

Loss of Vision

Causes of visual impairment/ loss in diabetic retinopathy:

1- Macular edema (most common cause)

2- Macular ischemia

3- Vitreous hemorrhage

4- Tractional retinal detachment

5- Neovascular glaucoma

Objectives :

- Definition
- Classification
- Causes
- Approach

Definition:

The International Classification of Diseases (2018) classified vision impairment into two groups, near and distance presenting vision impairment

Distance vision impairment :

Presenting distance visual acuity worse than 6/6 as measured by Snellen chart

Near vision impairment :

Presenting near visual acuity worse than N6 or M.08 with existing correction..

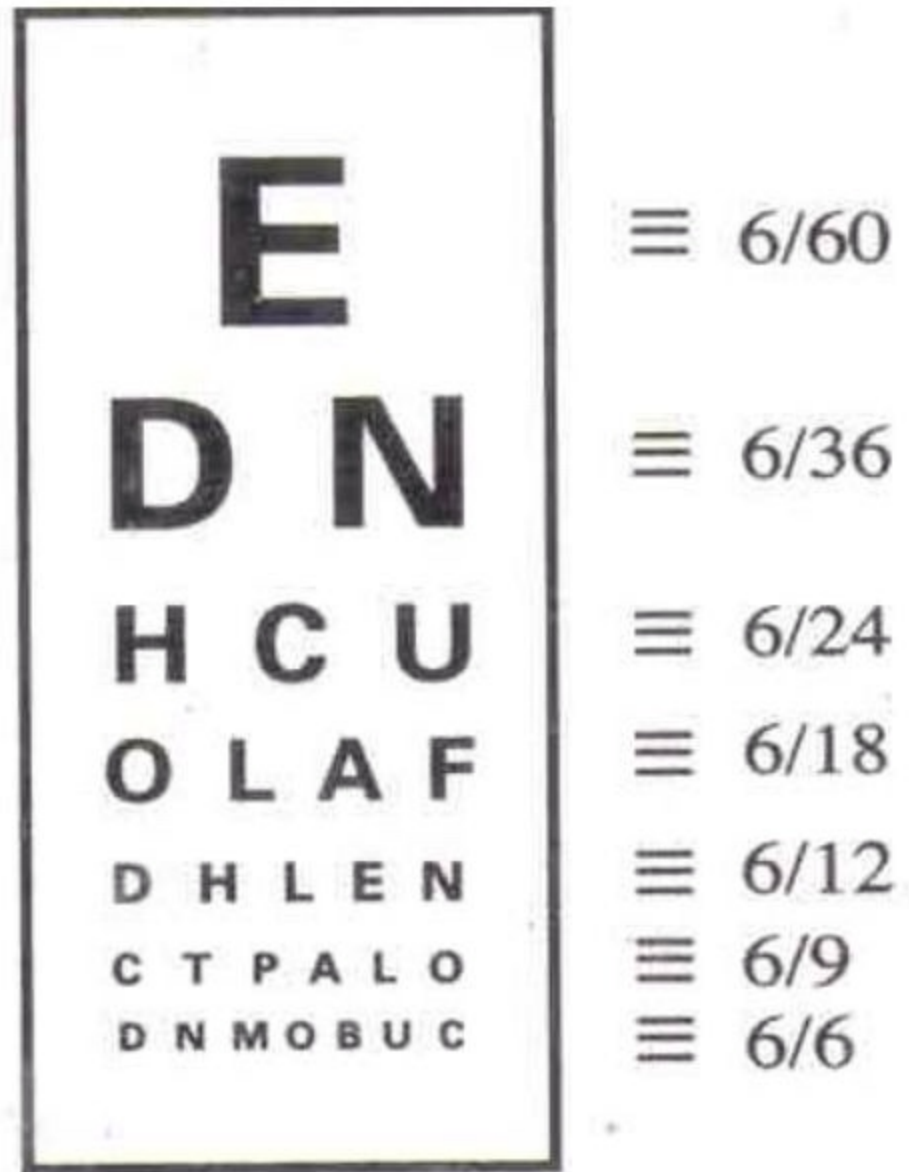
Severity of Distance vision impairment:

- Mild – presenting visual acuity equal to or better than 6/18 (0.3)
- Moderate – presenting visual acuity equal to or better than 6/60 (0.1) and worse than 6/18 (0.3)
- Severe – presenting visual acuity equal to or better than 3/60 (0.05) and worse than 6/60 (0.1)
- Blindness – presenting visual acuity worse than 3/60(0.05)

how to do the test?

Using the Snellen Chart

- Place patient at 6 metres from chart
- Use adequate illumination
- Cover left eye
- Ask patient to read from the top letter
- Keep going until they cannot read the line clearly and start to make multiple errors.



WHO levels of visual impairment

| Category | Worse than | Equal to or better than |
|------------------------------|-------------|-------------------------|
| Mild or no visual impairment | | 6/18 |
| | | 3/10 (0.3) |
| | | 20/70 |
| Moderate visual impairment | 6/18 | 6/60 |
| | 3/10 (0.3) | 1/10 (0.1) |
| | 20/70 | 20/200 |
| Severe visual impairment | 6/60 | 3/60 |
| | 1/10 (0.1) | 1/20 (0.05) |
| | 20/200 | 20/400 |
| Blindness | 3/60 | |
| | 1/20 (0.05) | No light perception |
| | 20/400 | |

You're not supposed to memorize the numbers here just keep in mind that vision loss is a spectrum and remember the cutoff point for legal blindness

Categories of visual impairment were defined according to the World Health Organization (WHO) International Classification of Diseases (ICD- 10) based on presenting distance visual acuity in the better eye

According to onset :

Sudden vs Gradual

Sudden :

Acute vision loss that happens over a period of a few seconds or minutes to a few days

Transient : lasting less than 24 hours

Persistent: lasting more than 24 hours

Gradual :

Chronic, slowly progressive loss of vision (happens over weeks to years)

Generally painless and usually bilateral but may occur asymmetrically

Most common example : cataract

Other examples: chronic open-angle glaucoma / diabetic retinopathy


Sudden visual loss :

Sudden Transient Vision Loss (TVL) (Amaurosis fugax) can be subdivided into :

Vascular :

carotid pathology
cardioembolic emboli
GCA
vasospasm

Two most common causes



Neurogenic :

retinal migraine

Ophthalmic :

papilledema

optic disc drusen

subacute (intermittent) angle-closure glaucoma

Sudden visual loss :

Sudden Persistent Vision Loss (PVL) (lasting more than 24 hours :

Acute Angle-closure glaucoma

Microbial keratitis

Acute anterior uveitis

Endophthalmitis

Hyphema

Vitreous hemorrhage

Rhegmatogenous retinal detachment

Central and branch retinal artery occlusion

Central and branch retinal vein occlusion

Anterior ischemic optic neuropathy

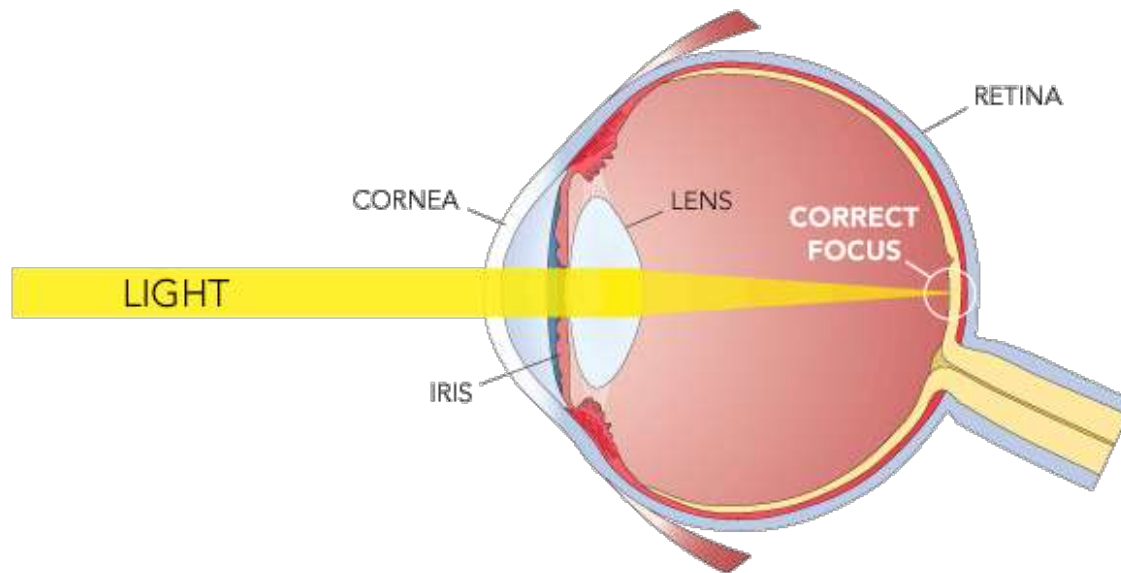
Optic neuritis

Etiological Classification

- Uncorrected refractive errors
- Media problems Normally clear & transparent
- Retinal causes
- Neurological and visual pathway
Extending from the optic nerve anteriorly & ending in the primary/secondary/tertiary medial wall of the occipital lobe around the calcarine sulcus
- Nonorganic (NOVL) or Functional visual loss (FVL)
Psychogenic / Faking

Uncorrected refractive errors

Emmetropia :- Parallel rays of light from a distant object are brought to focus on the retina with the eye at rest “not accommodating “



Refractive error or Ametropia occurs when parallel rays of light are not brought to a focus on the retina with the eye at rest “not accommodating

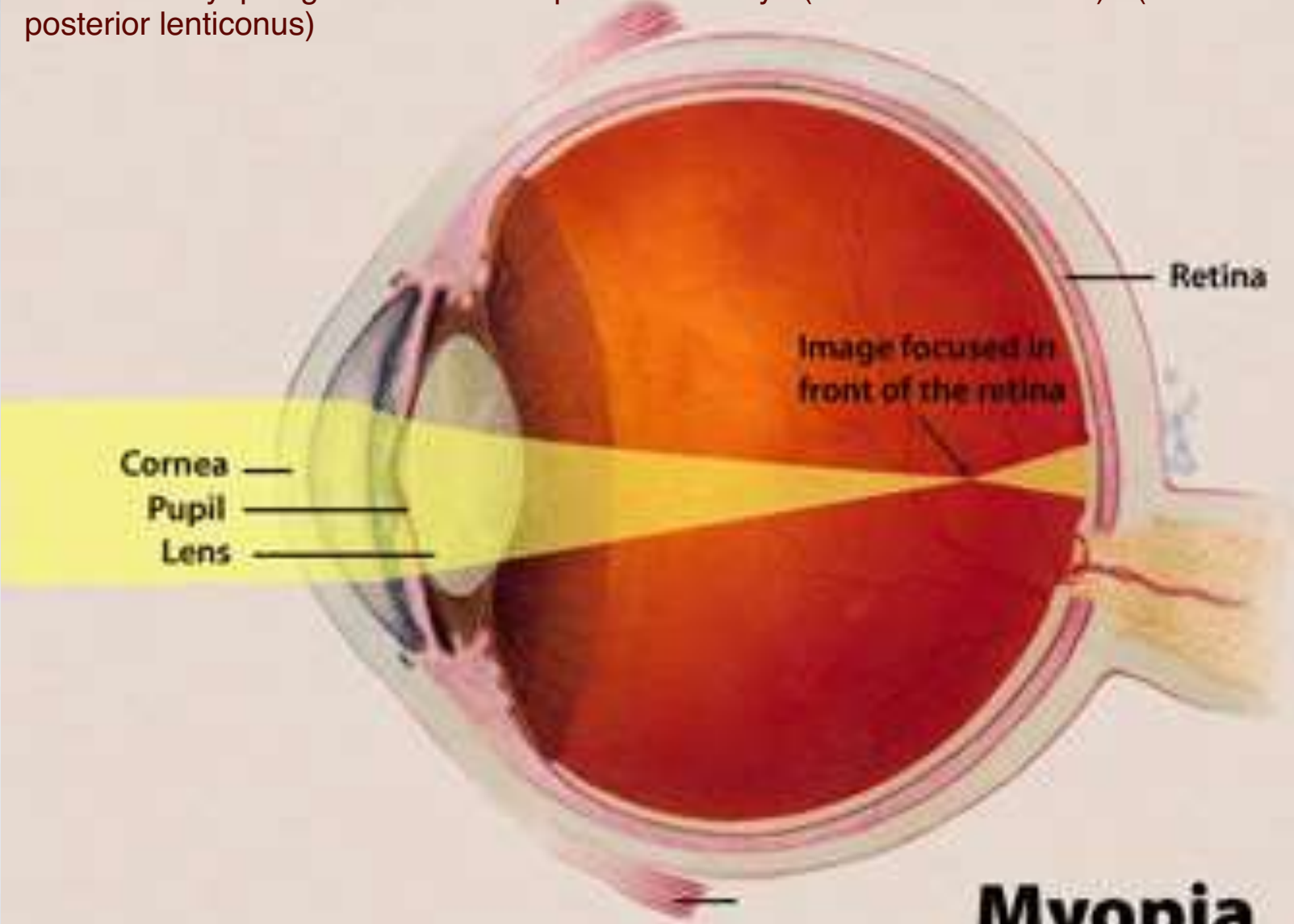
The four most common refractive errors are:

1. Myopia (nearsightedness): difficulty in seeing distant objects clearly
2. Hyperopia (farsightedness): difficulty in seeing close objects clearly
3. Astigmatism: distorted vision
4. Presbyopia: which leads to difficulty in reading or seeing at arm's length, it is linked to ageing and occurs almost universally

Myopia is the most common form of refractive errors

Axial myopia: normal refractive power of the cornea & lens but the axial length of the eye is greater than normal (most common)

Refractive myopia: greater refractive power of the eye (increased curvature) - (keratoconus/ anterior or posterior lenticonus)



Myopia
(nearsightedness)

Either axial (shorter axial length) or refractive (lower refractive power)

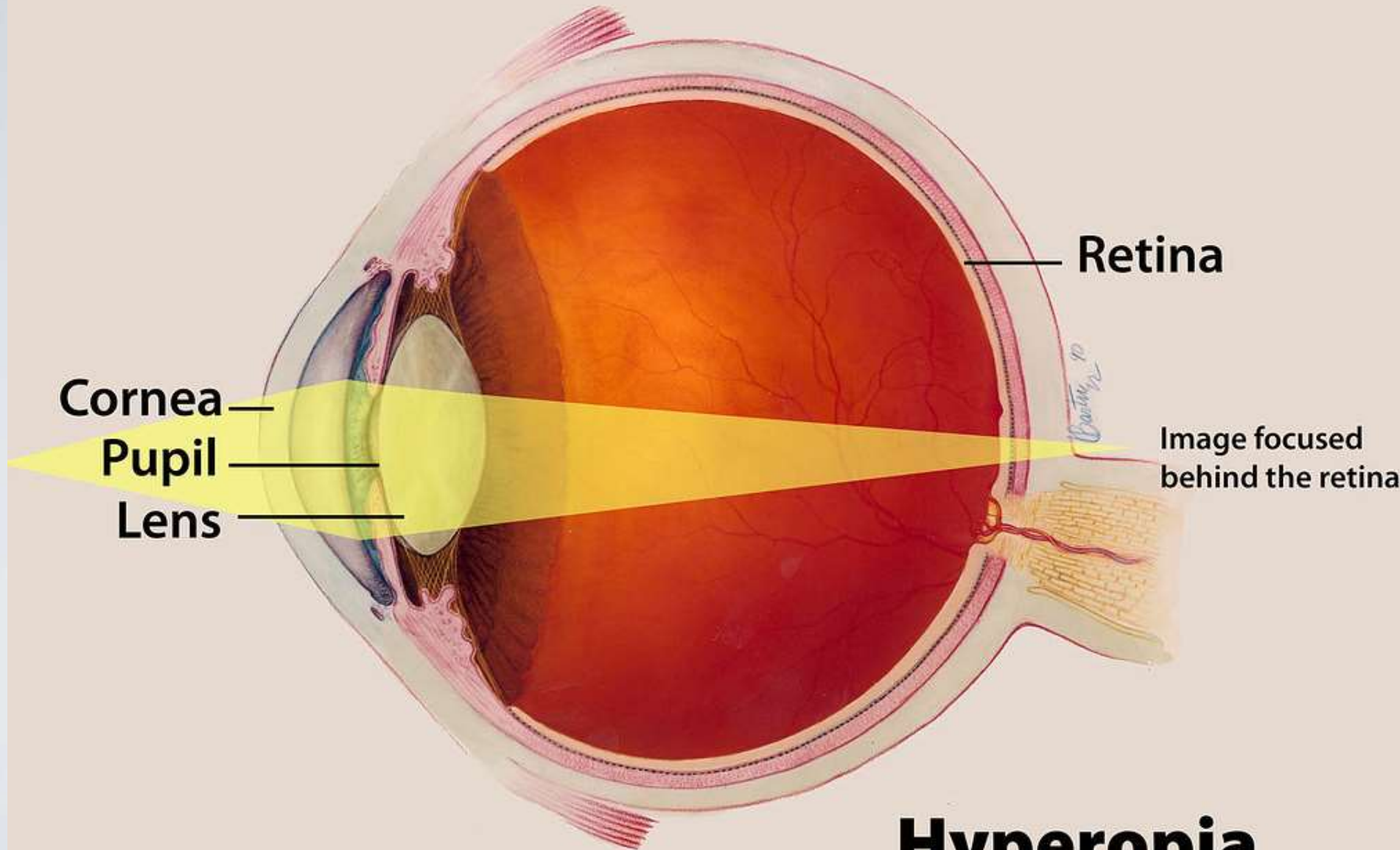
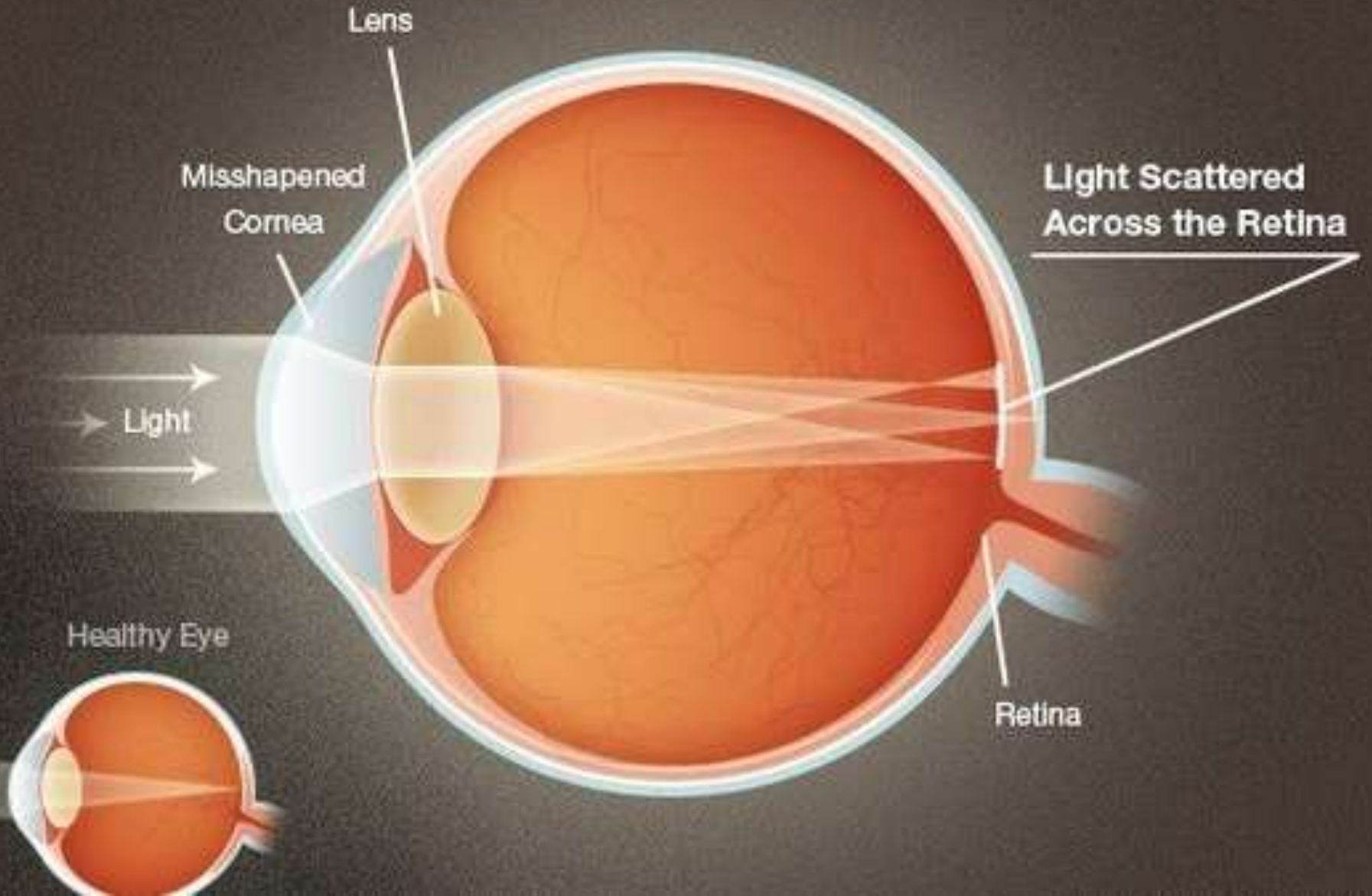


Image focused behind the retina

Hyperopia (farsightedness)

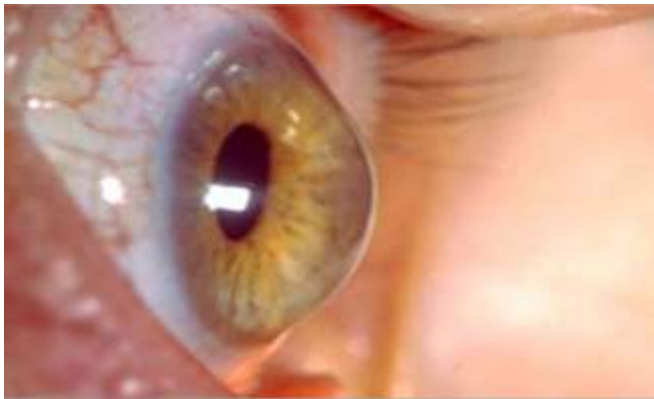
Astigmatism



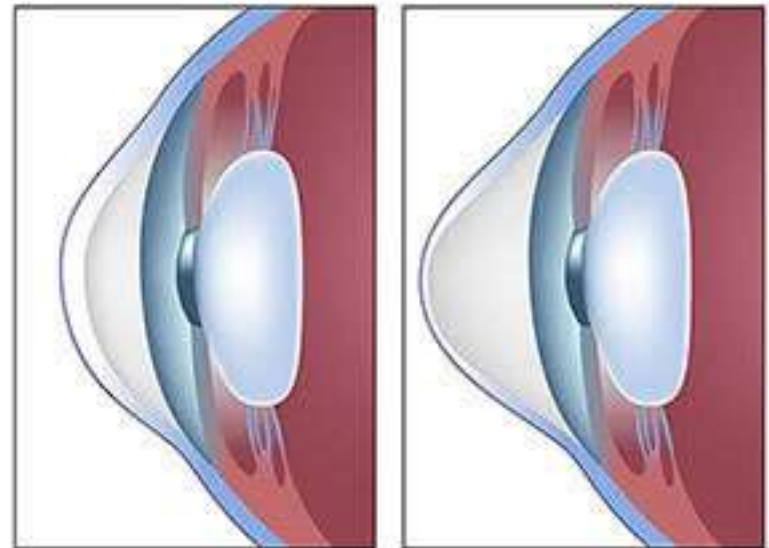
Keratoconus

Keratoconus is a progressive corneal thinning involves the central or paracentral parts that results in progressive change in corneal shape which assume a cone shape

Keratoconus cause visual loss secondary to progressive irregular myopic -astigmatism + bilateral painless



Keratoconus



Normal

Keratoconus

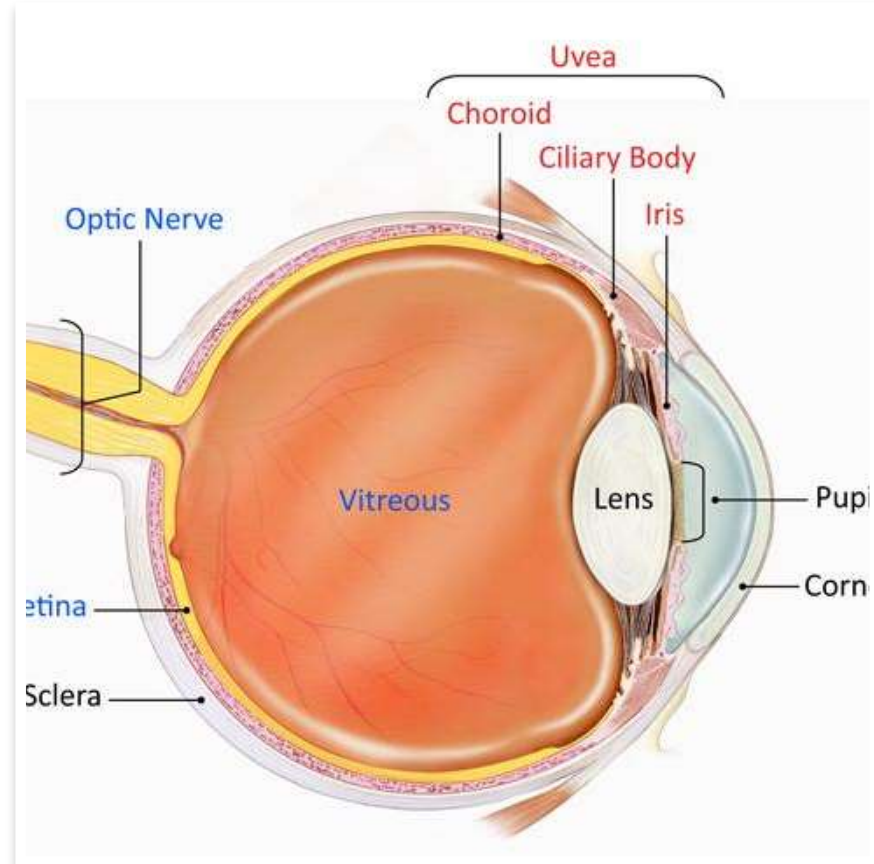
Media problems

Classical example of media problems: cataract

Ocular media are the transparent structures of the eye through which the light rays travel to retina

Ocular media include :

- Precorneal tear film
- Cornea
- Aqueous humour
- Lens
- vitreous



Corneal causes

Corneal edema

Corneal scar

Corneal infection (Keratitis)

Corneal dystrophies

Corneal degeneration

Types of angle-closure glaucoma:

- 1- Acute (unlikely bilateral/mostly unilateral/ other eye at risk & treated prophylactically): sudden persistent vision impairment
- 2- Subacute (intermittent): recurrent attacks of sudden transient vision impairment (resolves spontaneously)
- 3- Chronic: Gradual progressive asymmetrical bilateral vision impairment due to optic neuropathy (over months to

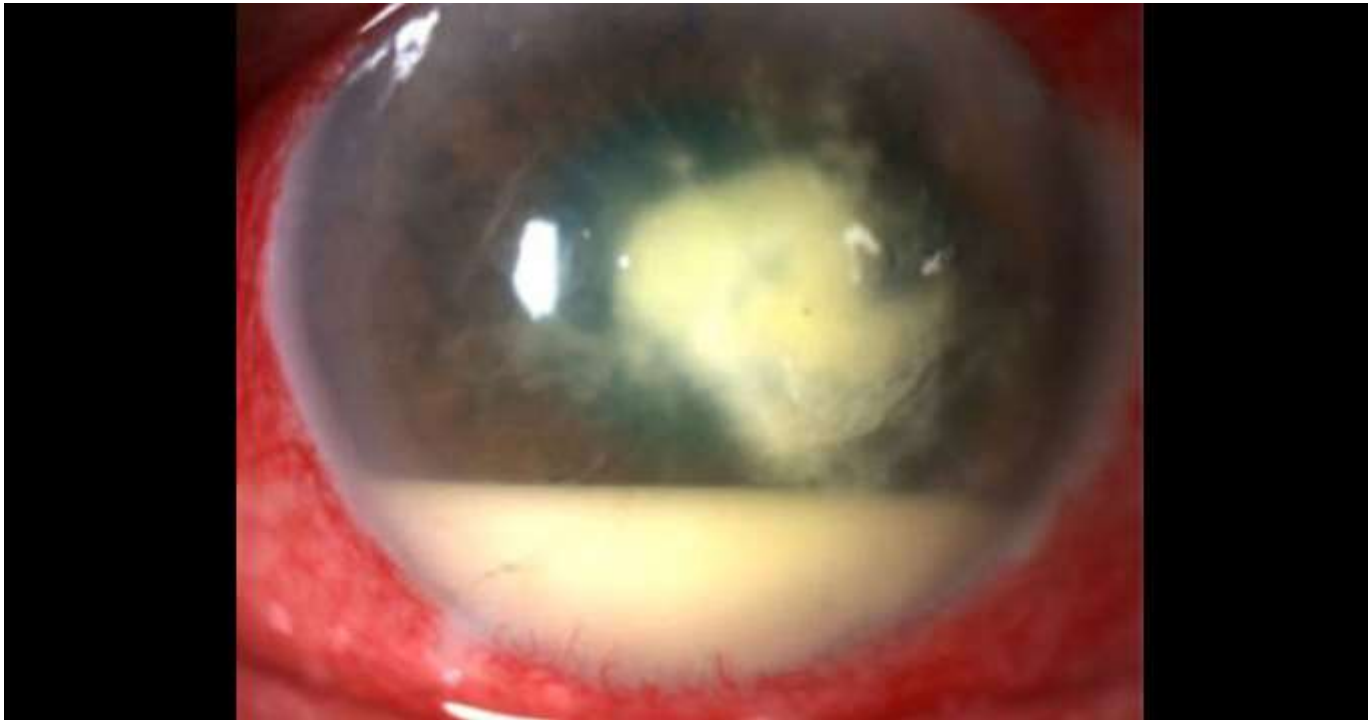


Corneal edema

Can happen due to trauma (one example is iatrogenic trauma)/ corneal endothelial dysfunction (Fuchs' dystrophy)/ acute angle-closure glaucoma >> increased IOP >> increased hydrostatic pressure >> extra fluid entering the cornea >> outweighs the endothelial capability to pump the fluid out of the cornea >> edema (if you were asked what is the direct cause of visual impairment & loss in acute angle-closure glaucoma you say corneal edema)

Microbial keratitis:

Painful monocular sudden persistent visual impairment usually associated with severe conjunctival redness nearly around the limbus (ciliary blush) + photophobia + discharge +tearing (treated with fortified antibiotic eye drops (dual therapy unless gram positive



Central corneal scar (from 2 to 8):

Visual impairment due to loss of transparency (greater contribution when the scar is central) & change in the shape of cornea leading to astigmatism (greater contribution when the scar is peripheral)

Mostly secondary to an old corneal trauma



Macular corneal dystrophy:

Bilateral progressive noninfectious noninflammatory corneal opacifying conditions

Bilateral painless progressive asymmetrical visual impairment usually in the young due to loss of corneal transparency





Secondary lipid keratopathy with corneal neovascularization

Degenerative corneal disorder

The cause of visual impairment is loss of normal corneal transparency due to corneal scarring

Aqueous humor

Anterior uveitis

Hyphema

Anterior uveitis :

WBCs in the aqueous humor

Hypopyon

layering of white blood cells in the anterior chamber
signifies severe anterior segment inflammation.



Hyphema

Blood in the anterior chamber

Microscopic : RBCs circulating

Macroscopic : layered in AC

Causes :

Traumatic : blunt trum or surgery

The most common cause of hyphema

Non traumatic

Robiosis iridis (NVIs) the most cause

Anterior uveitis

Most commonly secondary to diabetic retinopathy/ another possible cause is central or branch occlusion of the retinal vein

Tumors

Bleeding disorders : SCA

Vascular anomalies

Drugs **Blood thinners**



Lens Causes

Cataract Bilateral painless progressive asymmetrical visual impairment

Ectopia lentis

Change in shape

Cataract: loss of normal lens transparency most commonly occurs as aging

process

The most common cause of reversible vision loss

Ectopic lentis : Visual impairment in this case is due to refractive error in the form of hyperopic astigmatism

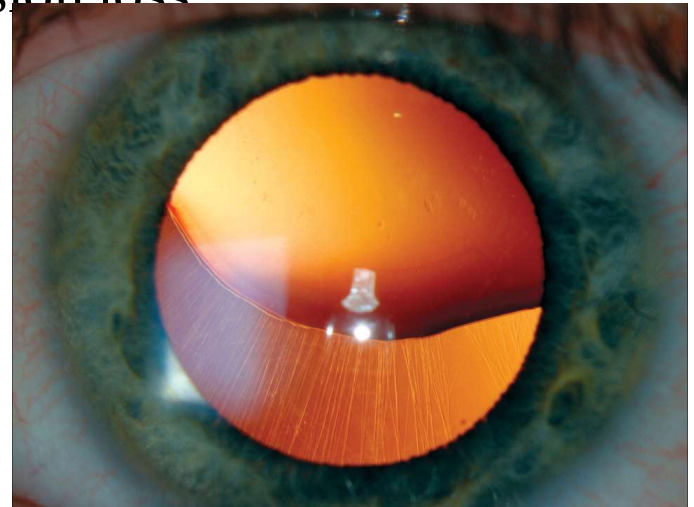
Trauma

CT diseases : Marfan syndrome Up & out

Metabolic : Homocystinuria

Congenital

Down & in



Change in shape:

Anterior lenticonus
Posterior lenticonus

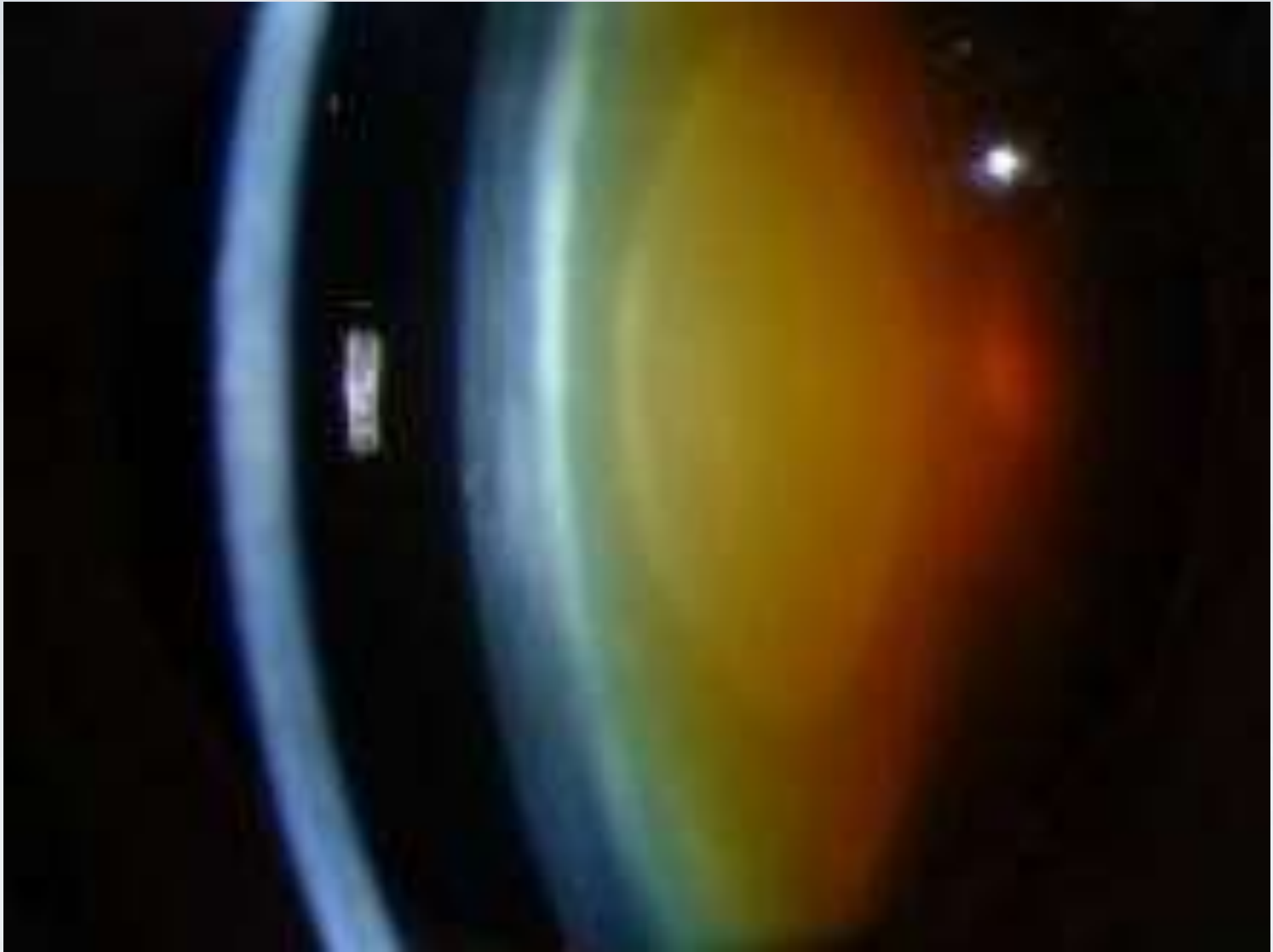


Elevated blood sugar can cause lens swelling, altering the refractive index

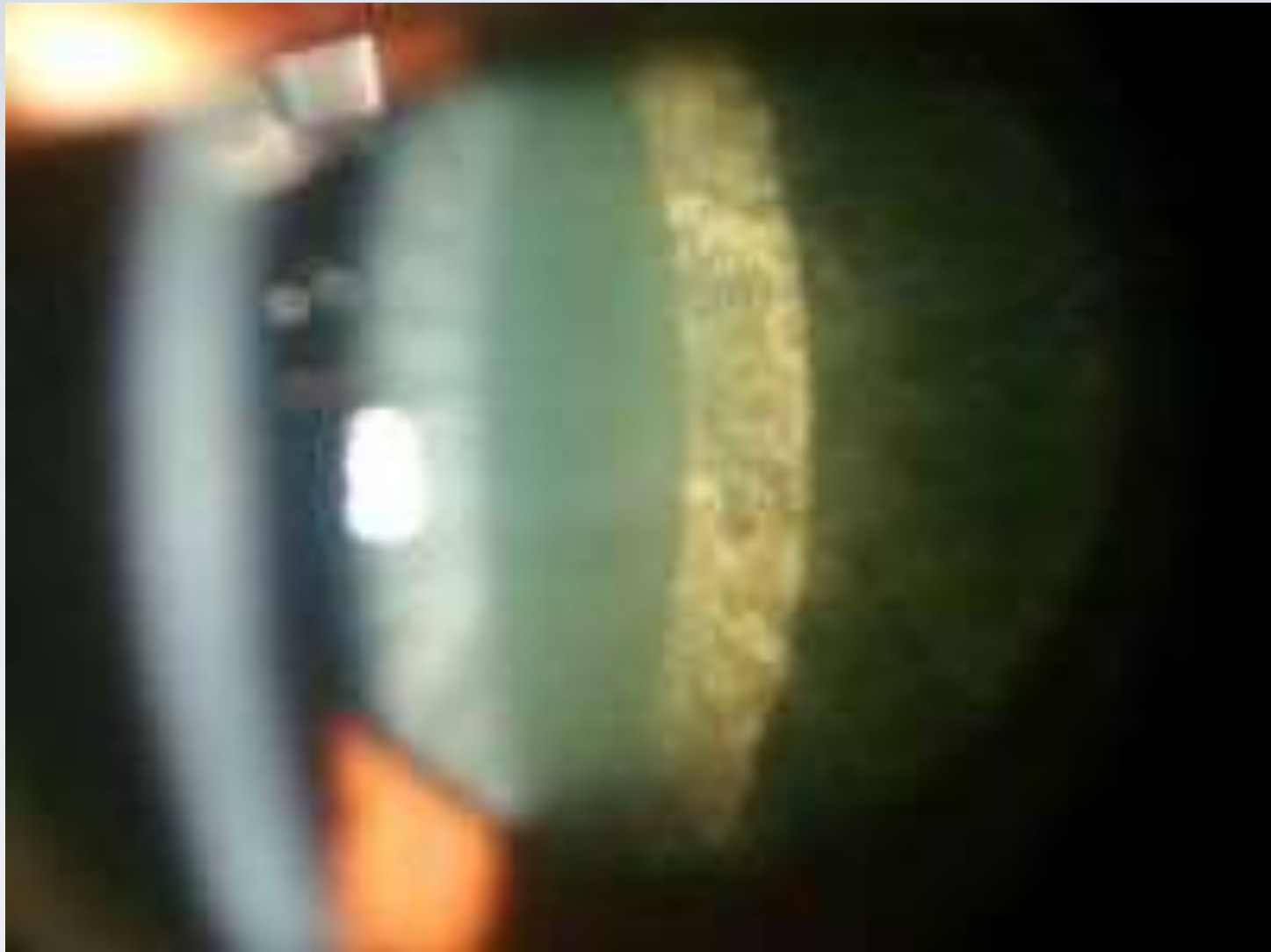
Due to myopic astigmatism

Vision impairment typically resolves
within days to weeks of normalization of blood glucose

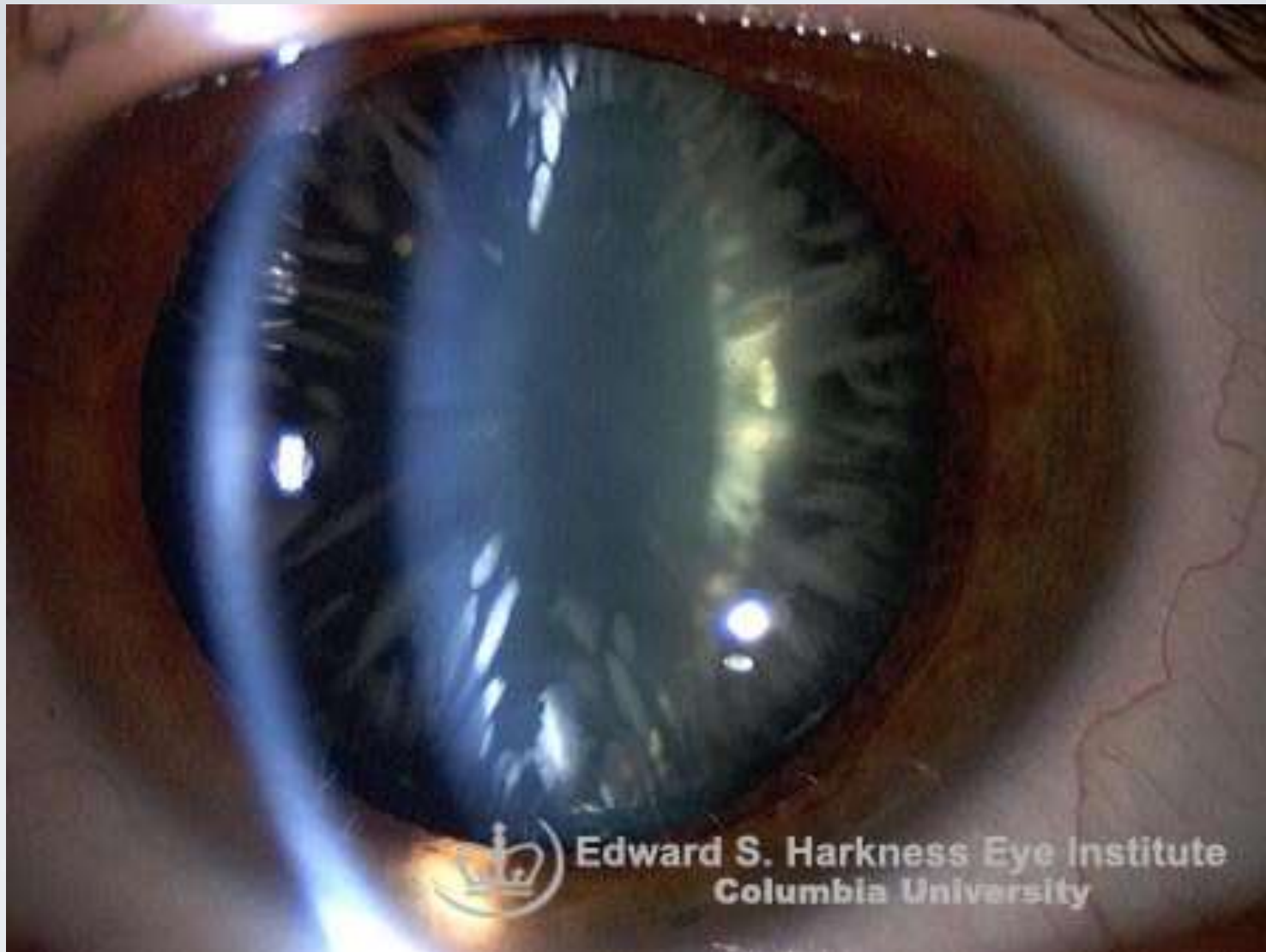
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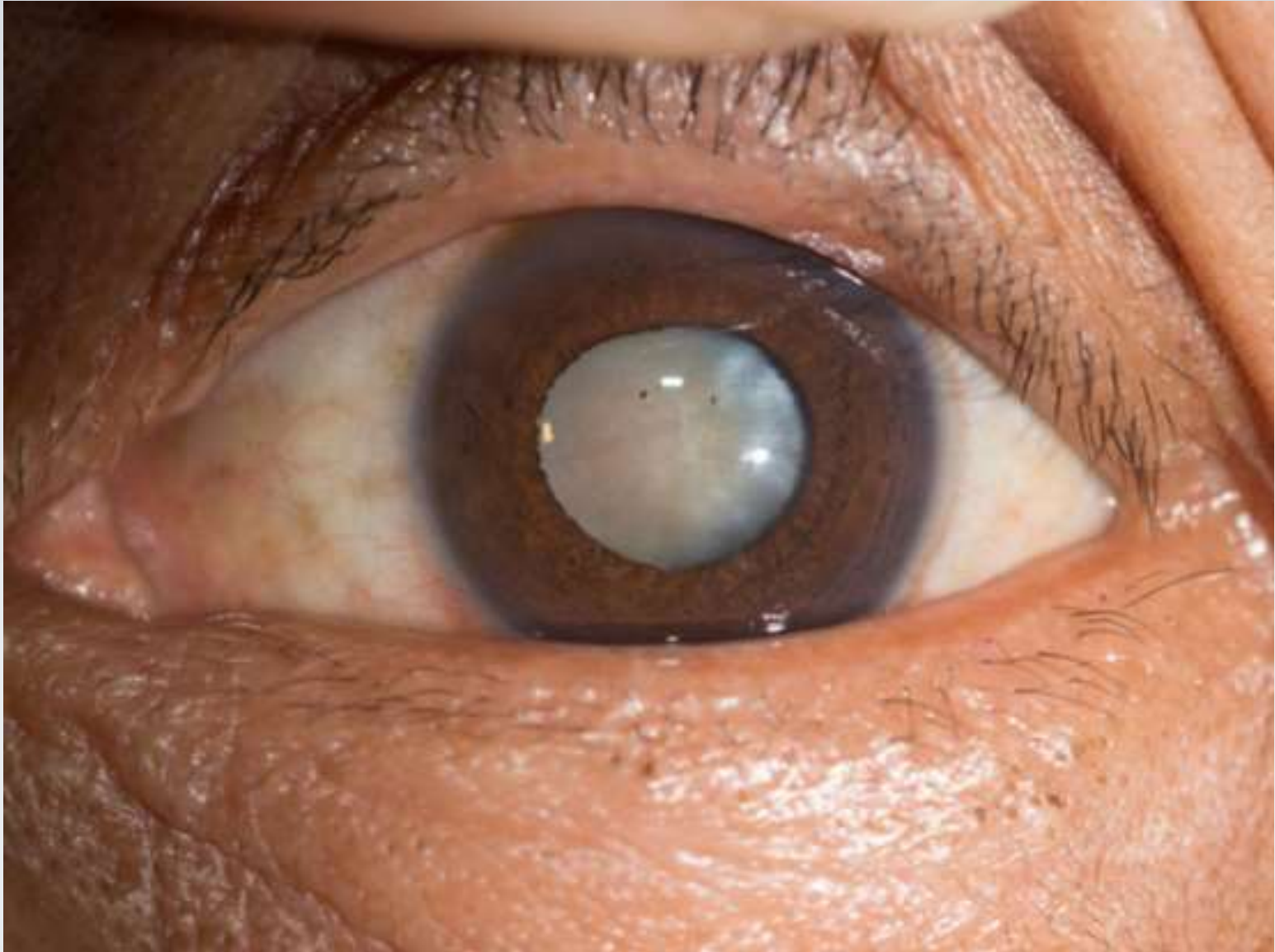
Nuclear sclerosis



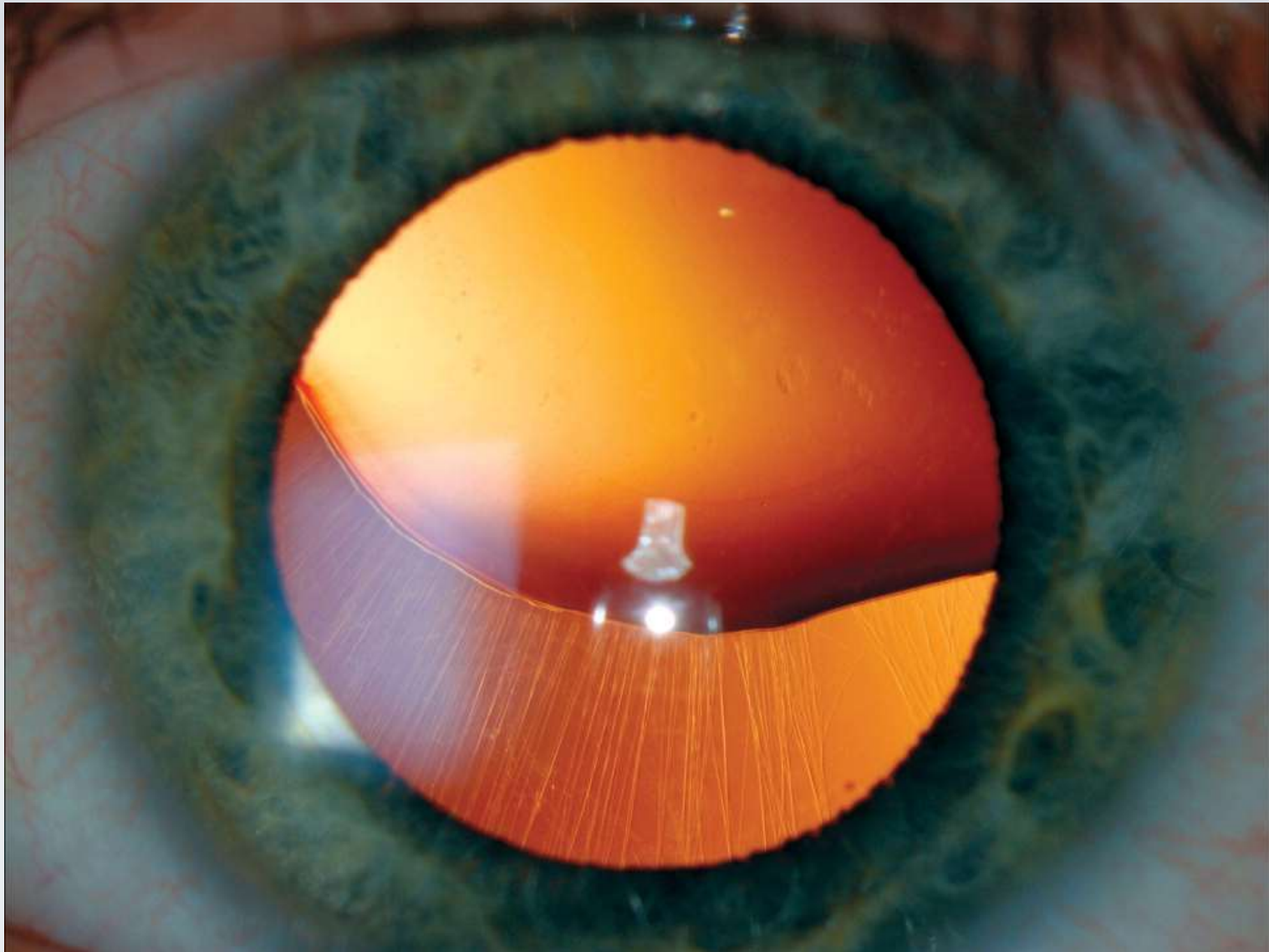
Posterior subcapsular cataract



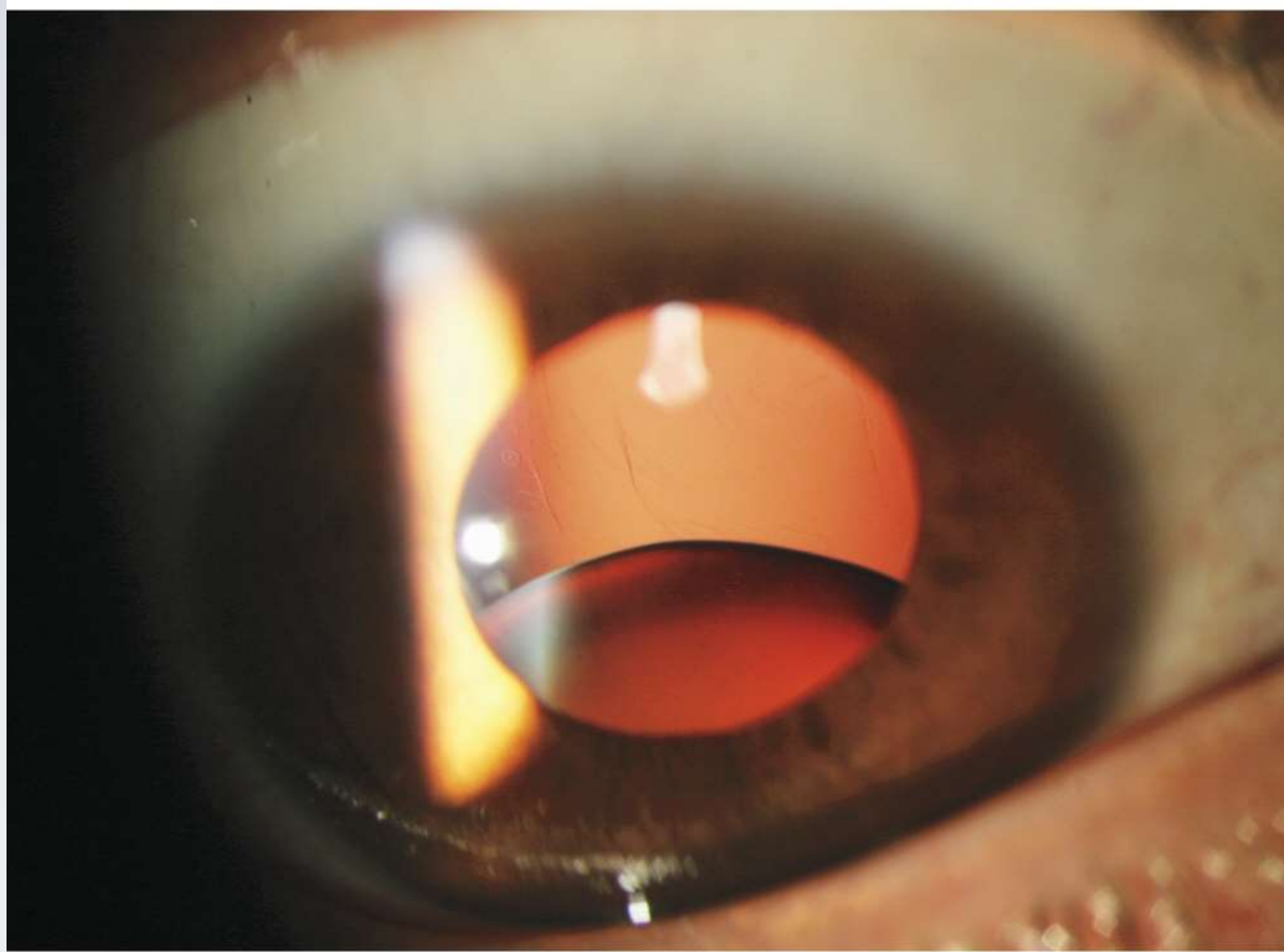
Cortical cataract



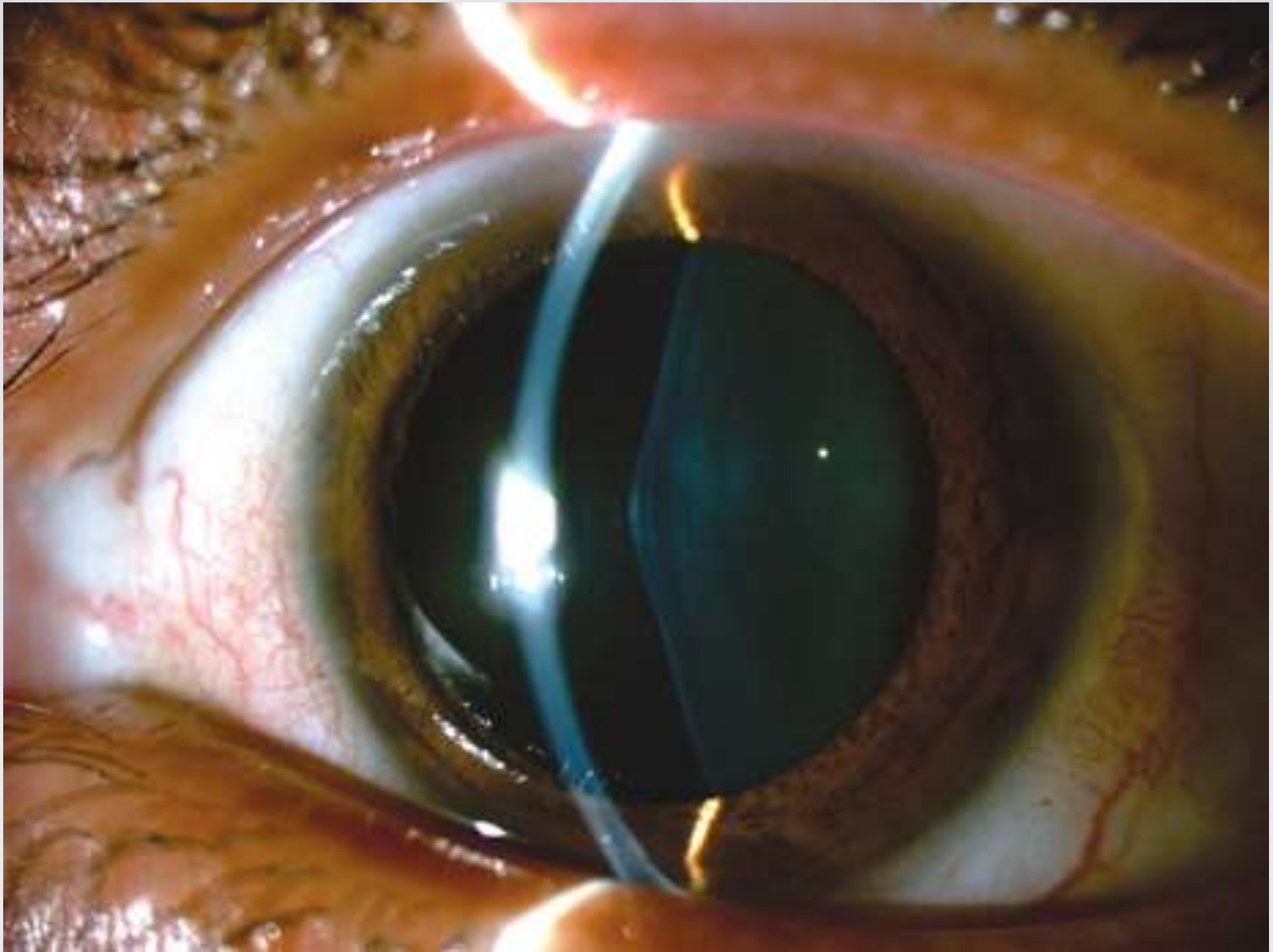
Mature cataract



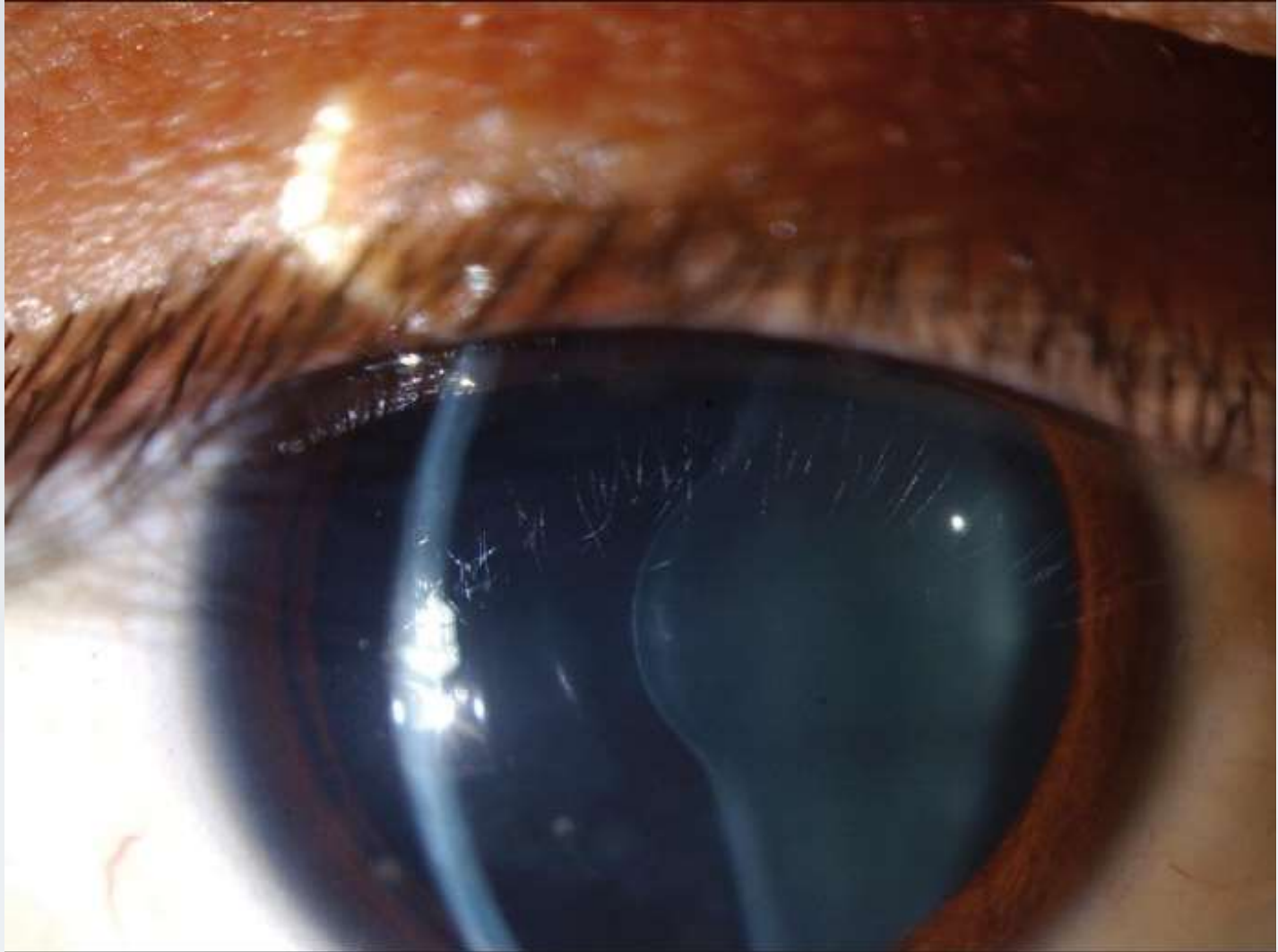
Superior ectopia lentis



Inferior ectopic lentis



Anterior lenticonus



Anterior lenticonus

Vitreous causes

Vitritis :

Infection : **Usually post op** Toxoplasmosis , endophthalmitis
Autoimmune : Behçet disease , Sarcoidosis

Vitreous hemorrhage :

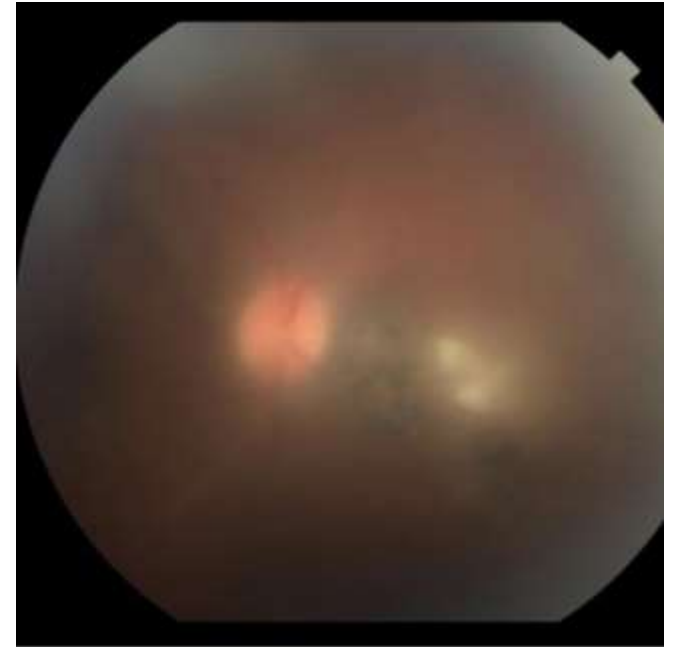
Traumatic **Usually unilateral could be painful or painless**

Non traumatic

Complicated PVD

Retinal neovascularization (NVDs ,NVEs)

Choroidal neovascularization (AMD)



Toxoplasm retinochoroiditis

Endophthalmitis (usually following cataract surgery)

Infection of all ocular fluids

Associated with secondary retinitis & vasculitis

Unilateral very painful visual impairment associated with ciliary blush, hypopyon, and corneal edema

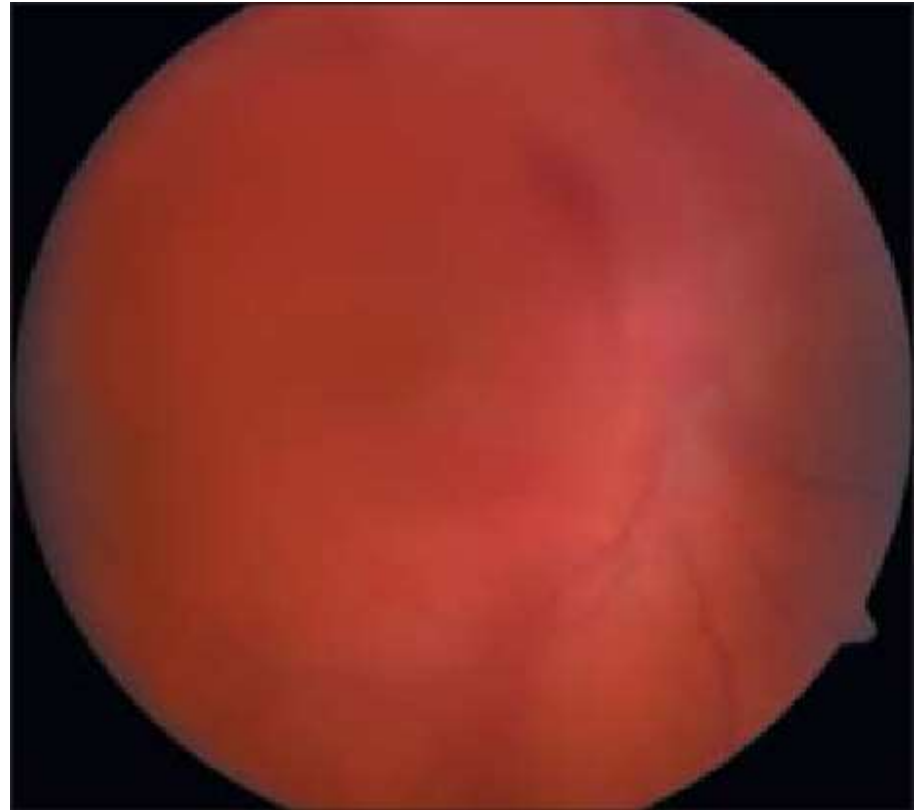
The hallmark of endophthalmitis is loss of red reflex due to vitritis



Vitreous causes

The reduction in vision is directly proportional to the amount of blood in the vitreous.

If the hemorrhage is dense enough, there may be a decreased red reflex, or the retina may not be visible with ophthalmoscopy



Vitreous hemorrhage

Retinal causes :

Diabetic retinopathy

Retinal vein occlusion (central and branch)

Visual impairment due to macular edema & retinal ischemia

Retinal artery occlusion (central and branch)

Visual impairment due to severe retinal ischemia

Age related macular degeneration (AMD)

Retinal detachment.

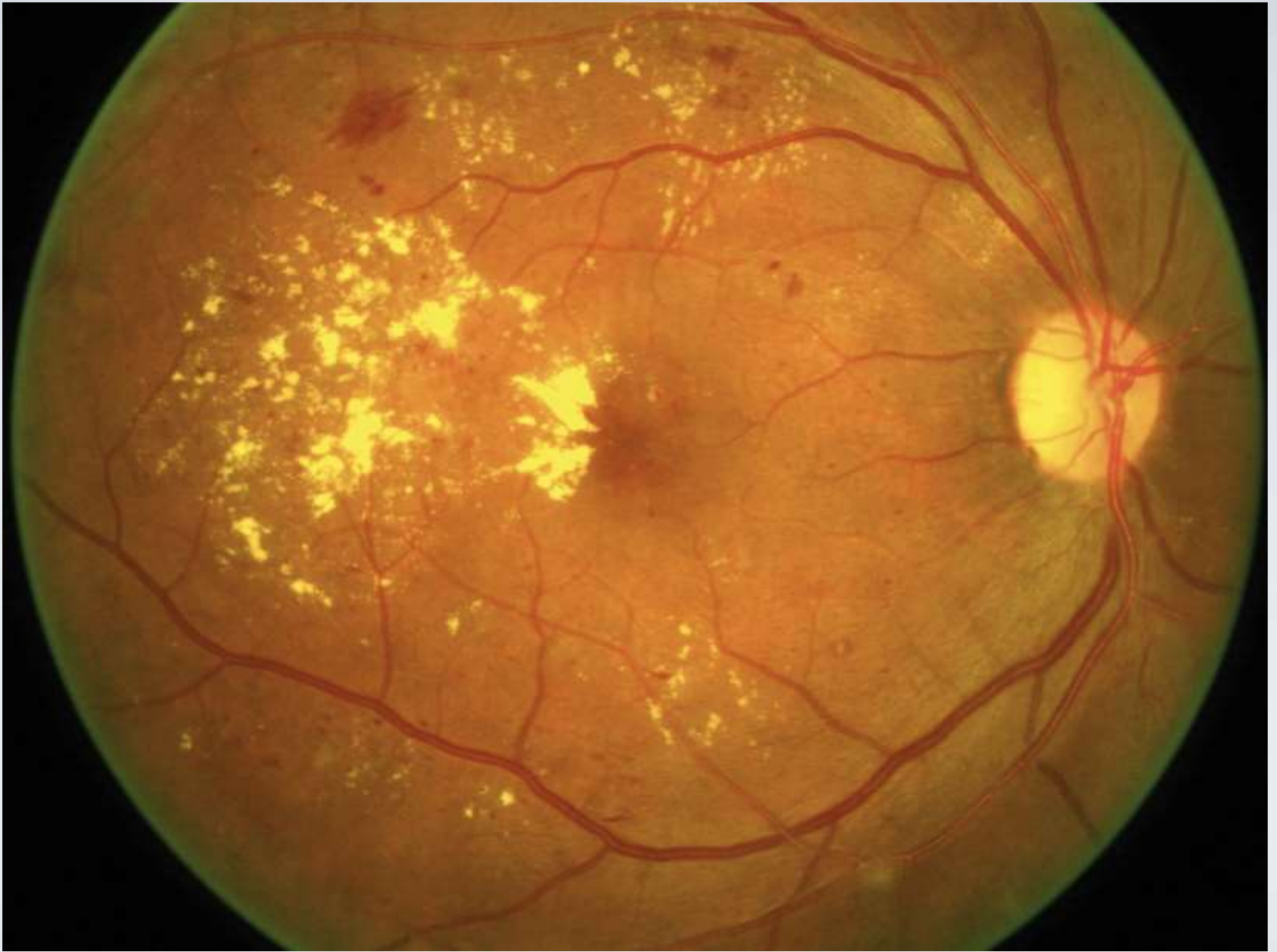
Visual impairment either due to atrophy of the central part of the retina or neovascularization & secondary bleeding

Acquired maculopathies : macular hole, epiretinal membrane

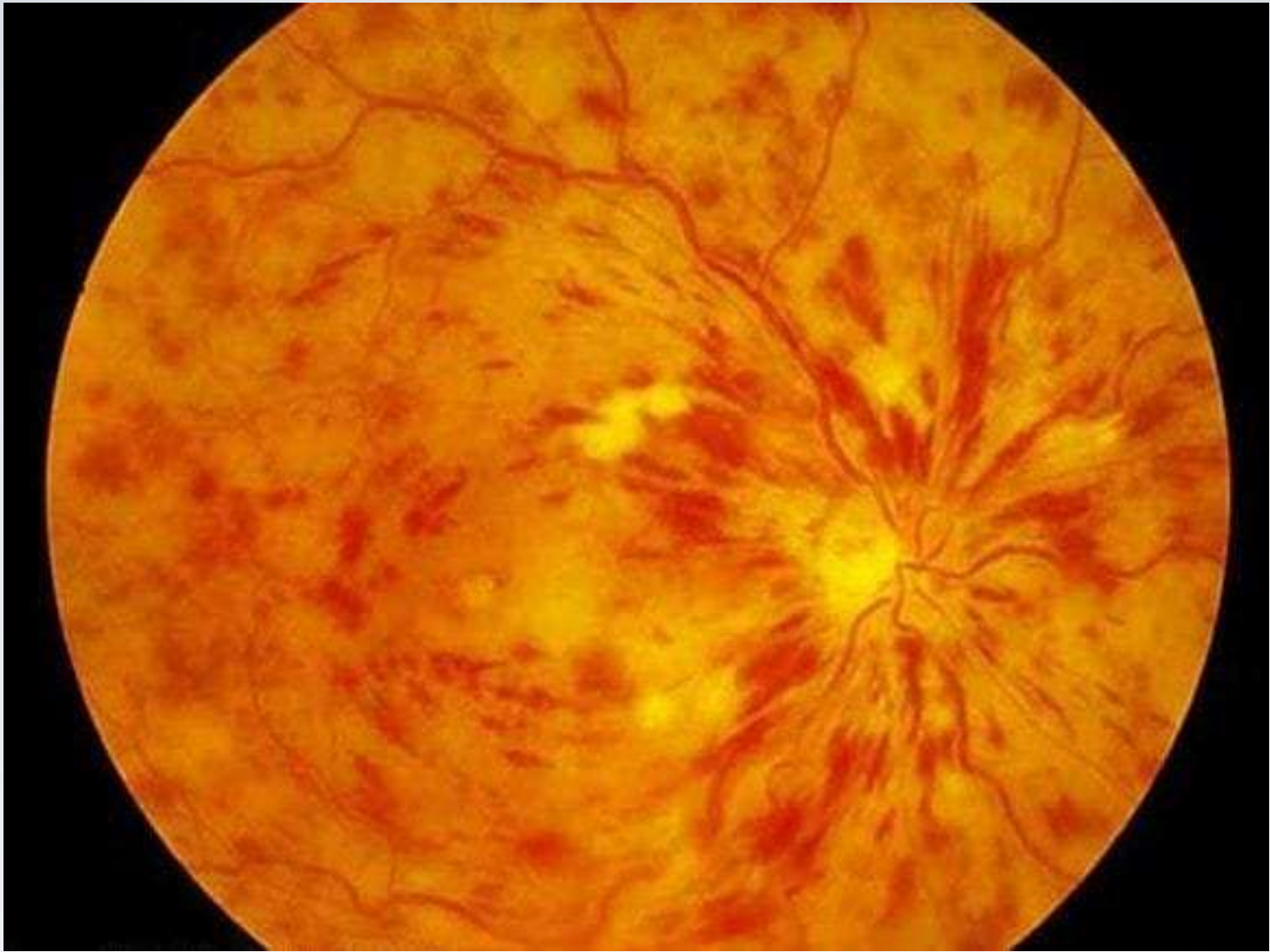
Posterior uveitis

Retinal dystrophies (Retinitis pigmentosa)

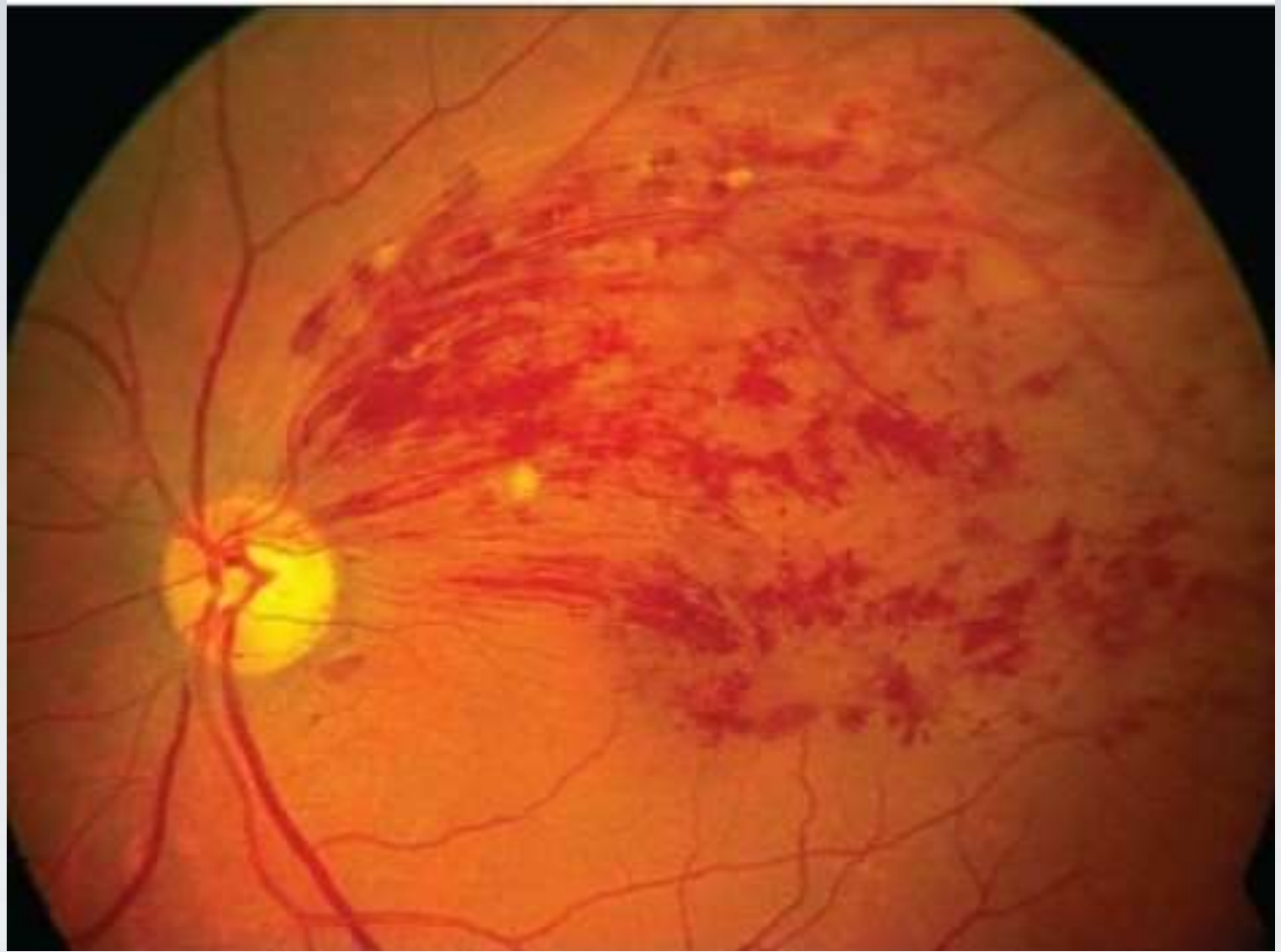
Macular dystrophies (Stargardt's disease)



Diabetic maculopathy



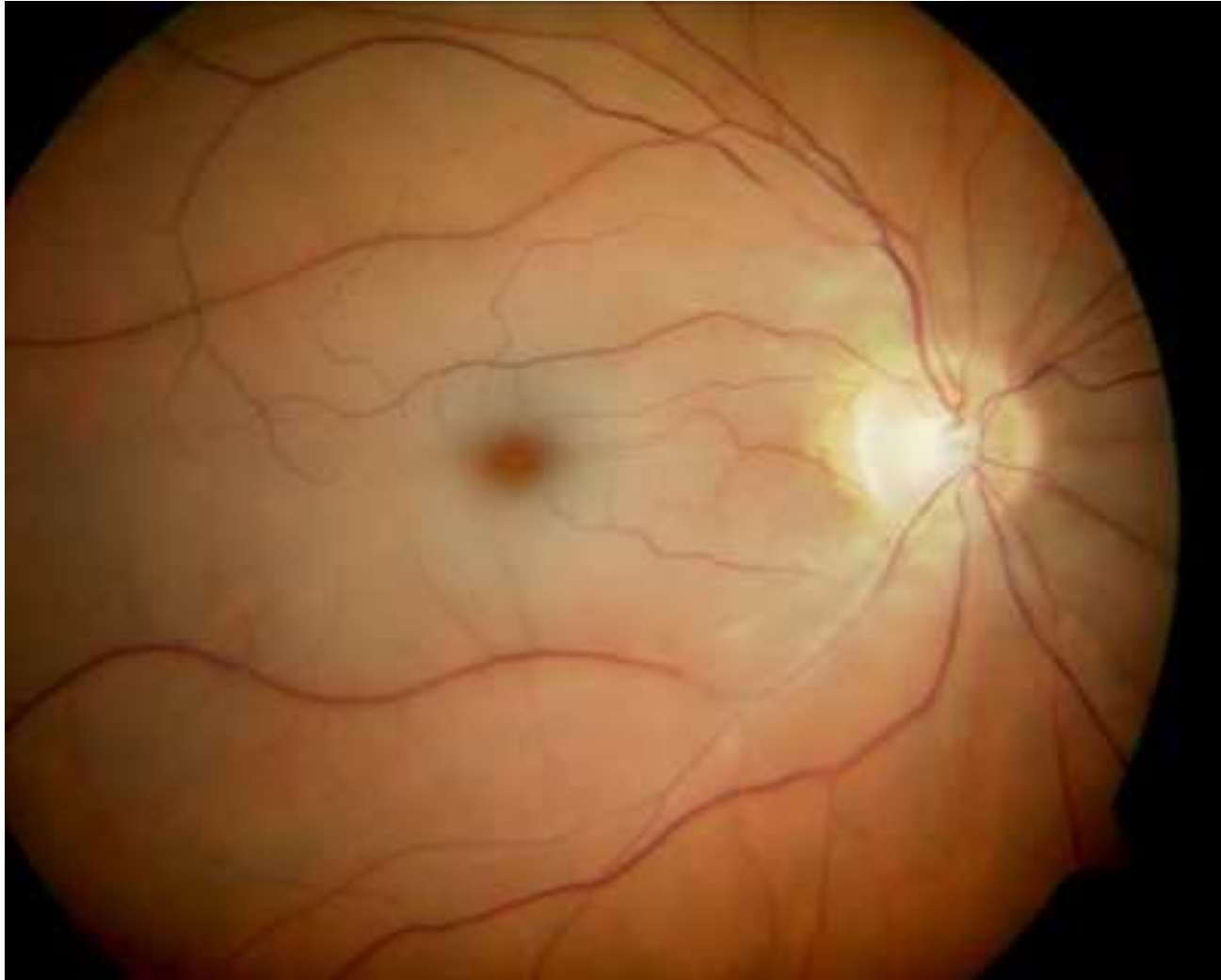
Central retinal vein occlusion



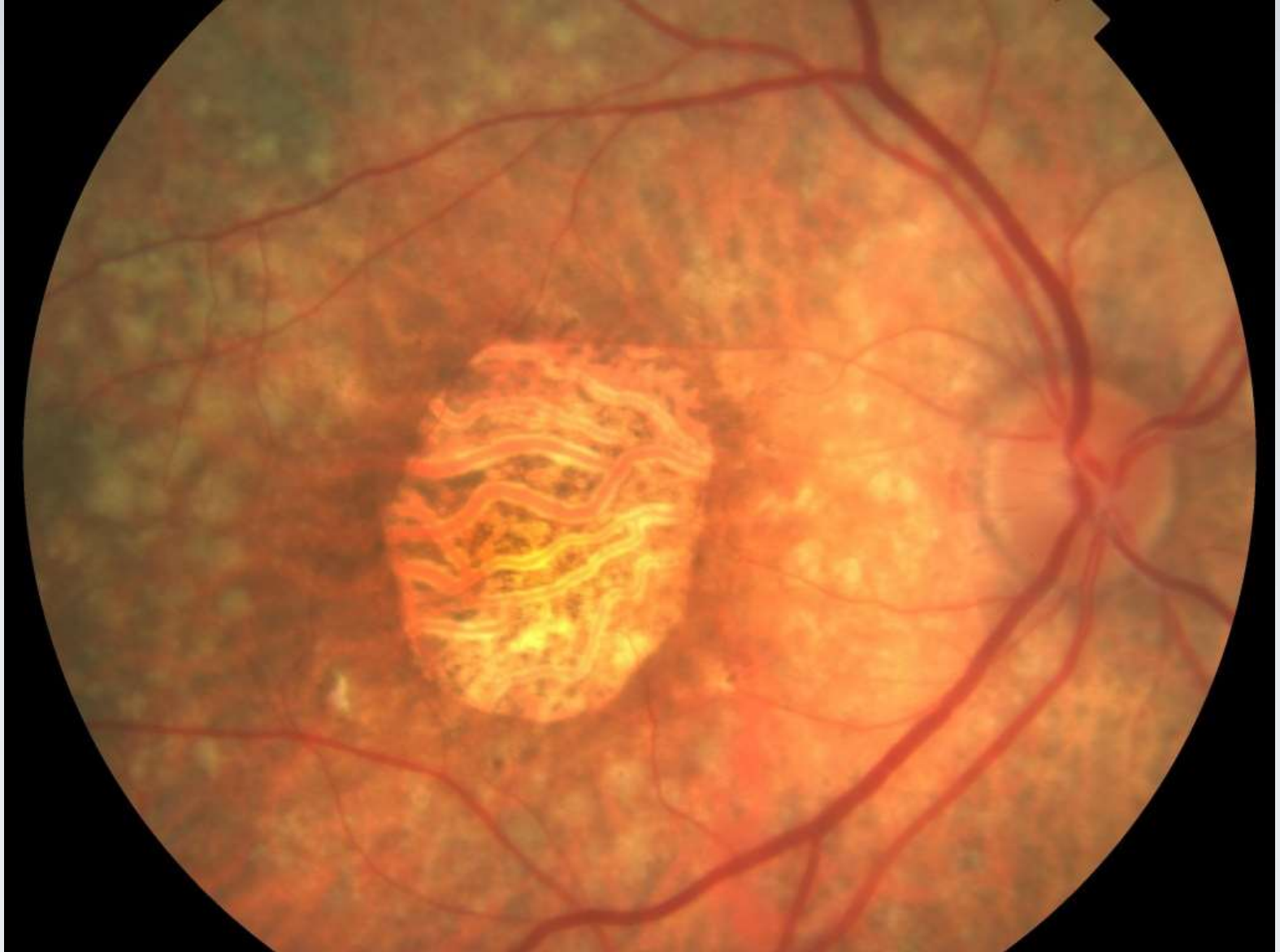
Branch retinal vein occlusion



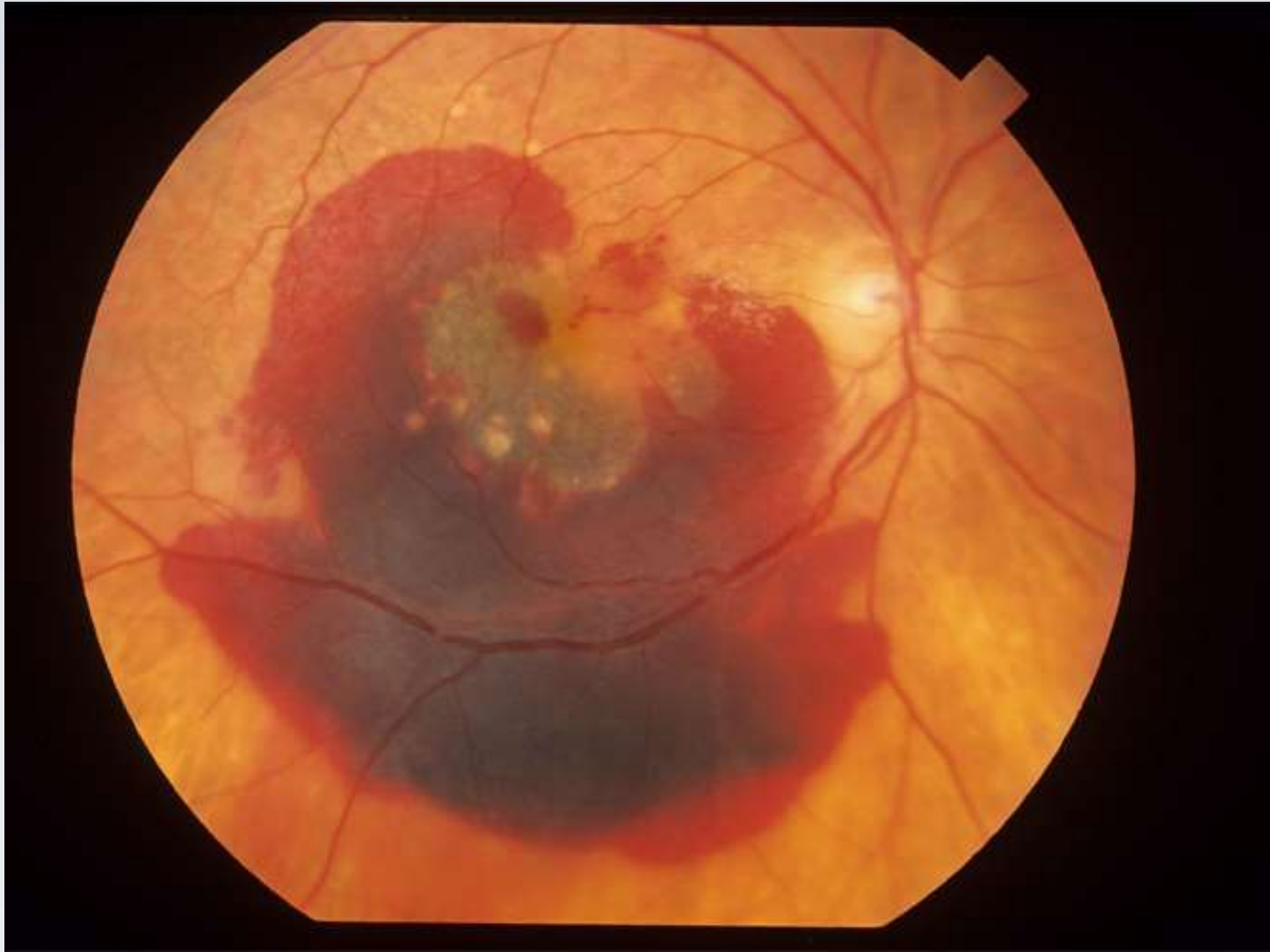
Central retinal artery occlusion



Central retinal artery occlusion

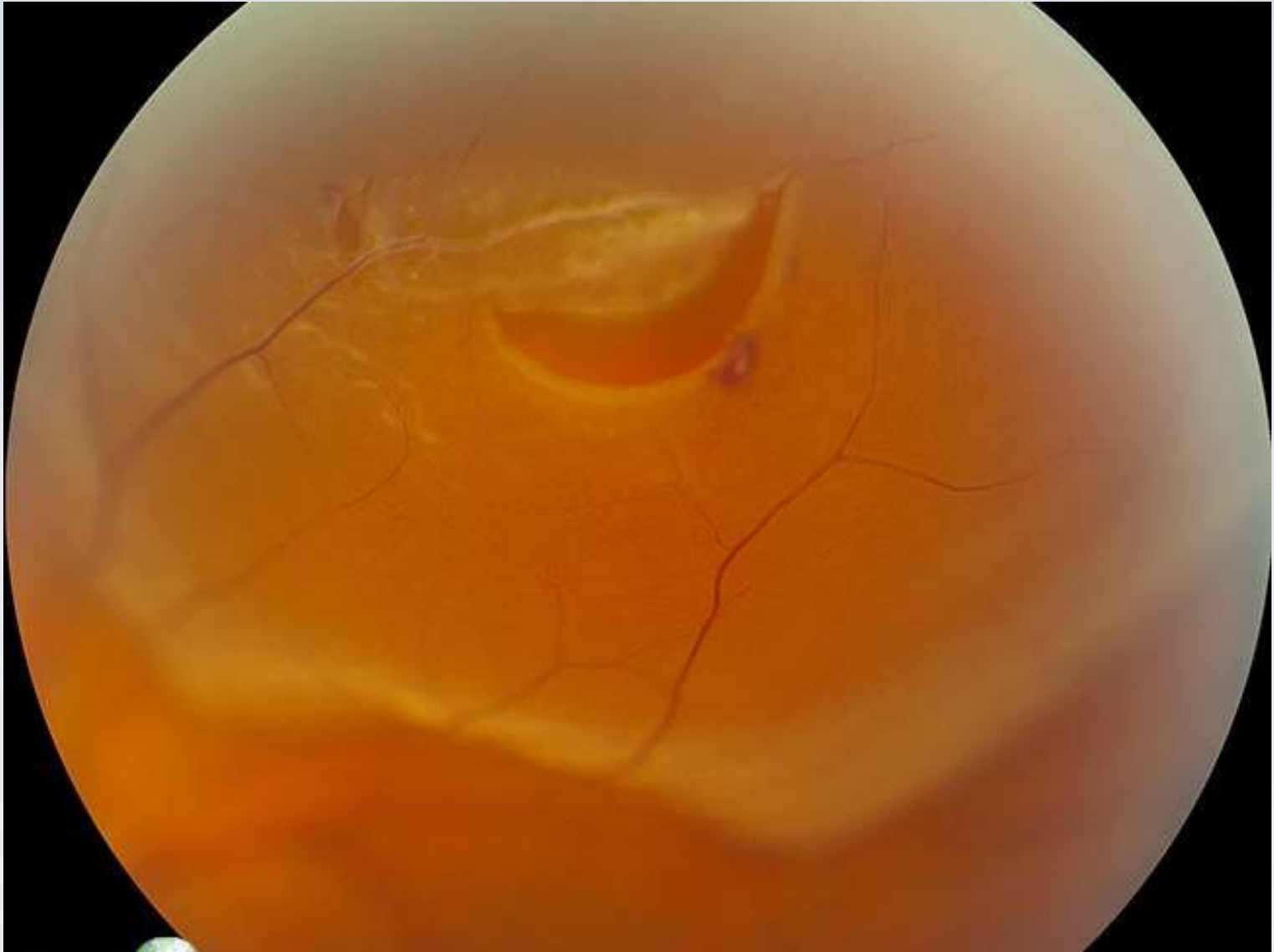


Atrophic age related macular degeneration

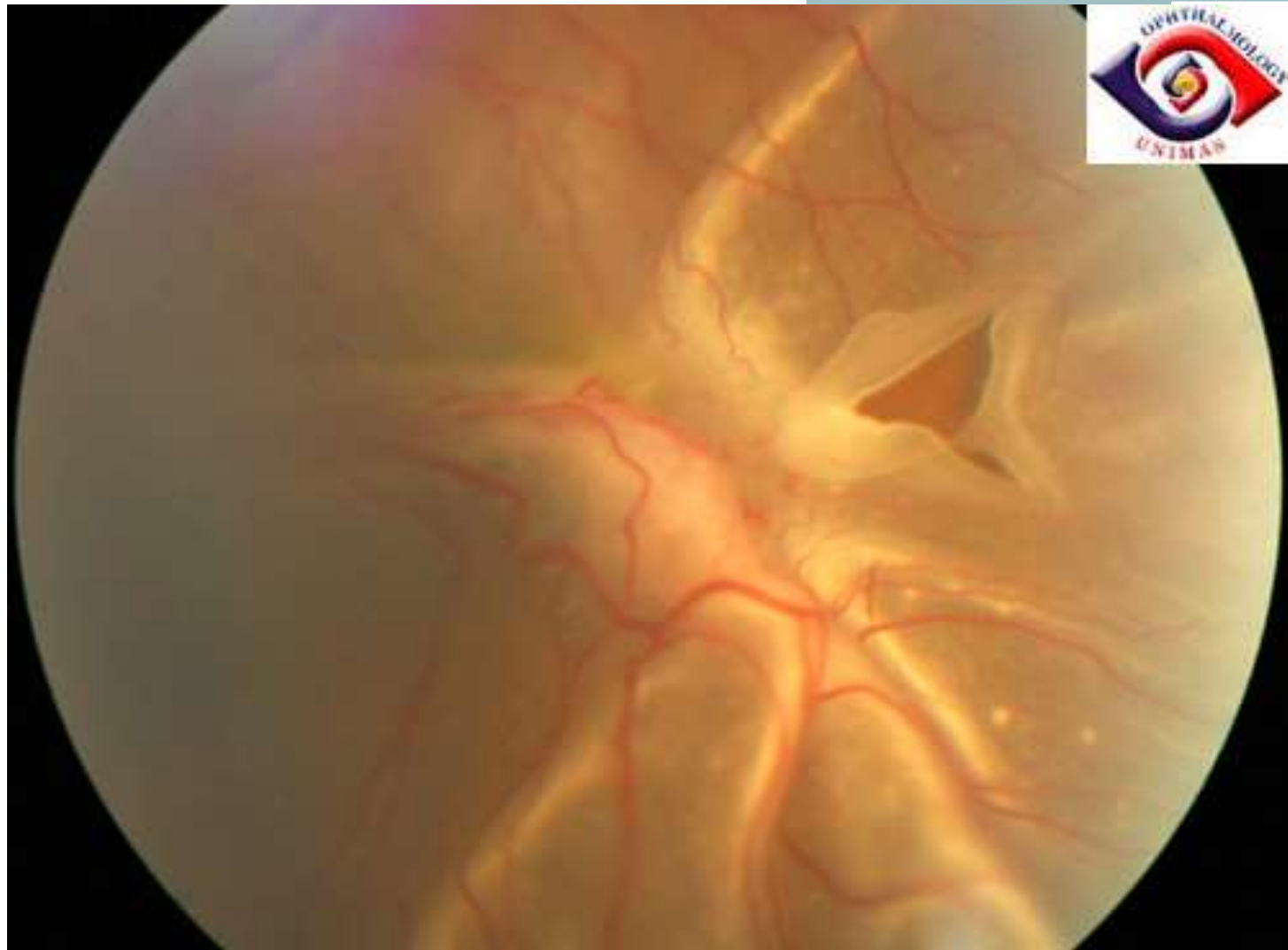


Wet age related macular degeneration

- **Retinal detachment** — Detachment of the neurosensory retina may occur spontaneously or in the setting of trauma. The most common form is due to a tear or break in the retina. Patients may describe sudden onset of new floaters or black dots in their vision, often accompanied by flashes of light (photopsias). In its early stages, a detachment may present as a persistent missing portion of the monocular visual field. Once the macula (central retina) has become involved, visual acuity will be severely compromised.
- Retinal detachment is ***not painful*** and does not cause a red eye. There may be a dulling of the red reflex, and ophthalmoscopic examination may reveal the retina to be elevated with folds. If the detachment is extensive, there may be a relative afferent pupillary defect

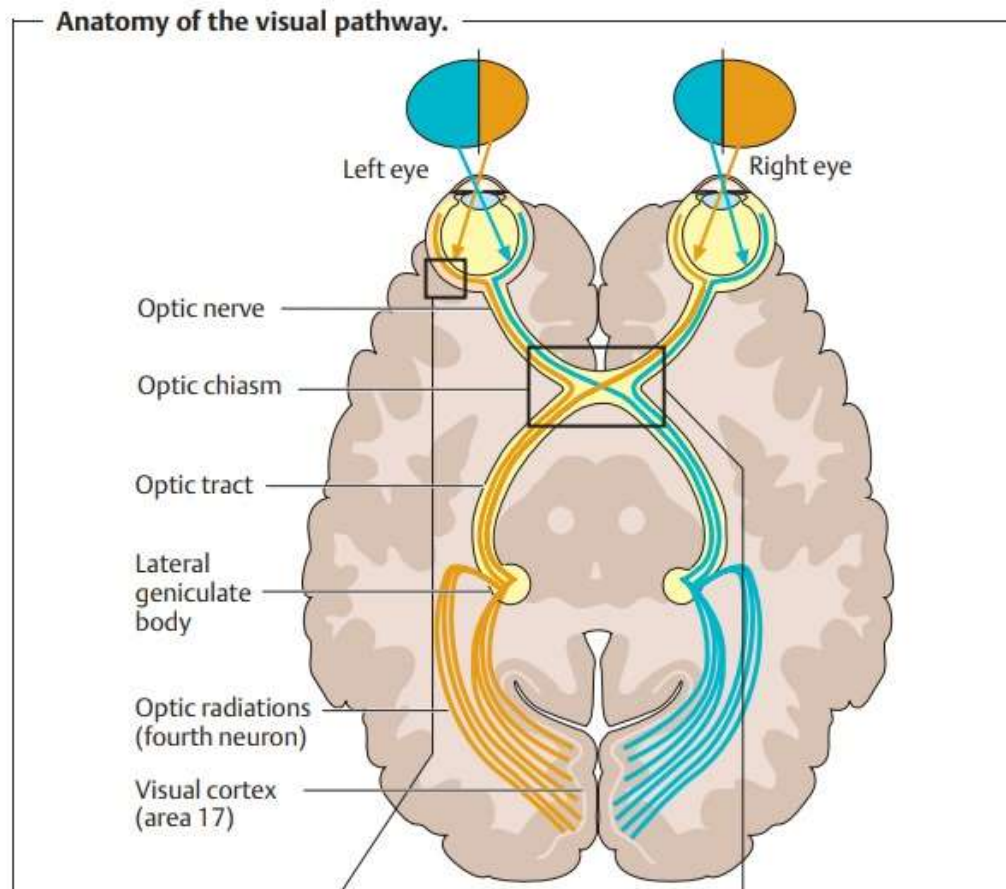












Rhegmatogenous retinal detachment



Rhegmatogenous retinal detachment

Virtual pathway problems:



| | Left | Right | |
|----|---|---|---|
| 1 | Optic nerve | | |
| 1a |  |  | Superior arcuate scotoma <i>e.g. glaucoma</i> |
| 1b |  |  | Inferior arcuate scotoma <i>e.g. glaucoma</i> |
| 1c |  |  | Centrocaecal scotoma <i>e.g. B12 deficiency optic neuropathy</i> <i>Leber's optic neuropathy</i> |
| 1d |  |  | Superior altitudinal defect <i>e.g. aion or pion</i> |
| 1e |  |  | Inferior altitudinal defect <i>e.g. aion or pion</i> |

Optic nerve problems:

1. Optic neuritis.
2. Ischemic optic neuropathy
3. Papilledema.

Optic nerve problems

- Optic neuritis is the most common cause of optic nerve disease in younger adults.
- Ischemic optic neuropathy is the most common etiology in older patients.

Optic neuritis :

Inflammation of the optic nerve may be associated with a variety of conditions, most notably multiple sclerosis.

Optic neuritis is the presenting feature in 15 to 20 percent of patients with multiple sclerosis, and it occurs at some time during the course of the disease in 50 percent of patients

Affected patients note pain on eye movement, reduced visual acuity and color desaturation (washed out color)

Relative afferent pupillary defect (RAPD) is typically present, and the optic disc is normal in retrobulber lesions

Ischemic optic neuropathy :

Ischemic optic neuropathy is generally categorized as :

Anterior (affecting the optic disc) vs posterior (retrobulbar)

Arteritic vs Nonarteritic

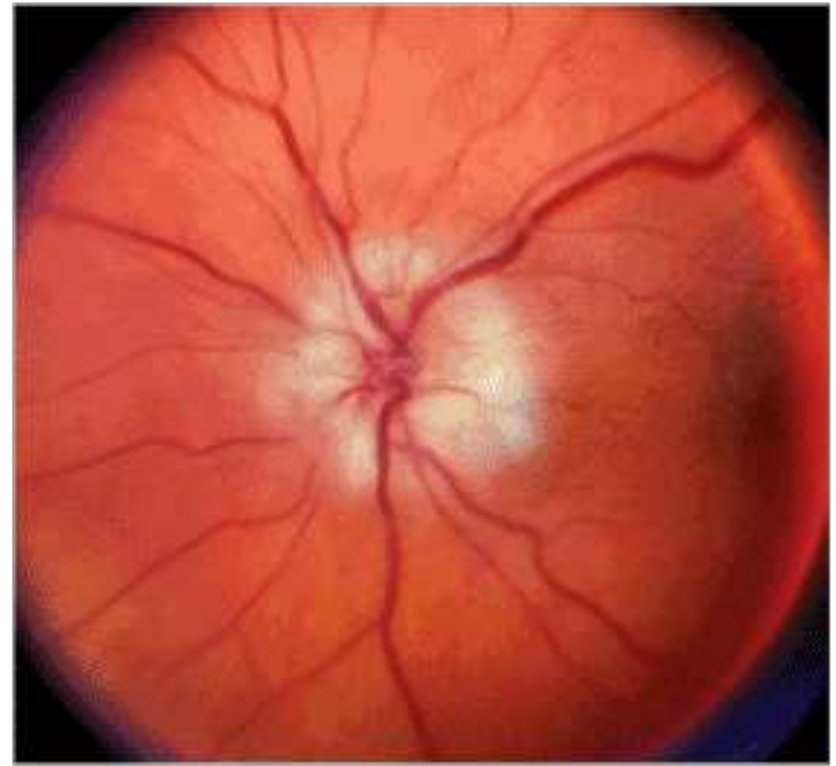
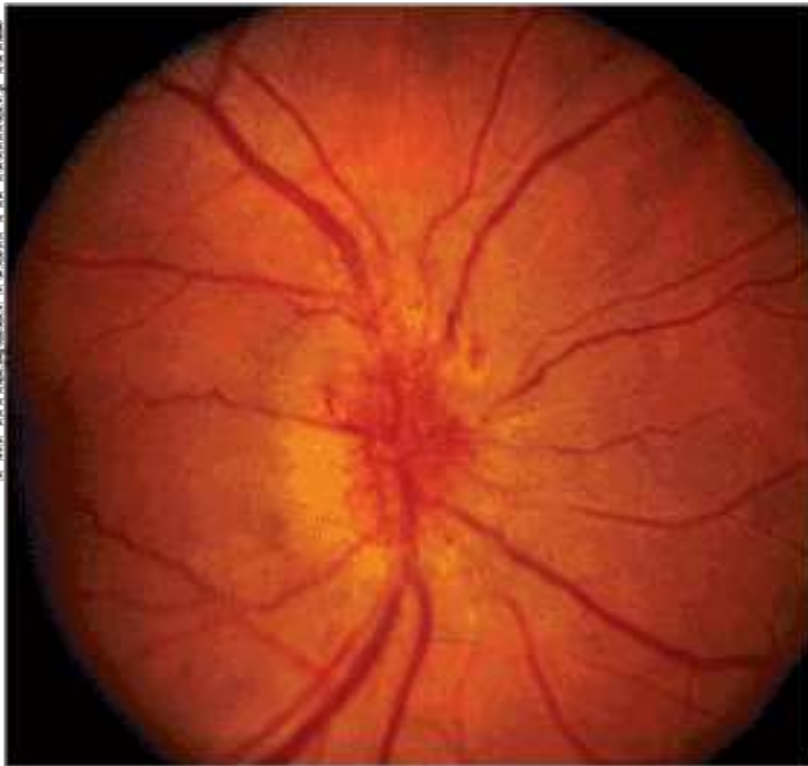
Presentation :

Unilateral , sudden , painless vision loss and color desaturation

Signs:

Relative afferent pupillary defect (RAPD)

Optic disc swelling



Left: Nonarteritic anterior ischemic optic neuropathy. Note the hyperemic swelling of the optic disc associated with the flame-shaped peripapillary hemorrhage. Right: Arteritic anterior ischemic optic neuropathy. Note the pallid swelling of the optic disc and a peripapillary cotton-wool spot.

Papilledema :

Bilateral optic disc swelling secondary to increased intracranial pressure

Can lead to transient visual obscurations or mild persistent blurred vision.

Examination reveals bilateral optic nerve swelling without relative afferent papillary defect.

Visual obscurations :

Are **transient** losses (“graying out”) of **vision** lasting a few seconds, occurring in the context of raised intracranial pressure (ICP), and especially associated with activities known to elevate ICP (coughing, sneezing, bending down, straining at stool) and relieved by their cessation

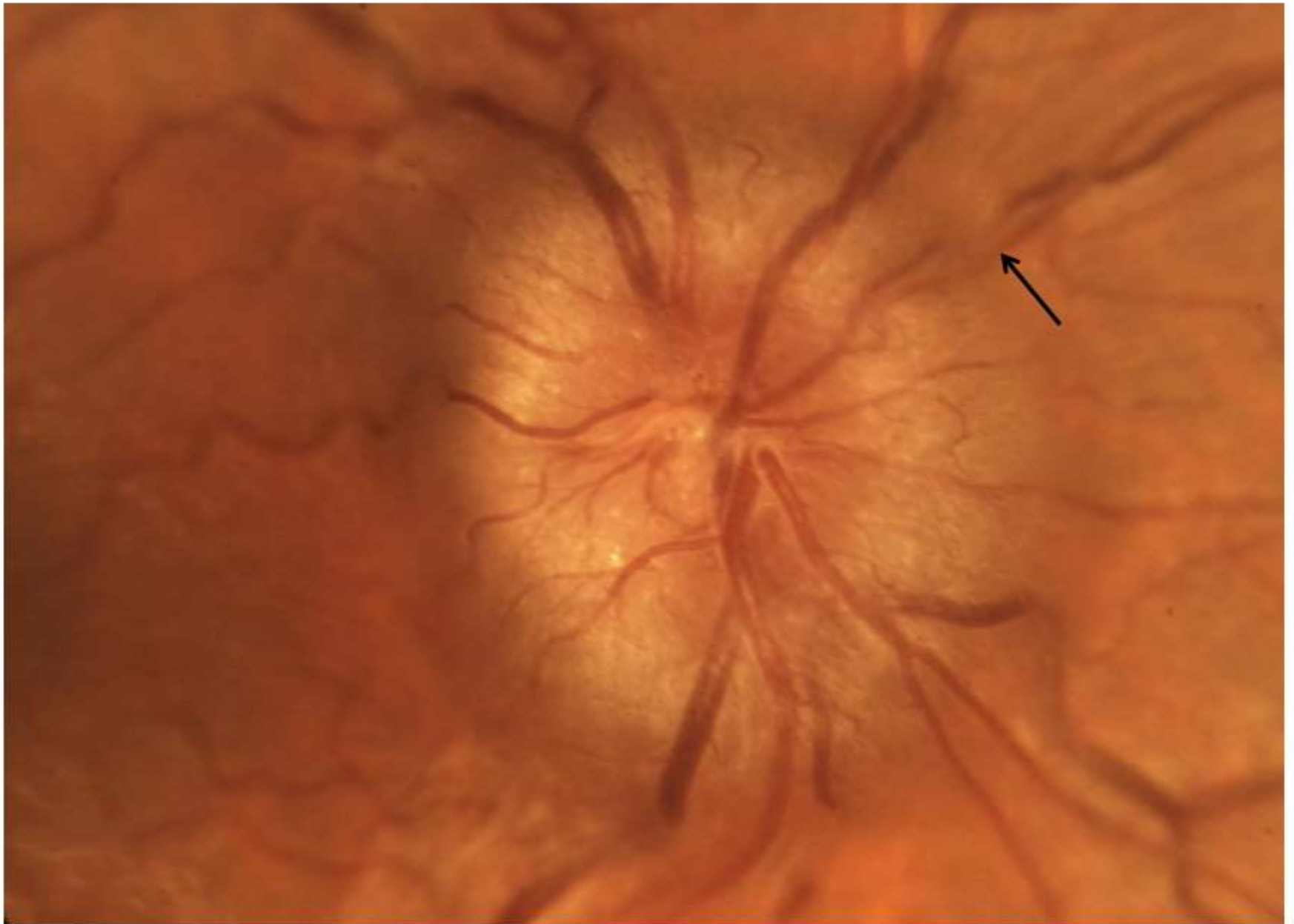
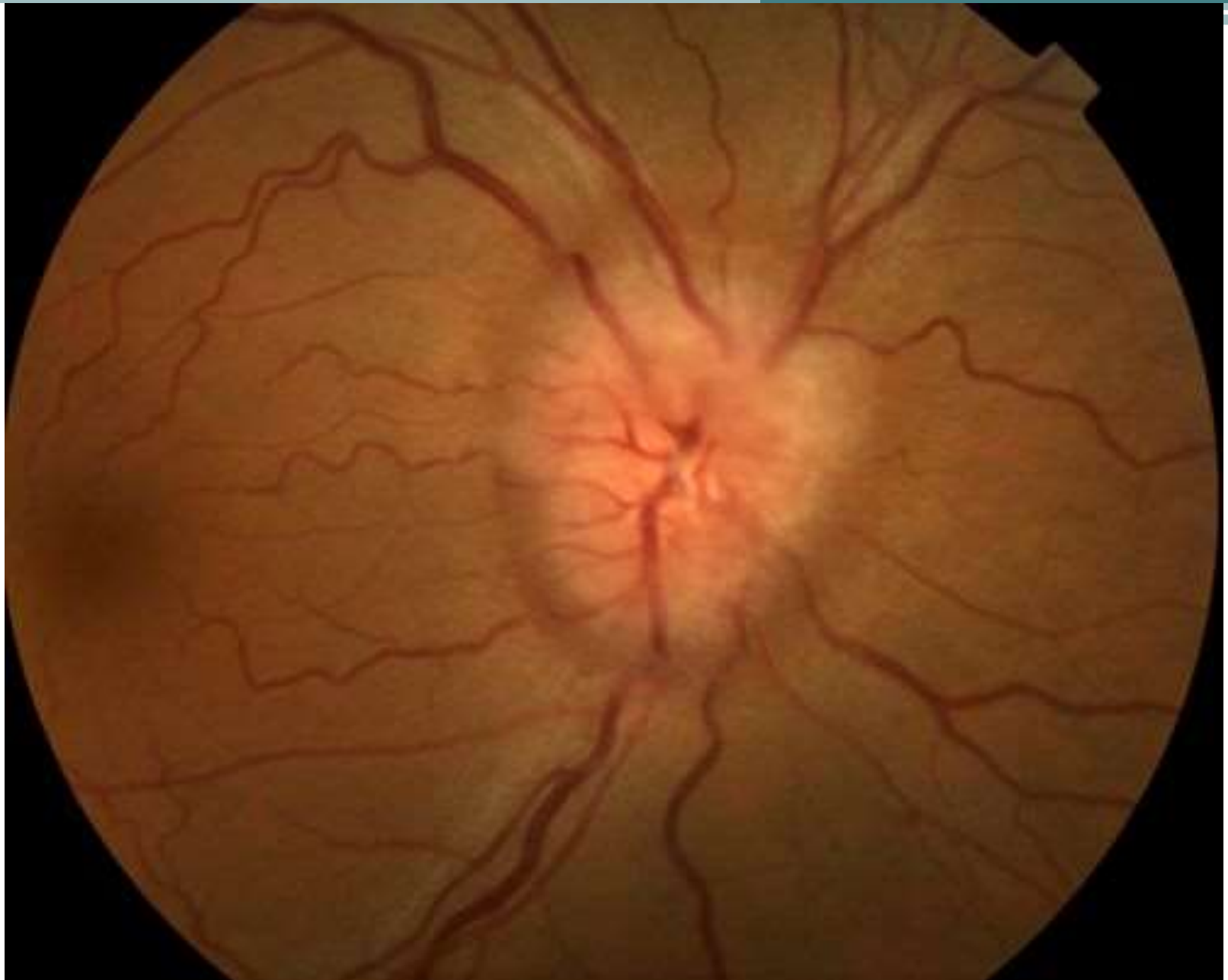
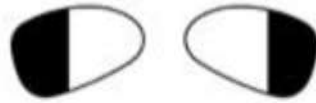


Figure 8. Grade III papilledema is characterized by Loss of major vessels as they *leave* the disc (arrow).



Chiasm



Bitemporal hemianopia

i.e. pit tumour, chiasmal glioma, meningioma, sarcoidosis, MS, abscess

Optic tract



Incongruous left homonymous hemianopia

optic tract lesion, i.e. glioma, MS, metastasis

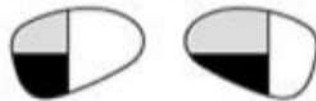
Meyer's loop



Left superior quadrantanopia

i.e. temporal lobe lesion ('pie in the sky')

Parietal lobe fibres



Left homonymous hemianopia

denser below, i.e. parietal lobe lesion (mnemonic LP = lower parietal)

Posterior optic radiation



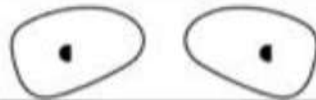
Congruous left hemianopia

Deep occipital cortex



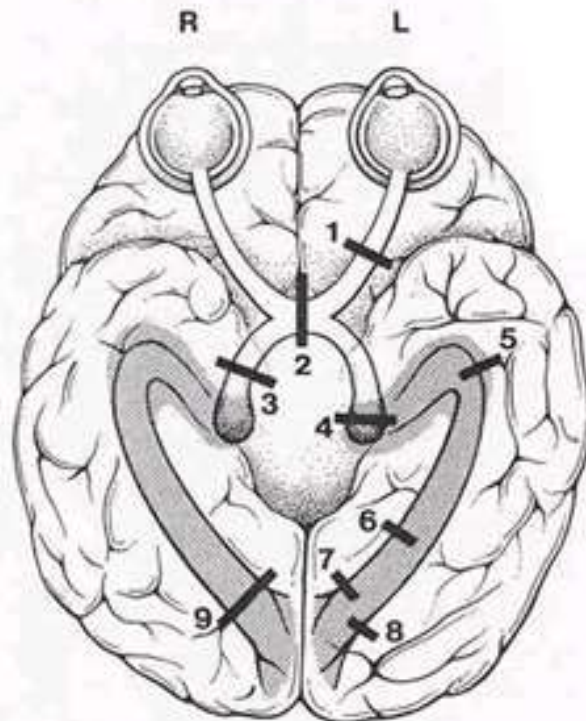
Left homonymous hemianopia with macular sparing, e.g. SOL, MS, trauma, vasculitis

Macular fibres at occipital cortex



Central scotomatous left hemianopia, e.g. SOL, MS, trauma, vascular

Anatomy of the visual pathways and visual field correlation (view of underside of brain)



| Location | Field Defect | | Comment |
|------------------------------------|--------------|-----------|--|
| | Left Eye | Right Eye | |
| 1 Left Optic Nerve | | | No light perception left eye |
| 2 Chiasm | | | Bitemporal hemianopsia |
| 3 Right Optic Tract | | | Incongruous left homonymous hemianopia |
| 4 Left Lateral Geniculate Nucleus | | | Right homonymous sectoranopia (lateral chorioidal artery) - or - Incongruous right homonymous hemianopia |
| 5 Left Temporal Lobe | | | Right homonymous upper quadrant defect ("pie in the sky") |
| 6 Left Parietal Lobe | | | Right homonymous defect, denser inferiorly |
| 7 Left Occipital Lobe (upper bank) | | | Right homonymous lower quadrantanopsia (macular sparing) |
| 8 Left Occipital Lobe (lower bank) | | | Right homonymous upper quadrantanopsia (macular sparing) |
| 9 Right Occipital Lobe | | | Left homonymous hemianopia (macular sparing) |

Thank you