corneal tissue, which flattens the cornea and allows light rays to focus more accurately on the retina.
* In LASIK — the most common refractive procedure — a thin flap is created on the surface of the cornea, a laser removes some corneal tissue, and then the flap is returned to its original position.
* **Degenerative myopia**
* In most cases, nearsightedness is simply a minor inconvenience and poses little or no risk to the health of the eye. But sometimes myopia can be so progressive and severe it is considered a degenerative condition.
* Degenerative myopia (also called malignant or pathological myopia) is a relatively rare condition that is believed to be hereditary and usually begins in early childhood. About 2 percent of Americans are afflicted, and degenerative myopia is a leading cause of [legal blindness](https://www.allaboutvision.com/lowvision/legally-blind.htm).
* In malignant myopia, the elongation of the eyeball can occur rapidly, leading to a quick and severe progression of myopia and loss of vision. People with this condition have a significantly increased risk of retinal detachment and other degenerative changes in the back of the eye (such as bleeding in the eye from abnormal blood vessel growth).
* Degenerative myopia also may increase the risk of [cataracts](https://www.allaboutvision.com/conditions/cataracts.htm).

light coming from infinity are focused behind the light sensitive layer of the retina, when the eye is HYPERMETROPIA (LONGSIGHTEDNESS): **Hypermetropia (hyperopia, long-sightedness or far- sightedness)**is a form of refractive error in which parallel rays of at rest.

**Donders (1864)**discusses in his historical review about hypermetropia. Much of the problem was caused by confusion between the effects of presbyopia and hypermetropia on near vision.

Small hypermetropia may be corrected by voluntary accommodation. Even high errors of refraction may be corrected this way, but convex glasses may be required if symptoms are not relieved.

**Emmetropia** is the condition where the eye has no refractive error and requires no correction for distance vision. Refractive error (ametropia) results when cornea and lens inadequately focus the light rays, resulting in blurred images. The measuring unit for refractive error is dioptre (D), which is defined as the reciprocal of the focal length in meters.

In hypermetropia, the cornea is flatter or the axial length is too short. Therefore, the images do not focus by the time they reach to the retina. For clear vision, a hypermetropic eye must accommodate to increase its lenticular power to bring distant objects in focus on retina. This requires contraction of ciliary muscle, and therefore, far-sighted eye is never at rest and work even harder to see near objects clearly. Hypermetropic corrections add positive focusing power to the eye for clear vision.

**Accommodation:** The degree of hypermetropia corrected by accommodative effort is known as facultative hypermetropia. Remaining uncorrected hypermetropia is called absolute hypermetropia. Total hypermetropia after abolishing voluntary accommodation is known as manifest hypermetropia (facultative plus absolute). With advancing age, accommodative effort cannot be sustained, and hypermetropia becomes absolute till the effort of accommodation fails to correct any hypermetropia. Thus the facultative hypermetropia becomes abolished and there remains no difference between absolute and manifest hypermetropia.

Some of the hypermetropia is corrected by the inherent tone of the ciliary muscles and this is called latent hypermetropia. The degree of latent hypermetropia is high in young persons and becomes less with advancing age. Complete cycloplegia (paralysis of accommodation) can abolish latent hypermetropia. The refractive error estimated under complete cycloplegia is called total hypermetropia (manifest plus latent).

The symptomsvary depending upon the age of the patient and the severity of refractive error. Patient may be asymptomatic. Small amount of refractive error in young patients is usually corrected by mild accommodative effort, without producing any symptoms.

Symptomatic patients may present with:

**When hypermetropia is fully corrected:** At times the hypermetropia is fully corrected (thus vision is normal) but due to sustained accommodative efforts the patient develops asthenopic symptoms.

* Asthenopia (eyestrain).
* Frontal or fronto-temporal headache.
* Watering.
* Mild aversion to light.

These symptoms worsen as the day progresses and are aggravated by prolonged near work.

**When hypermetropia is not fully corrected:**When hypermetropia is not fully corrected by the voluntary accommodative efforts, then the patient complains of defective vision more for near than distance, due to sustained accommodative effort. Patient present with:

* Asthenopia.
* Defective vision more for near.

**When hypermetropia is high:** When hypermetropia is high (more than 4 D), the patients usually do not accommodate and they suffer with:

* Marked defective vision for both near and distance.

**When there is more of absolute hypermetropia:** With ageing the eye move from latent and facultative hypermetropia to greater degrees of absolute hypermetropia. This leads to progressive defective vision. Patient present with:

* Blurring of vision at a younger age than in emmetrope.

**When there is Spasm of accommodation:** Spasm of accommodation may induce pseudo-myopia. It may be detected by cycloplegic refraction. It presents as:

* Intermittent sudden blurring of vision.

In general, child may also present with lid diseases (like blepharitis, stye or chalazion), convergent squint or amblyopia.

### **Causes**

**Hypermetropia**may be:

* **Axial hypermetropia:** Axial hypermetropia is the commonest type. The total refractive power of the eye is normal but there is axial shortening of the eyeball. About 1 mm shortening of the antero-posterior length of the eye results in about 3 Dioptres (D) of hypermetropia.
* **Curvature hypermetropia:** Curvature hypermetropia is that condition in which curvature of the cornea, lens or both is increased (flatter) than the normal, resulting in change in refractive power of the eye. About 1 mm increase in radius of curvature results in 6 D of hypermetropia.
* **Index Hypermetropia:**Index Hypermetropia occurs due to change in refractive index of the crystalline lens with age.
* **Positional hypermetropia:** Positional hypermetropia results from posteriorly placed crystalline lens of the eye.
* **Absence of crystalline lens:** Absence of crystalline lens either congenital absence or acquired (following surgical removal or posterior displacement) leads to aphakia. There is high hypermetropia in aphakia.

It may also be functional, as is seen in presbyopia or may be induced by cycloplegic drugs.

### **Diagnosis**

Diagnosis of hypermetropia is based on the symptoms and clinical signs observed.

**Clinical signs:**

* **Visual acuity:**Visual acuity varies with degree of hypermetropia and power of accommodation. Patients with low degree of refractive error may have normal visual acuity. However, there is decrease in visual acuity for seeing near objects.
* **Cover test:** Cover test reveals an accommodative convergent squint. Due to altered accommodative convergence (AC) and accommodation (A) balance (AC/A ratio), maintaining binocular vision becomes difficult. The advantages of binocular vision are sacrificed in favour of more obvious advantages of clear vision. The better eye dominates for vision and the other eye develops accommodative convergent squint.
* **Eyelids:** One may develop blepharitis, stye or chalazion. The correlation between lid conditions and hypermetropia is not clear.
* **Eyeball:** Size of the eyeball may be normal or small.
* **Cornea**: Cornea may also be slightly smaller in size. There may be associated condition of cornea plana (flat cornea).
* **Anterior chamber:** Anterior chamber is relatively shallow in high hypermetropia.
* **Glaucoma:** The eye is small in high hypermetropia along with small size of cornea and shallow anterior chamber. Due to increase in size of the lens with ageing, the eye becomes prone to an attack of narrow angle closure glaucoma.
* **Lens:** Lens may be dislocated backwards.
* **Fundus:** Fundus examination shows small optic disc which may look hyperaemic (vascular) with ill- defined margins. This appearance may simulate papillitis. Since there is no swelling of the disc, it is called pseudo-papillitis. The retina is shiny due to reflection of light, called as **shot silk appearance**. Reflex of retinal vessels may be accentuated simulating arteriosclerotic changes. Vessels may be tortuous and may show abnormal branching.
* **Ultrasonography or biometry:** A- scan ultrasonography or biometry may show decreased antero- posterior length of the eyeball.

### **Management**

**Medical optical therapy:**

**Assessment of Vision:**

The most common component of assessment of visual function is to test central vision through visual acuity. Visual acuity determines ability to read symbols of varying sizes at a standard testing distance. This reference distance approximates optical infinity and is typically 6 meters. A 6/6 letter on the standard eye chart devised by Snellen is considered normal visual acuity. Refractive errors may result in uncorrected visual acuities that fall below 6/6. In the absence of other diseases, the condition of hypermetropia may be corrected with restoration of normal visual function. This may be achieved with spectacles or contact lenses.

Basic principle of therapy is to converge and focus the light rays on the retina with the help of convex (plus) glasses.

Rules for prescribing glasses in hypermetropia:

* **Cycloplegia:** Total hypermetropia is determined by performing refraction (checking power of glasses) under complete cycloplegia.
* **Small total manifest hypermetropia:** For small total manifest hypermetropia e.g. 1 D or less, correction may be required only if the patient is symptomatic.
* **Spherical power:** Spherical power is prescribed to the extent that it is suitably acceptable to the patient.
* **Astigmatism:** Astigmatism should be fully corrected.
* **Children younger than 4 years:** Children younger than 4 years requiring hypermetropic correction may usually accept full cycloplegic correction. It may be reduced in older children.
* **Older children:** Older children may not accept full cycloplegic correction because of the blur for distance. It may be increased gradually till the child accepts for the manifest hypermetropia.
* **Exophoria:** Hypermetropia should be under-corrected by about 1- 2 D if there is associated exophoria.
* **Accommodative convergent squint:** Full cycloplegic correction should be given if there is accommodative convergent squint.
* **Amblyopia (lazy eye):** In the presence of associated amblyopia (Functionally reduced vision not correctable with glasses and is not due to any eye disease) in one eye, full correction with occlusion therapy should be given.
* **Growth of child:** Hypermetropia decreases with growth of the child. Periodic refraction should be conducted and the correction should be reduced accordingly.

**Prescription of convex power:**

* **Spectacles:** Convex lenses may be prescribed as spectacles.
* **Contact lenses:** Contact lenses may be prescribed for cosmetic reasons once the refractive power of the eye stabilises. Contact lenses may be prescribed for unilateral hypermetropia as well.