

# Loss of Vision



# 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  
↳ distant acuity chart

## **Near vision impairment :**

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

ALO

## 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)

↳ only number to memorize

only know that visual impairment is on spectrum

RW

## 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	

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

*ex: cataract, diabetic retinopathy, glaucoma*

# Sudden visual loss :

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

· <sup>< 24 Hrs</sup>  
depending on etiology

↳ most commonly due to ipsilateral carotid artery stenosis  
or cardioembolic emboli

Vascular :

carotid pathology  
cardioembolic emboli  
GCA  
vasospasm

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

Endothalmitis

Hyphema

Vitreous hemorrhage

Rhegmatogenous retinal detachment

Central and branch retinal artery occlusion

Central and branch retinal vein occlusion

Anterior ischemic optic neuropathy

Optic neuritis



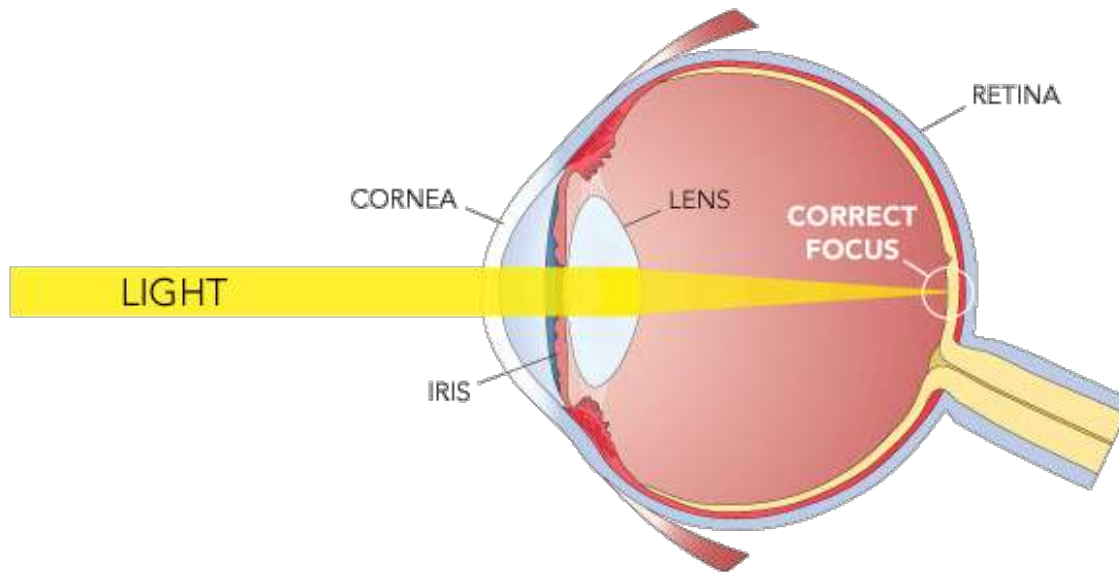
# Etiological Classification

- Uncorrected refractive errors
- Media problems , *ocular media is normally clear & transparent*
- Retinal causes
- Neurological and visual pathway
- Nonorganic (NOVL) or Functional visual loss ((FVL)

*if not any of these ⇒ non organic or functional vision loss, which means the patient is either faking or psychic*

## Uncorrected refractive errors

<sup>(normal)</sup>  
**Emmetropia** :- Parallel rays of light from a distant object are brought to focus on the retina with the eye at rest “not accommodating “

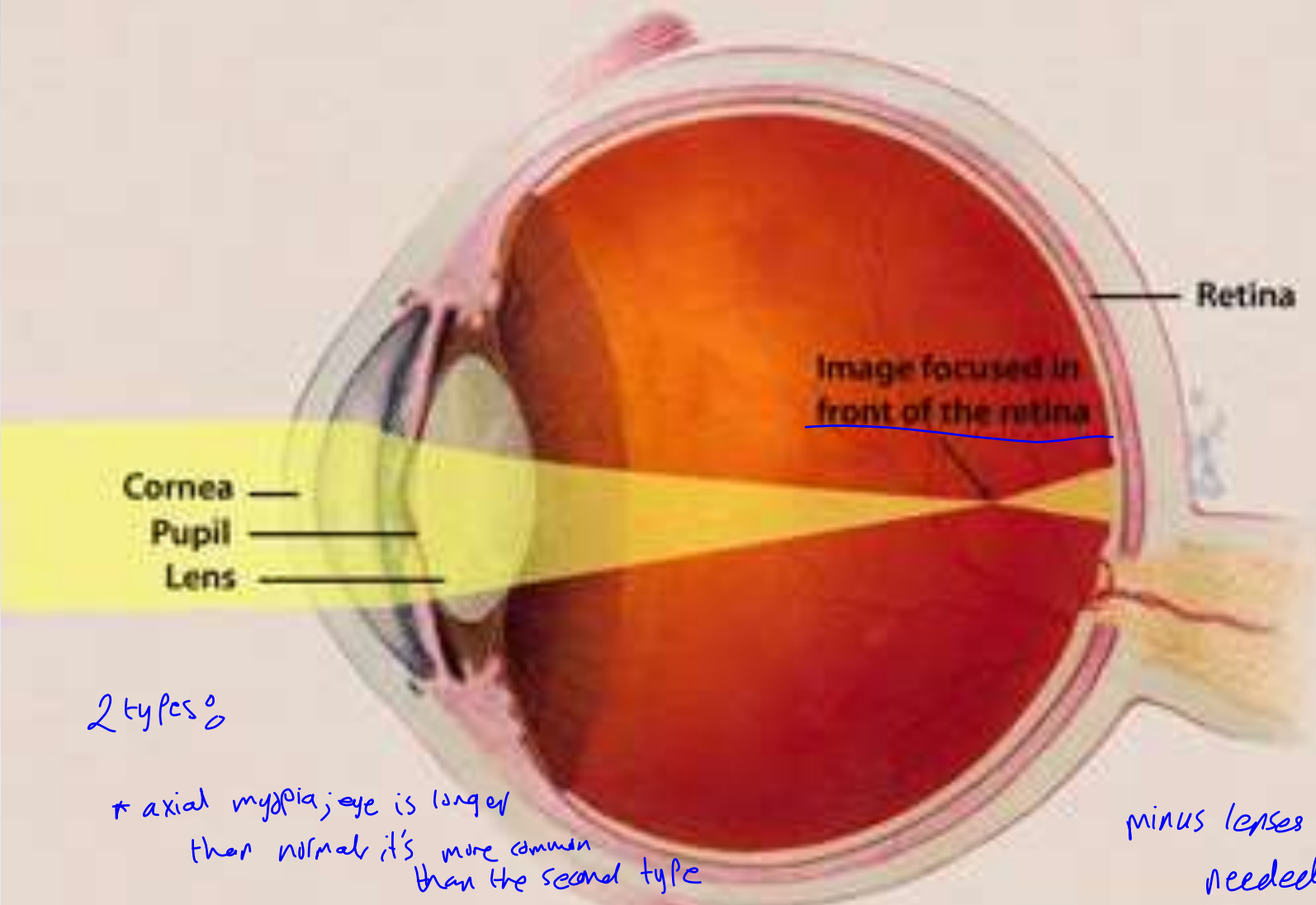


Refractive error or Ametropia occurs when parallel rays of light are not brought to a focus on the retina with the eye at rest “not accommodating

The four most common refractive errors are:

1. Myopia (nearsightedness): difficulty in seeing distant objects clearly → *most common form*
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



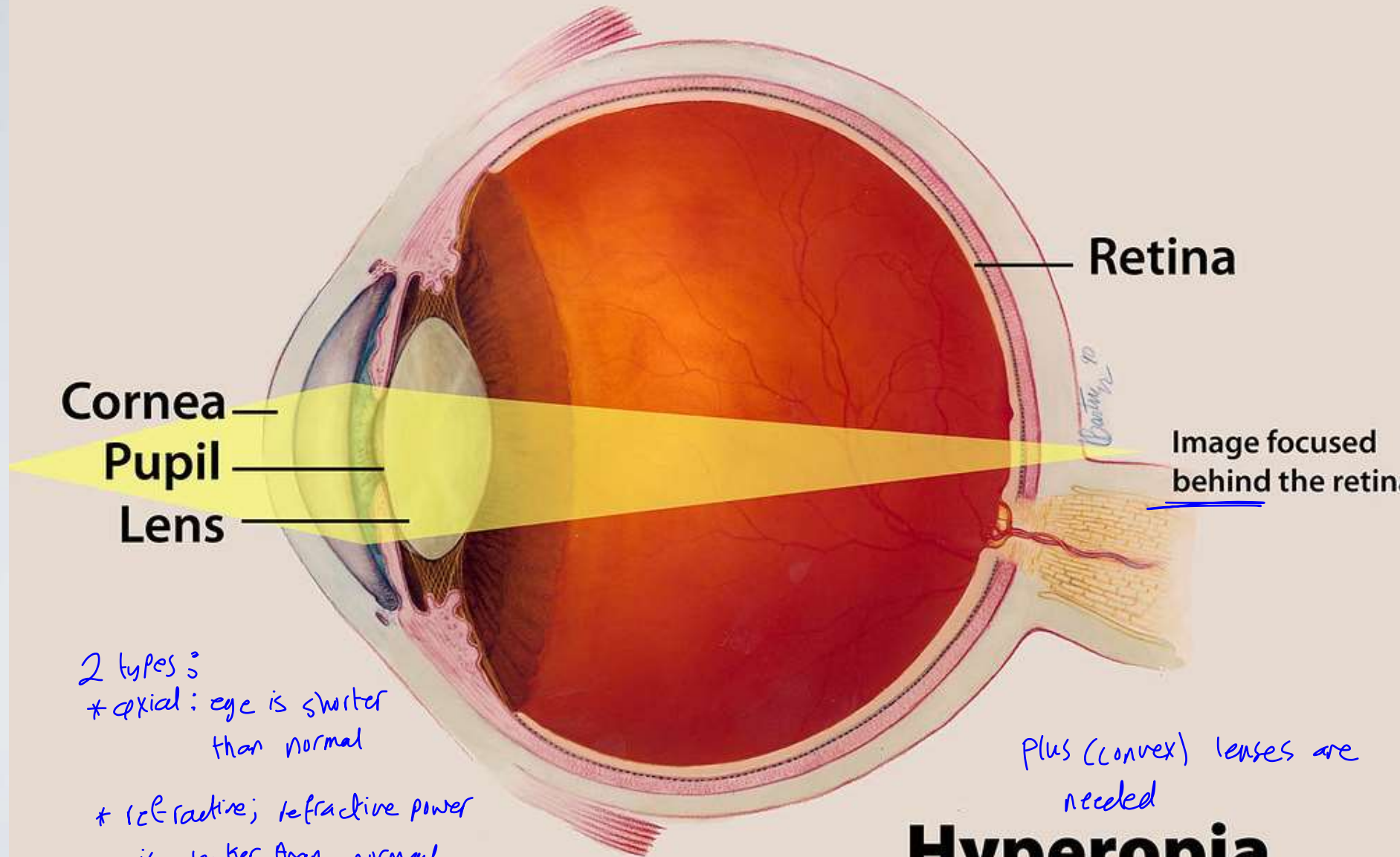
2 types:

\* axial myopia; eye is longer than normal, it's more common than the second type

\* refractive myopia; refractive power of the eye is stronger than normal as keratoconus, ant./post. lenticulus

minus lenses (concave) are needed to correct it.

# Myopia (nearsightedness)



Cornea —  
Pupil —  
Lens —

Retina

Image focused  
behind the retina

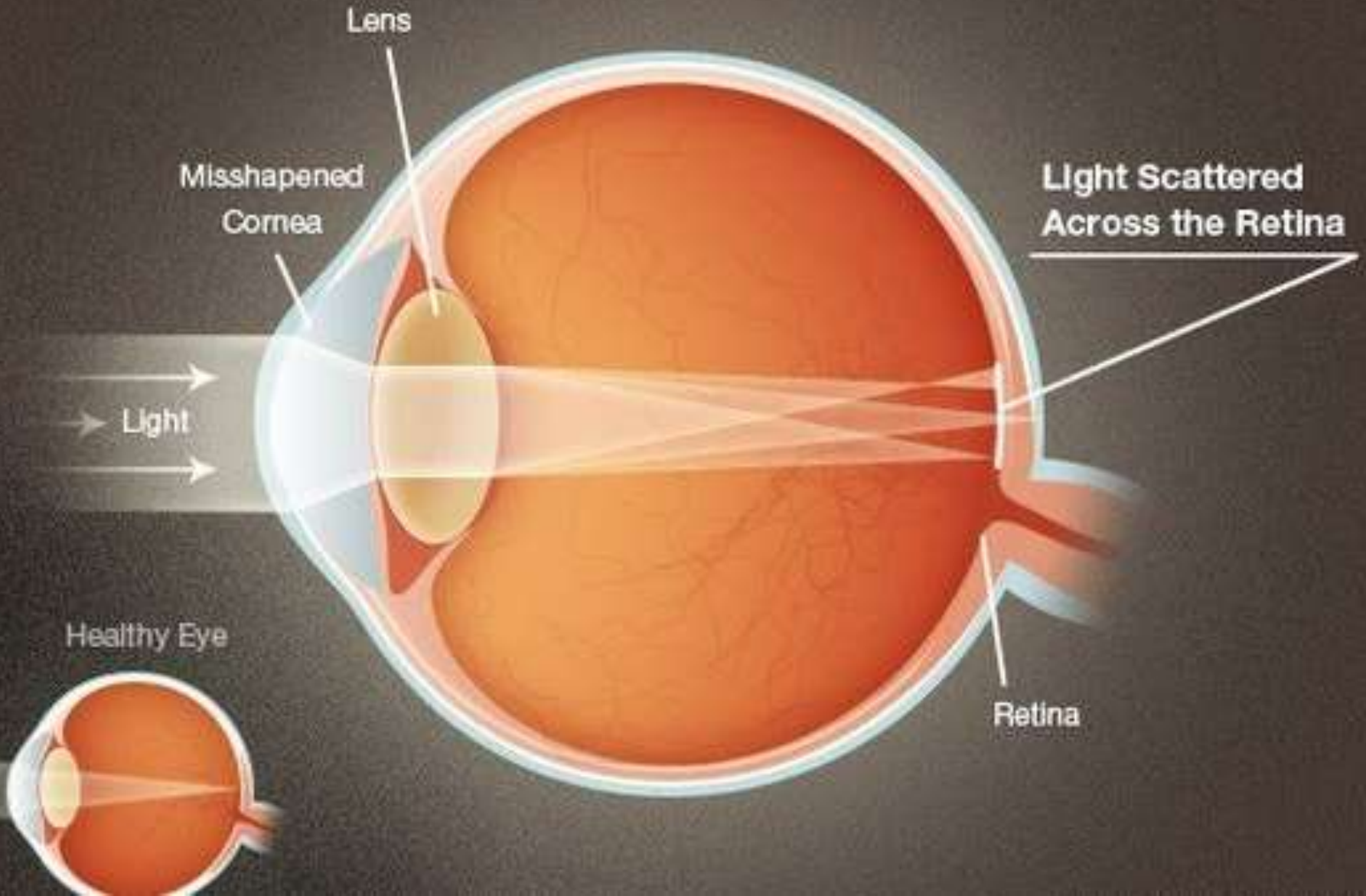
2 types:  
\* axial: eye is shorter than normal  
\* refractive; refractive power is weaker than normal

plus (convex) lenses are needed

# Hyperopia (farsightedness)

# Astigmatism الابورية

*classical ex. → Keratoconus*



# Keratoconus

\*common in Jordan

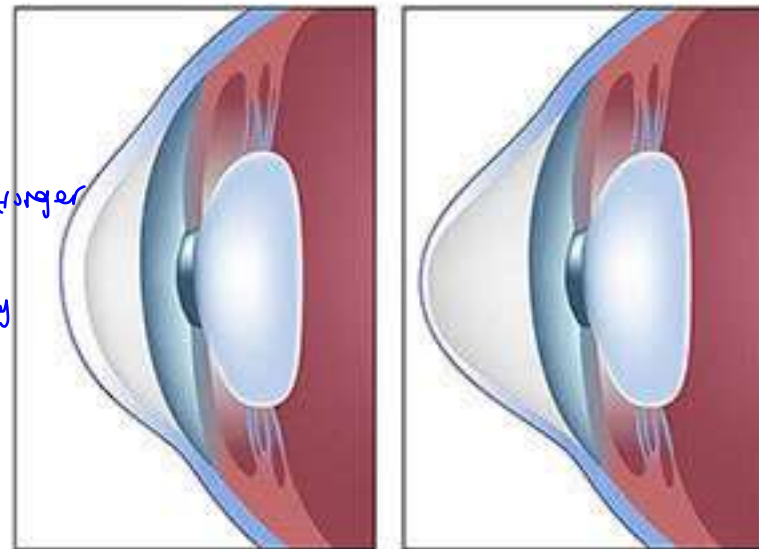
Keratoconus is a progressive corneal thinning involves the central or paracentral parts that results in progressive change in corneal shape which assume a cone shape

Keratoconus cause visual loss secondary to progressive irregular myopic -astigmatism

myopia → refractive stronger  
center is more steeped than periphery  
↓  
astigmatism



Keratoconus



Normal

Keratoconus

bilateral, progressive, painless, asymmetrical visual loss

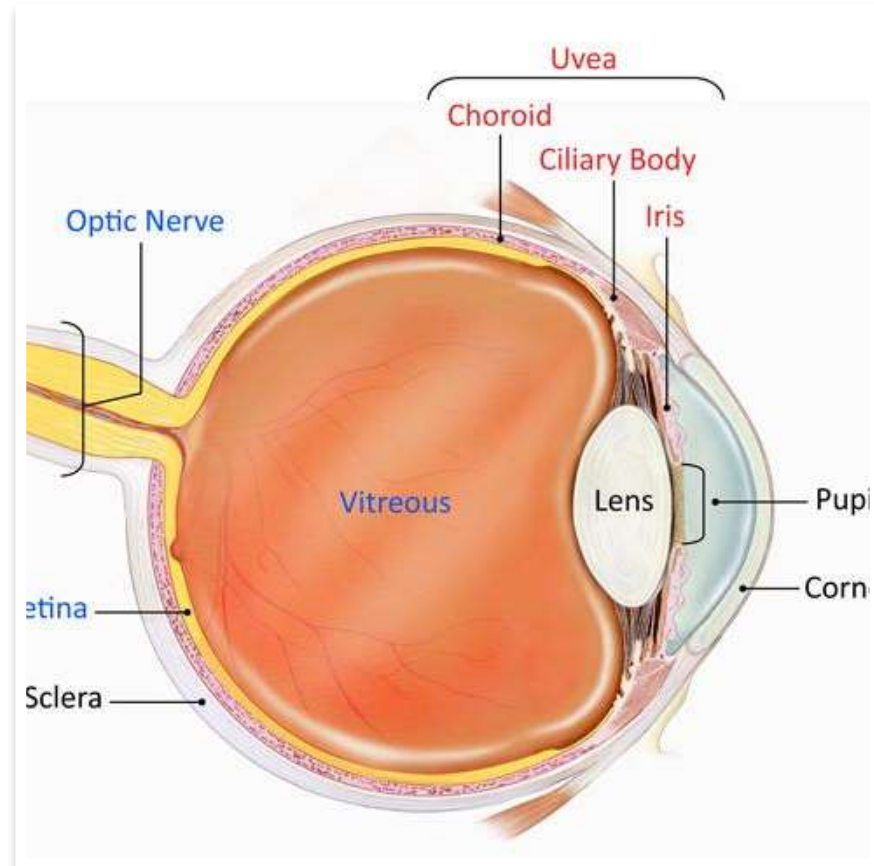
# Media problems

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

→ those structures must be transparent and clear, if those are lost → visual impairment/loss



\* cataract is a classical example on media problem → bilateral, painless, progressive, asymmetrical visual impairment/loss



# Corneal causes

Corneal edema

Corneal scar

Corneal infection (Keratitis) → infection or inflammation

Corneal dystrophies

Corneal degeneration

presenting of acute angle closure glaucoma;

severe visual impairment, severe pain, redness, autonomic symptoms as N/V (due to  $\uparrow$  IOP), usually unilateral



although problem is bilateral

trt: refer to glaucoma (cc.)

usually seen in hyperopic eyes (short eyes)

→ cause of visual impairment is optic neuropathy

in glaucoma in general

exception is acute angle closure glaucoma

the cause is corneal edema

angle closure glaucoma;

① acute; sudden persistent vision loss

② subacute; resolves spontaneously (intermittent) repeated attacks

③ chronic; gradual visual impairment, painless

### Corneal edema

could be due to: - trauma (surgery)

- dysfunction of corneal endothelial cells as for corneal dystrophy

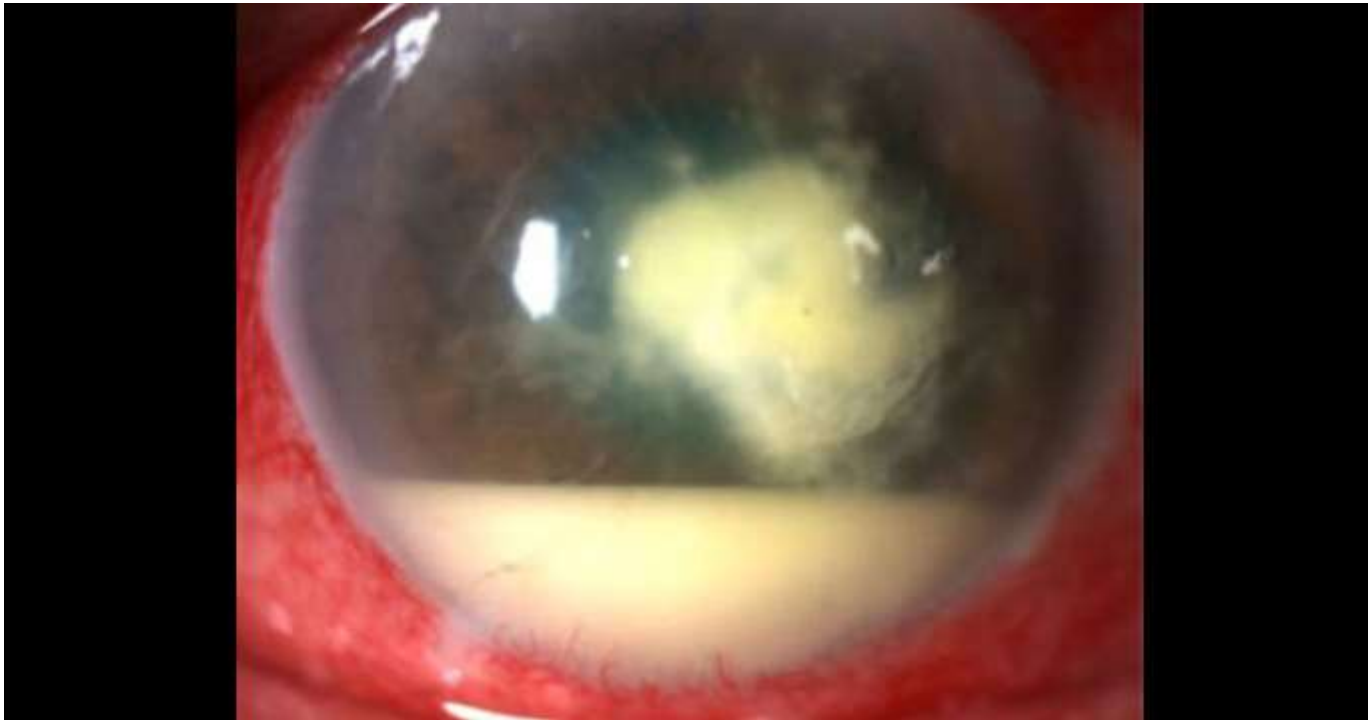
~~xxx~~ = acute angle closure glaucoma

microbial keratitis

presentation: Painful, uniochlar, sudden, persistent, severe  
conjunctival redness (ciliary flush), photophobia,  
tearing + discharge  
Tx: fortified antibiotics (dual therapy) or mono with

Amoro failures  
for g(+) strep.

+ culture is  
always  
required



Corneal scar  $\Rightarrow$  loss of transparency in the cornea  
+ shape of the cornea is changed  $\Rightarrow$  astigmatism



\*if the scar was located on the periphery of the cornea the effect of astigmatism will be more on the visual field

macular corneal dystrophies; bilateral, progressive, non-infectious, non-inflammatory corneal opacifying conditions  
gradual, asymmetrical, painless



Visual impairment is due to loss of corneal transparency

Secondary lipid keratinopathy with corneal neovascularization  $\Rightarrow$  degenerative corneal disorder

$\Rightarrow$  loss of transparency



What to always remember about these: \* keratoconus (myopic astigmatism)

\* trauma (loss of trans. + astigmatism)

*unilateral + painful*

\* acute angle closure glaucoma (corneal edema)

\* bacterial keratitis (loss of transparency due to infiltration + edema)

## Aqueous humor

*↳ normally clear without any cells or proteins*

Anterior uveitis

HypHEMA *↳ RBCs in ant. chamber*

Anterior uveitis :

WBCs in the aqueous humor

Hypopyon

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



# Hyphema

→ can ↑ IOP

indications for surgical repair  
of hyphema: (AC washout)  
→ very high IOP over period  
of time

Blood in the anterior chamber  
Microscopic : RBCs circulating  
Macroscopic : layered in AC

Causes :

Traumatic : blunt trauma or surgery  
The most common cause of hyphema

Non traumatic

NCC & Neovascularization of the iris (NVI) the most cause

Anterior uveitis

Tumors

Bleeding disorders : SCA

Vascular anomalies

Drugs



↳ fragile + tend  
to bleed

↳ secondary to retinal ischemia (DR, old vascular occlusion in  
retina)



# Lens Causes

Cataract  
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

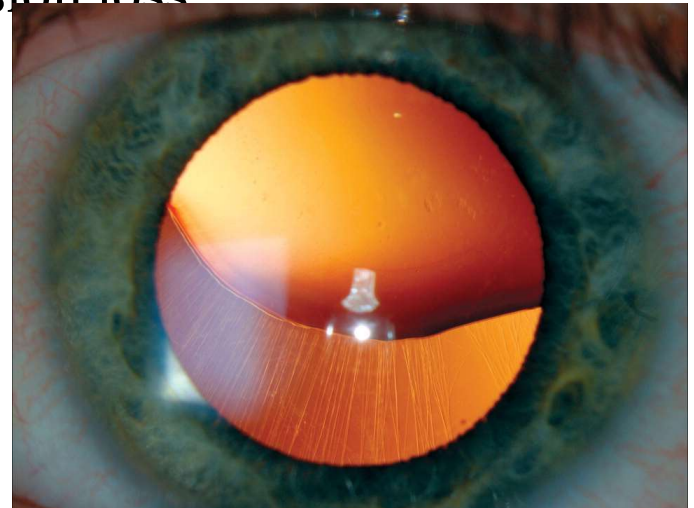
Ectopic lentis : *displacement of the lens from its normal pupillary plane*

Trauma

CT diseases : Marfan syndrome (*upward*)

Metabolic : Homocystinuria

Congenital



Change in shape:

Anterior lenticonus  
Posterior lenticonus



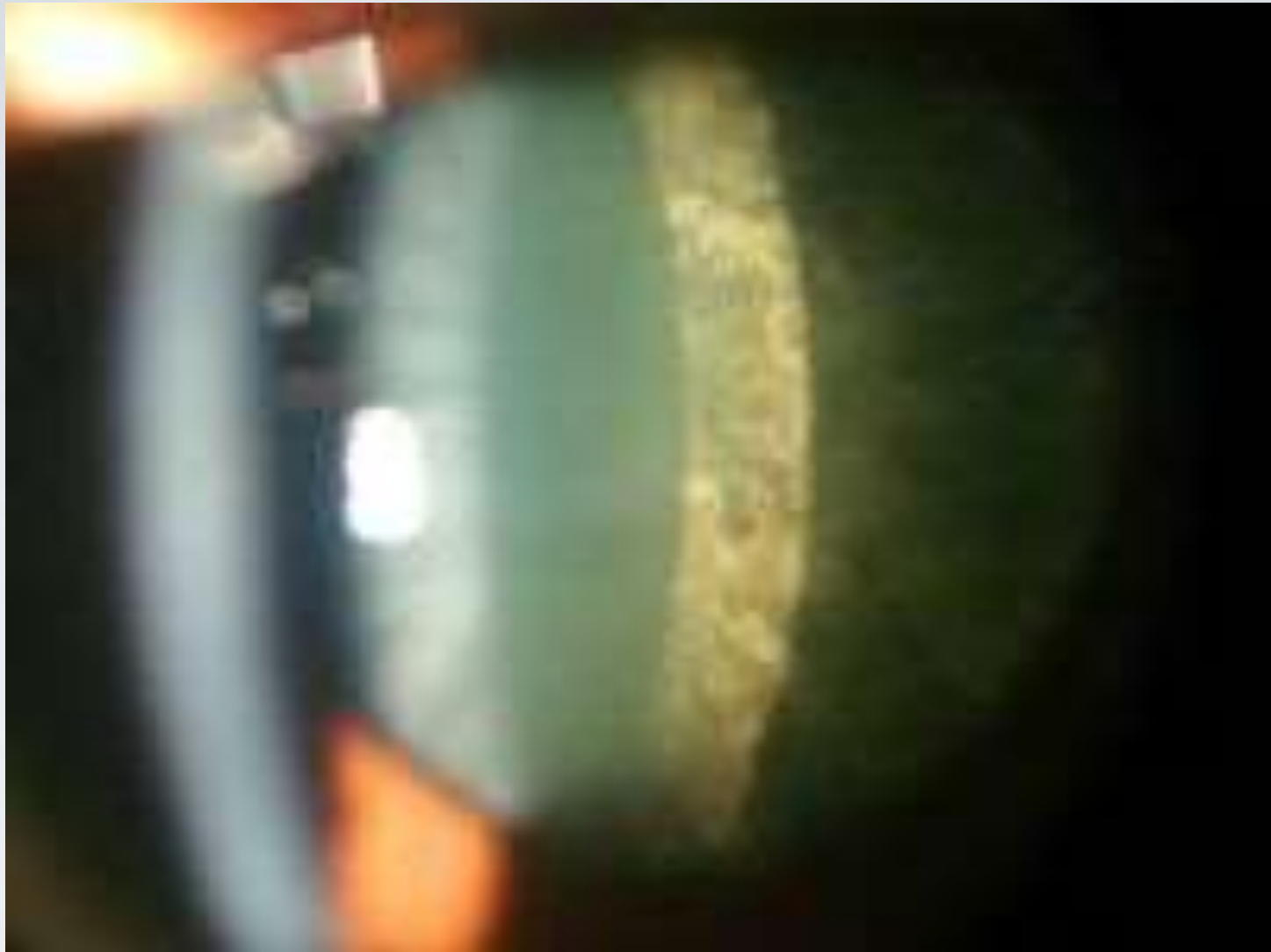
Elevated blood sugar can cause lens swelling, altering the refractive index

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

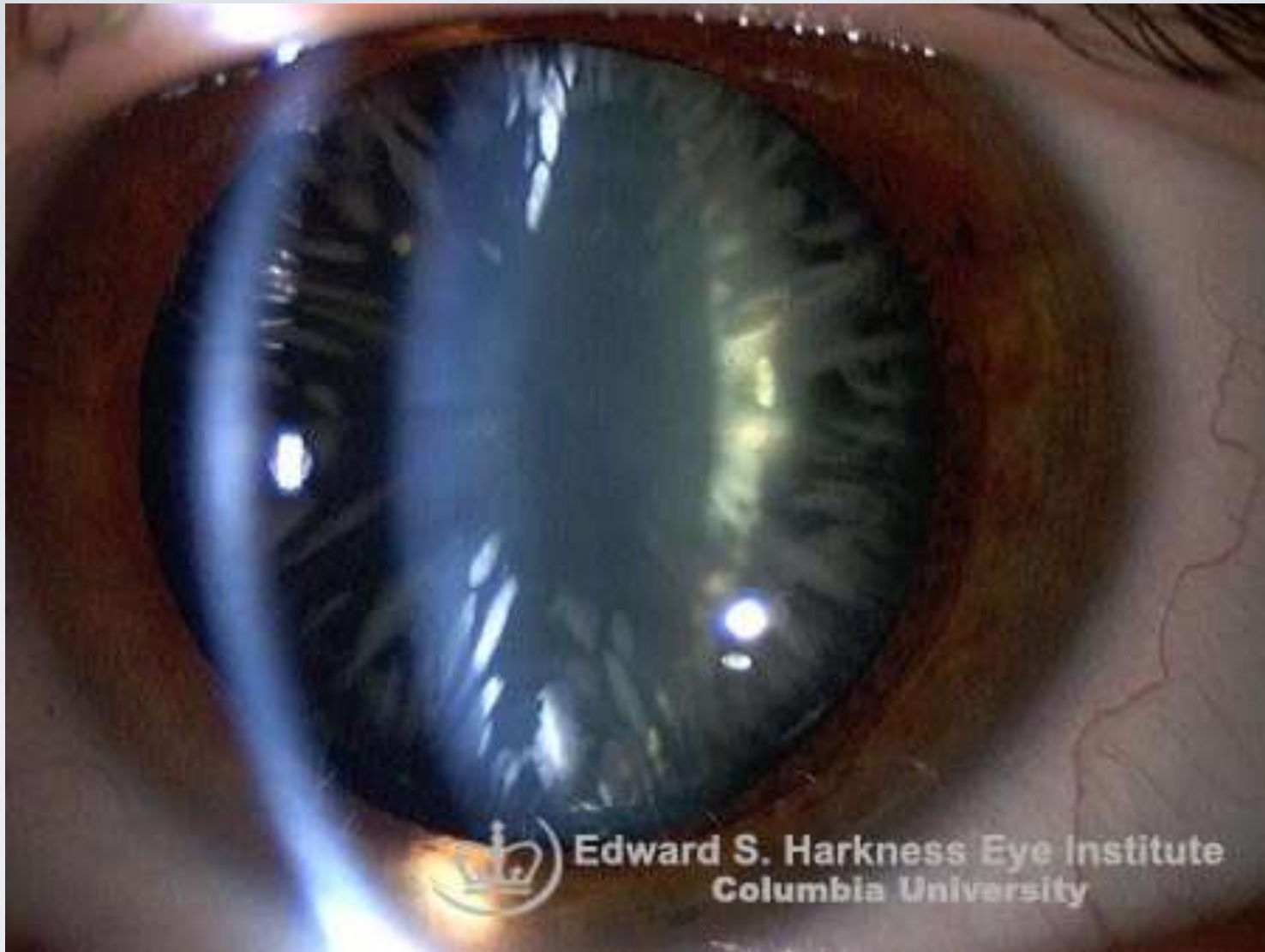
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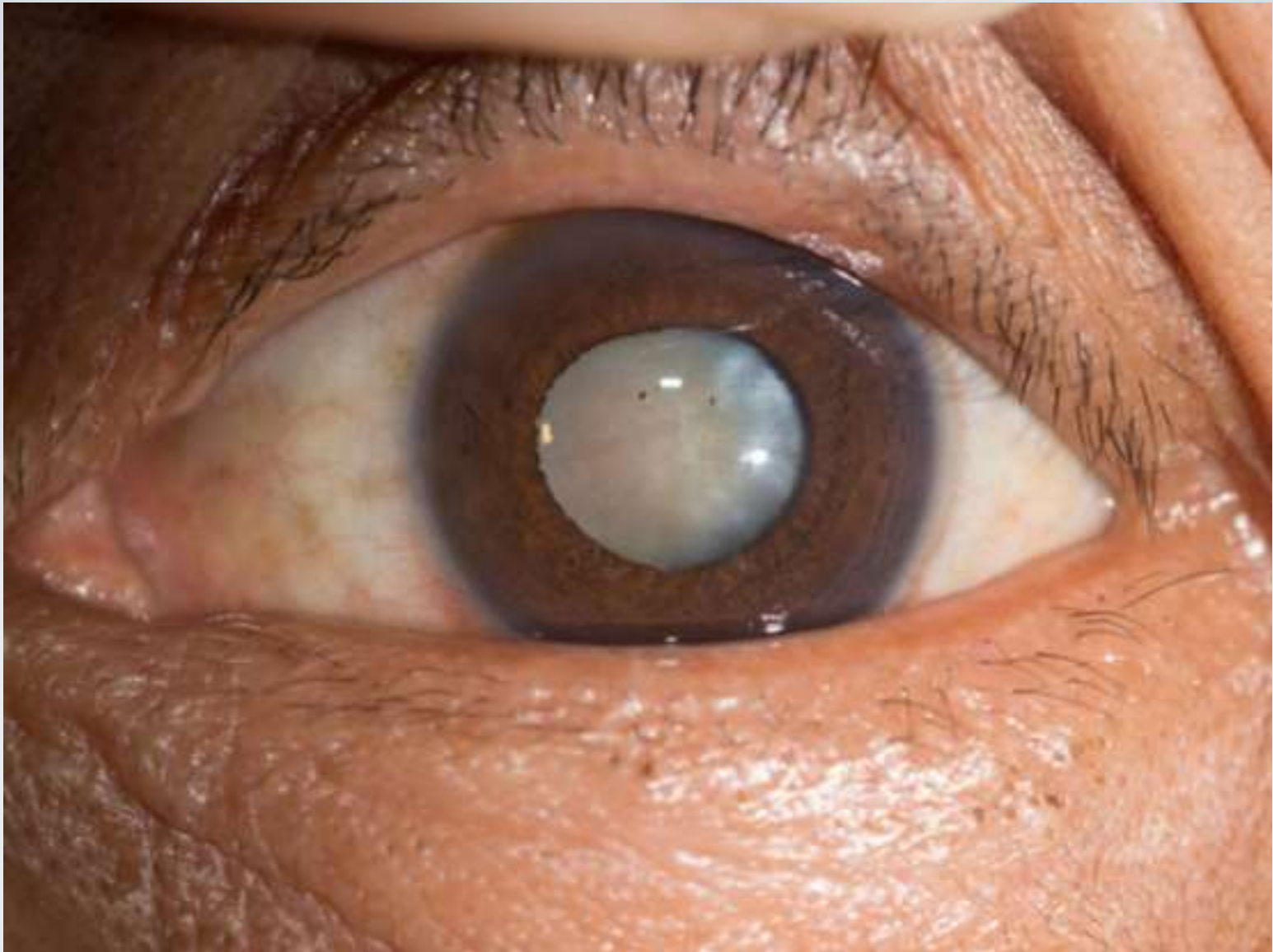
Nuclear sclerosis



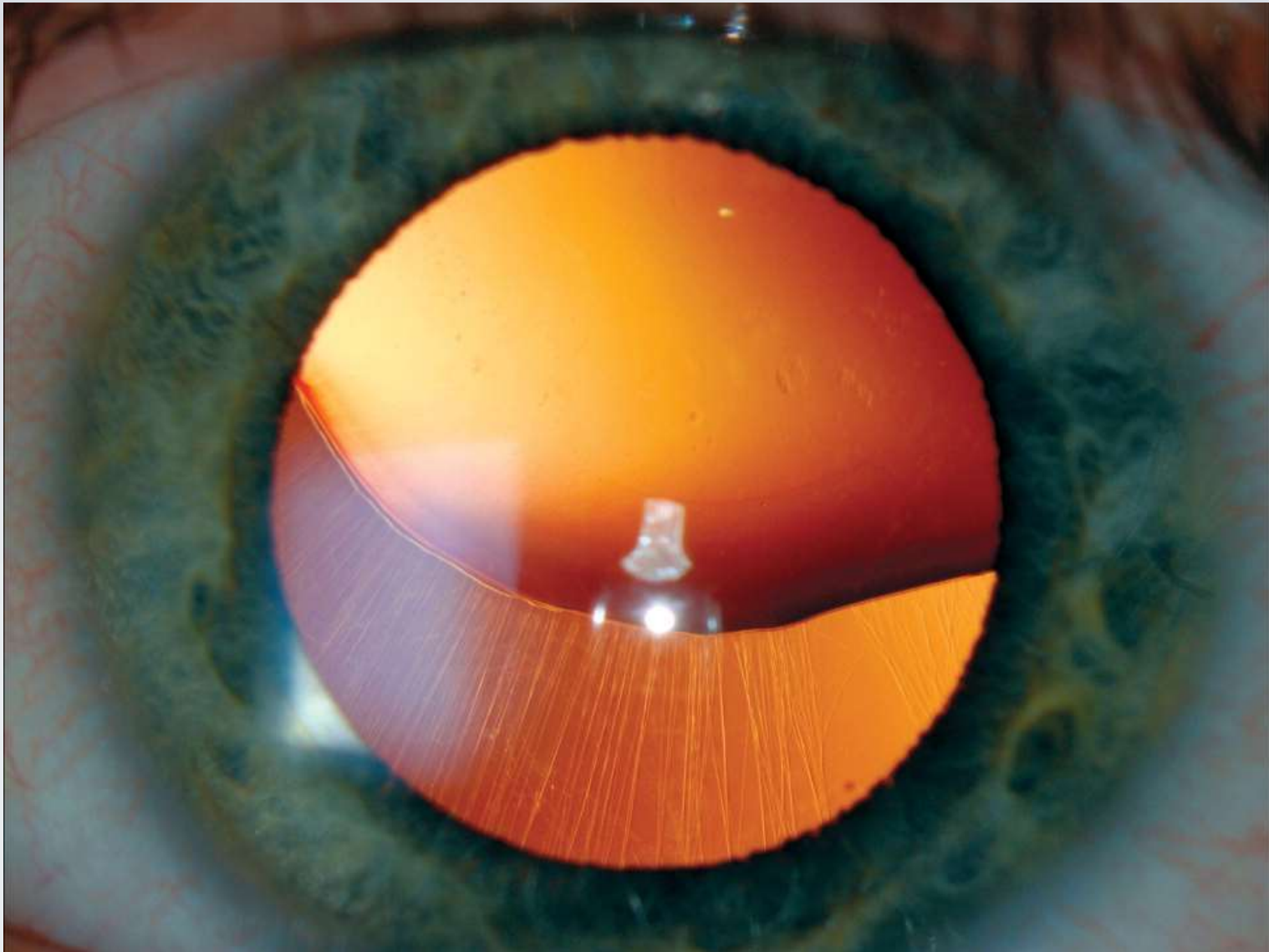
Posterior subcapsular cataract



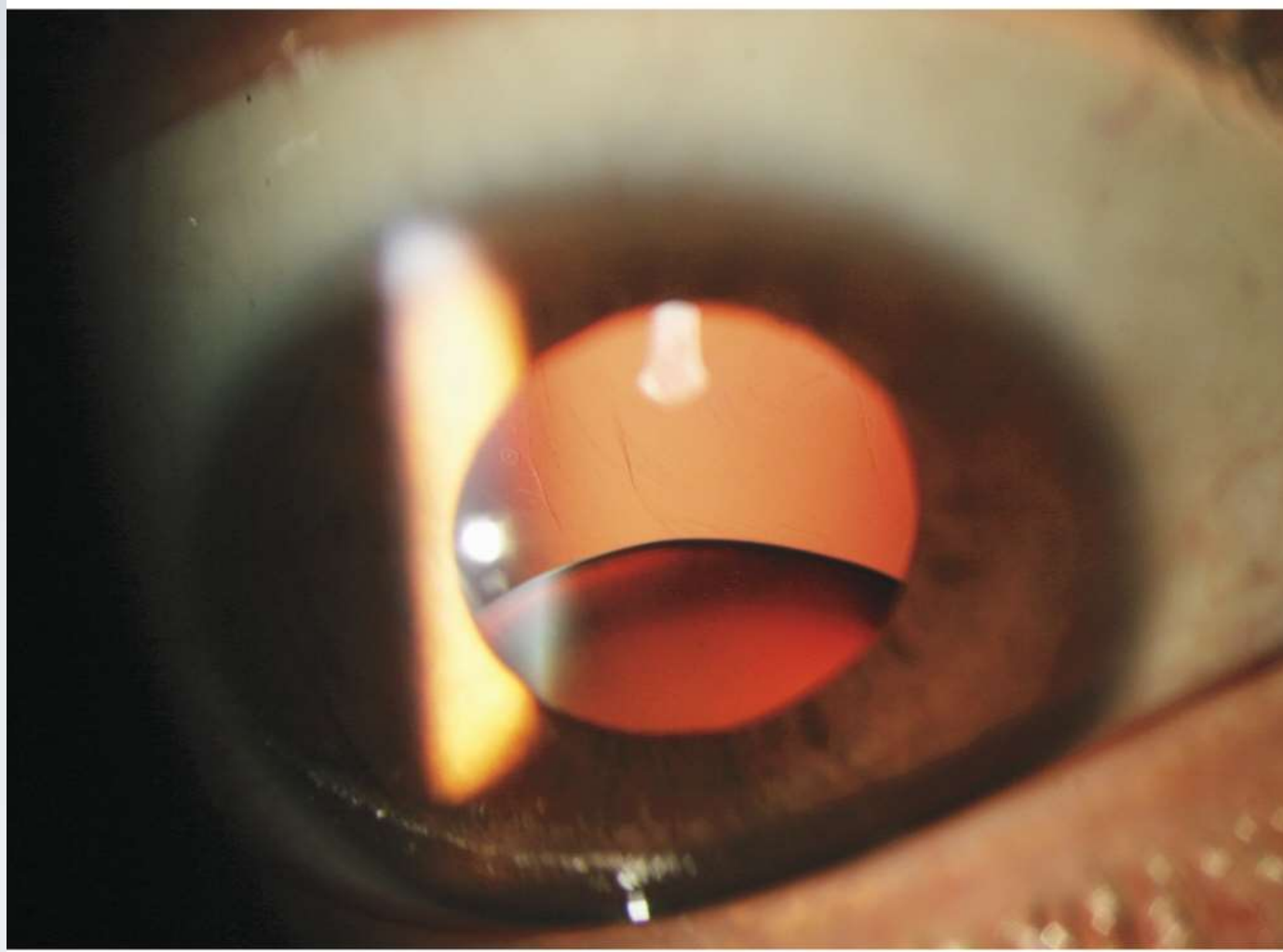
Cortical cataract



Mature cataract



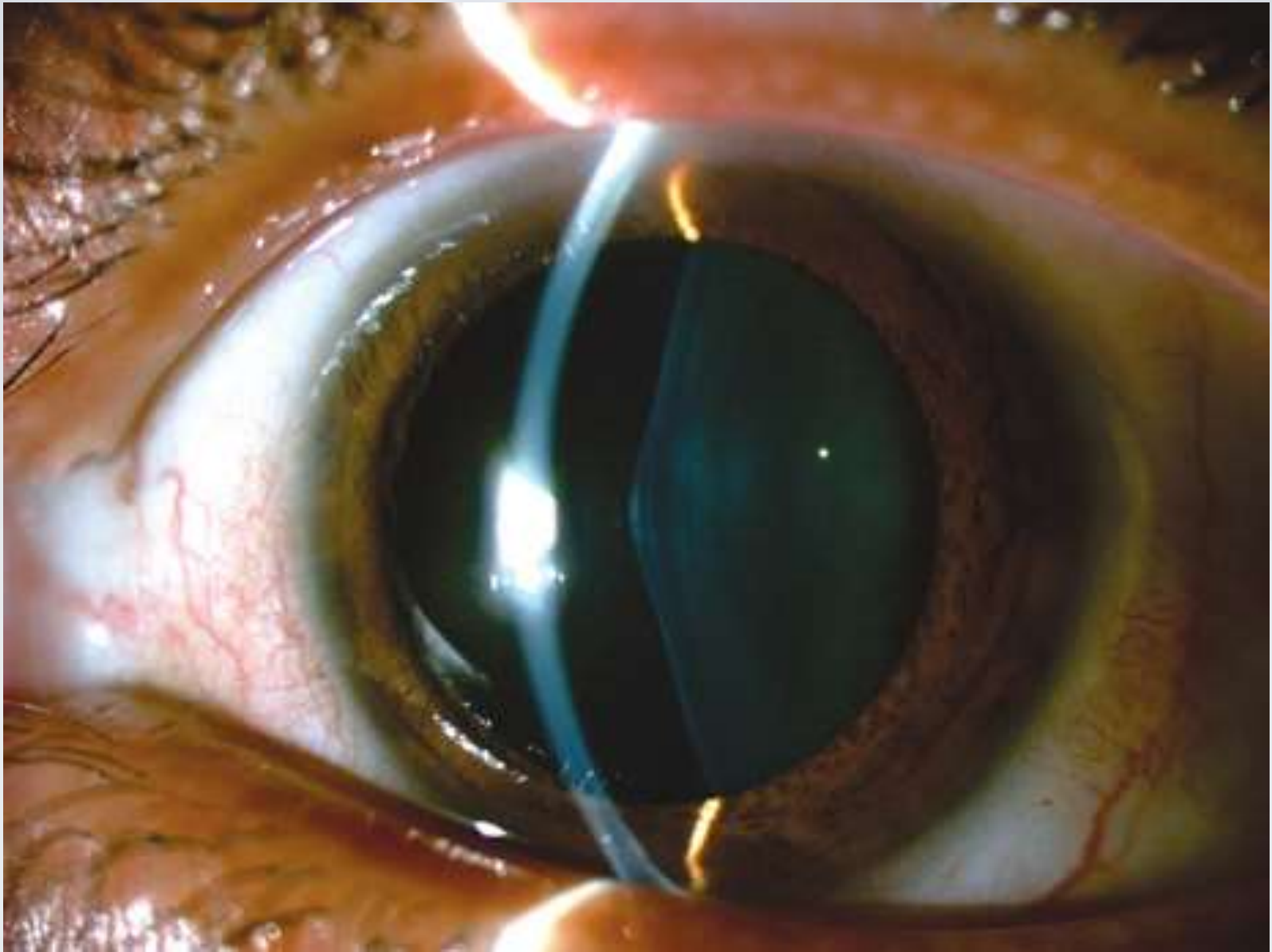
Superior ectopia lentis



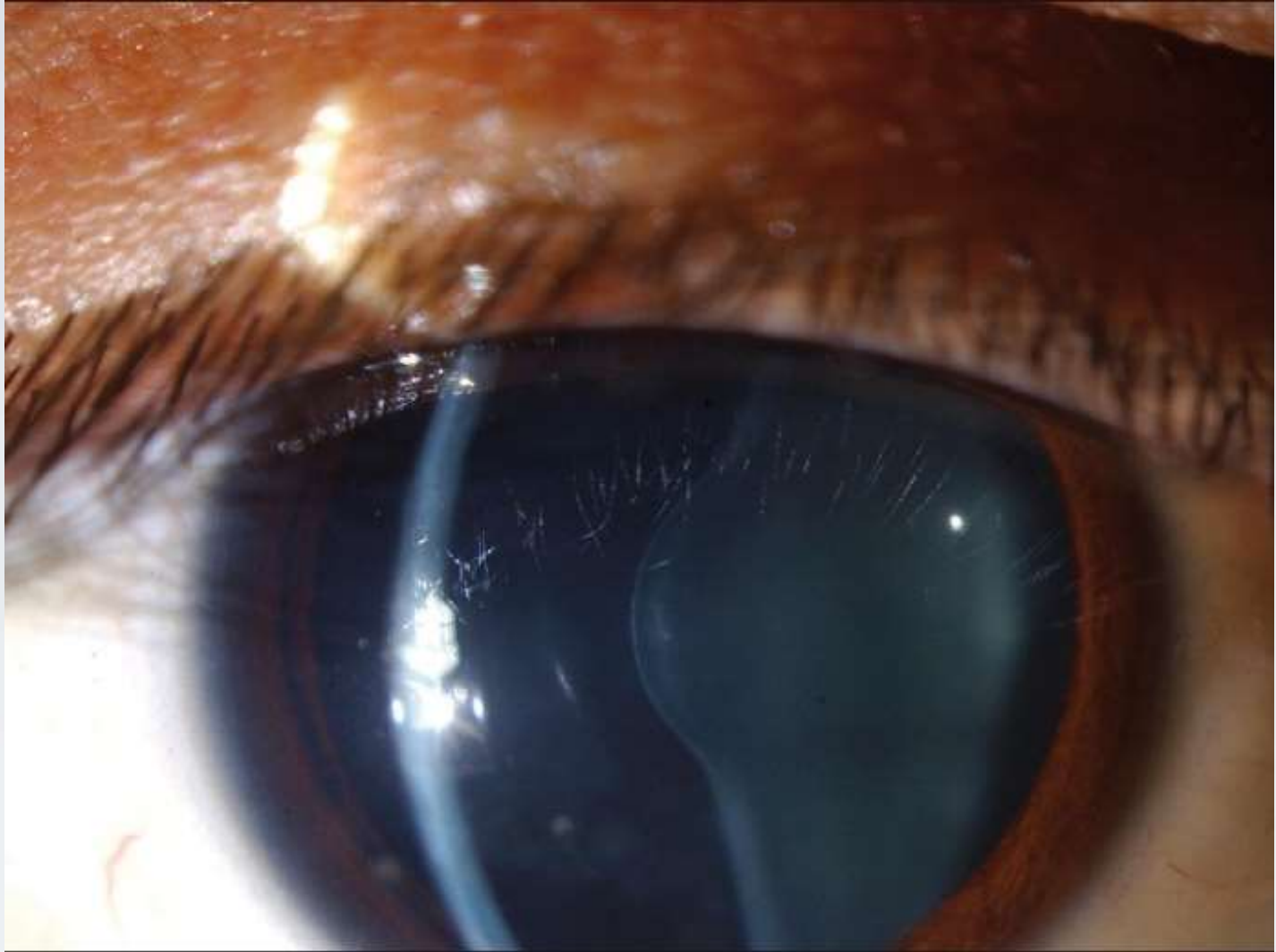
## Inferior ectopic lentis (Sunset sign)

⇒ refractive error result; usually hyperopic astigmatism, as aphakic part will cause hyperopic shift and the other part was normal refraction (through the part of the lens) ⇒ astigmatism





Anterior lenticonus *myopic astigmatism*



Anterior lenticonus

# Vitreous causes

→ loss of normal transparency of the vitreous

## **Vitritis :**

Infection : Toxoplasmosis , endophthalmitis  
Autoimmune : Behçet disease , Sarcoidosis

## **Vitreous hemorrhage :**

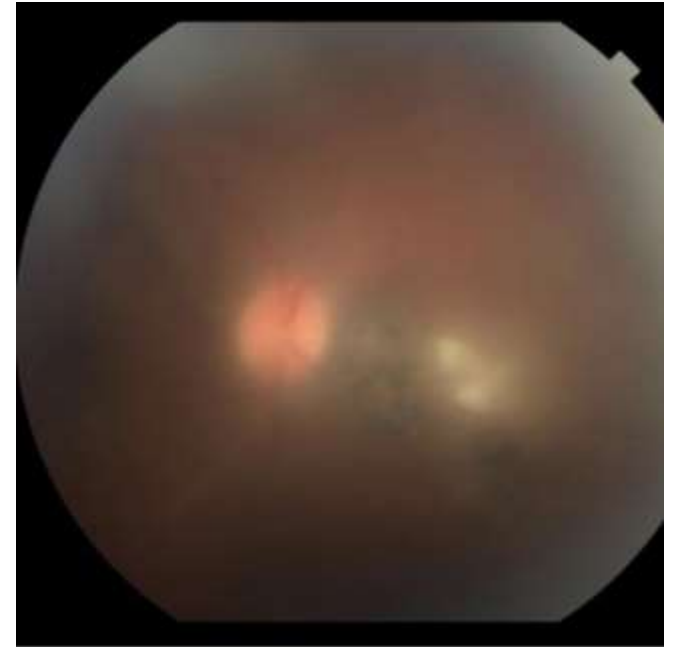
Traumatic

Non traumatic

Complicated PVD

Retinal neovascularization (NVDs ,NVEs)

Choroidal neovascularization (AMD)



Toxoplasm retinochoroiditis

Post surgical endophthalmitis (inflammation of all ocular fluid)  
aqueous humor + vitreous gel

general inflammatory signs +  
★ hallmark: loss of red reflex due to vitritis ★



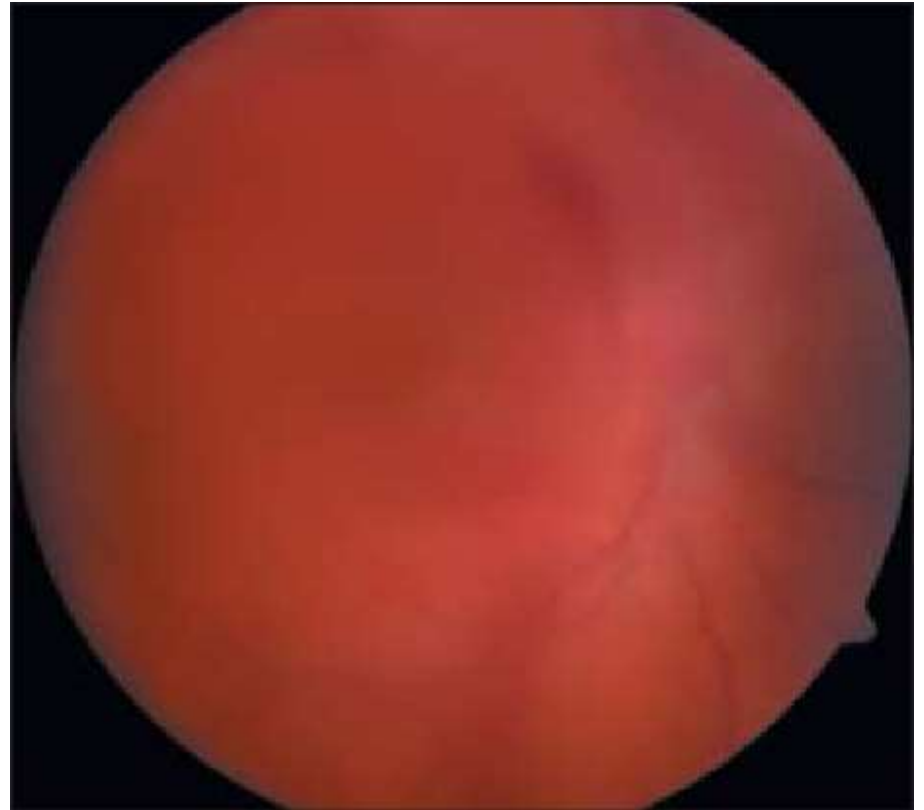
US can also  
be used to  
confirm

tst intravitreal injections with AB<sub>x</sub> / or surgically → pars plana vitrectomy

## 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

*If media is clear, the problem may be ↓*

## Retinal causes :

Diabetic retinopathy ☆

Retinal vein occlusion (central and branch)

Retinal artery occlusion (central and branch) ☆

Age related macular degeneration (AMD) ☆

Retinal detachment. ☆

Acquired maculopathies : macular hole, epiretinal membrane

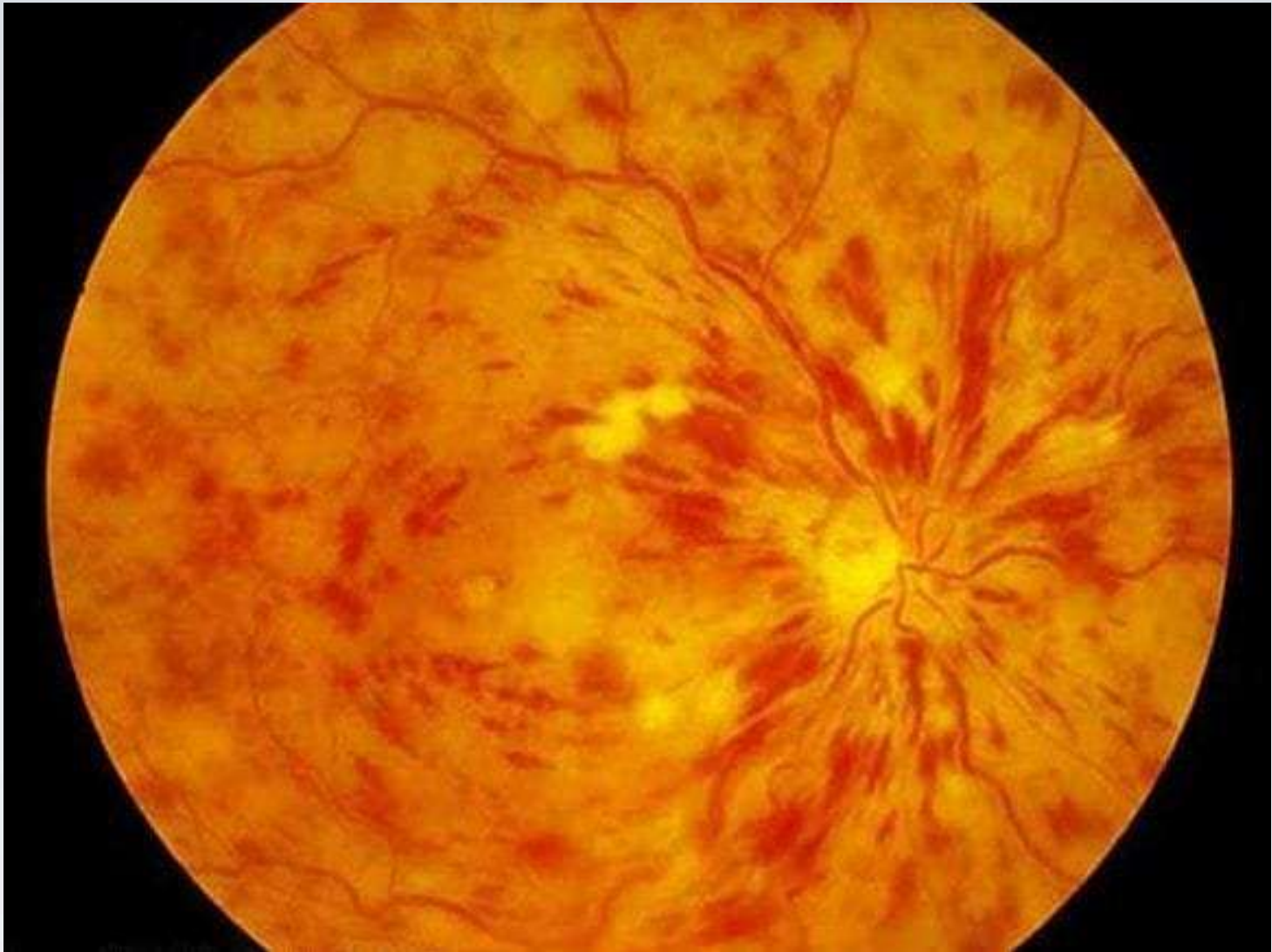
Posterior uveitis

Retinal dystrophies (Retinitis pigmentosa)

Macular dystrophies (Stargardt's disease )

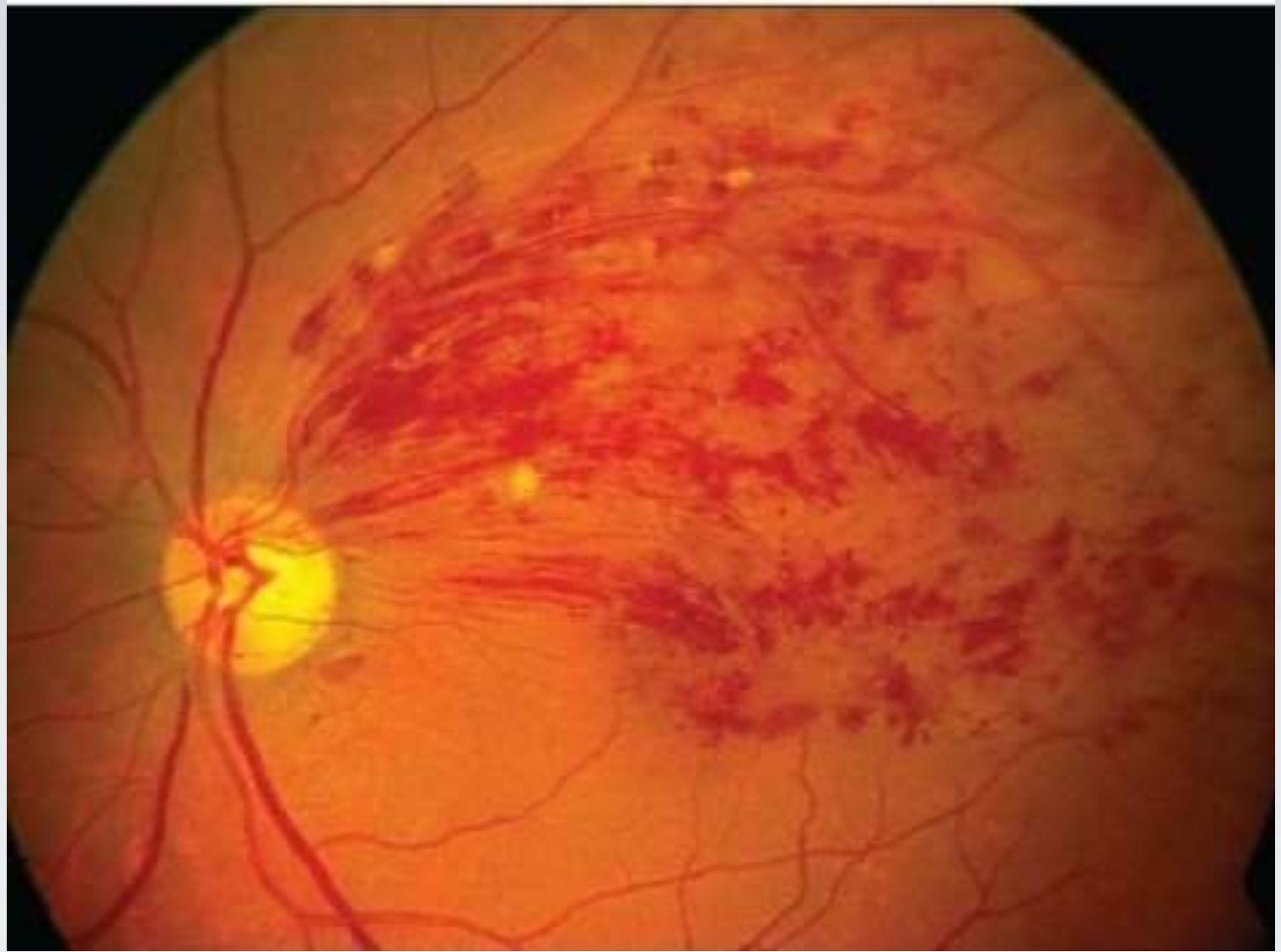


Diabetic maculopathy



Central retinal vein occlusion



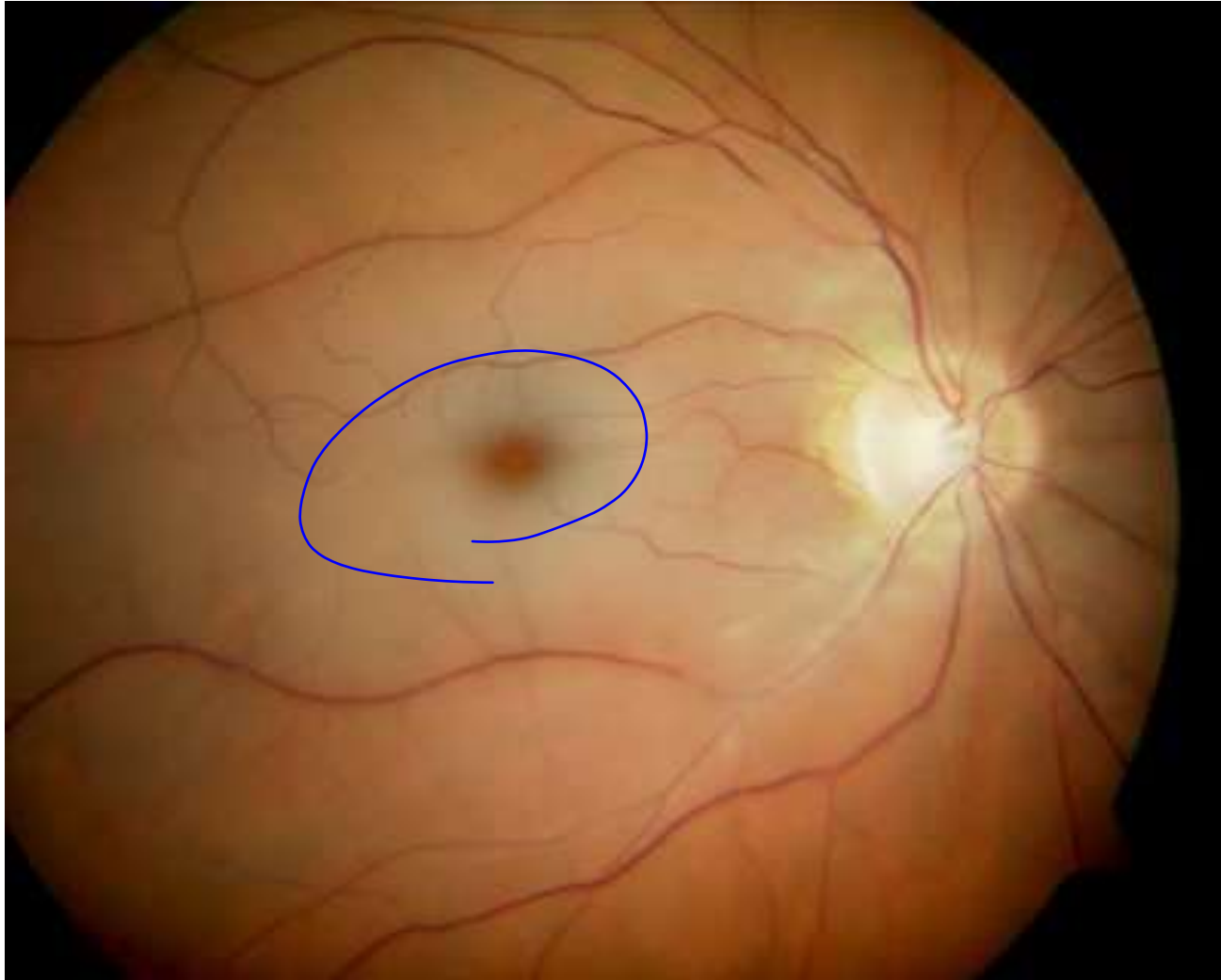


Branch retinal vein occlusion



Central retinal artery occlusion

⇒ severe retinal  
ischemia

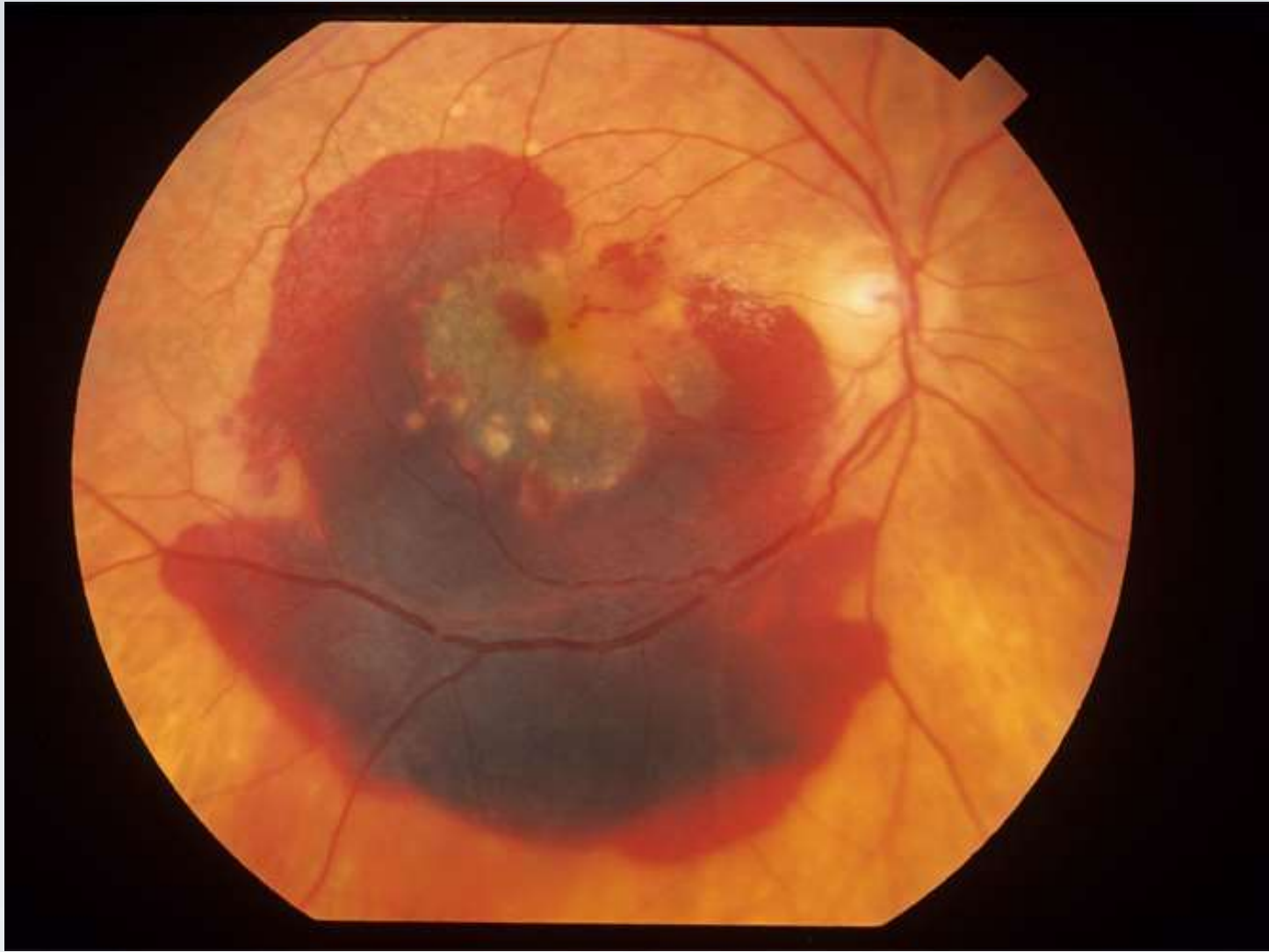


Central retinal artery occlusion



## Atrophic age related macular degeneration

↳ bilateral, asymmetrical, painless visual impairment + loss



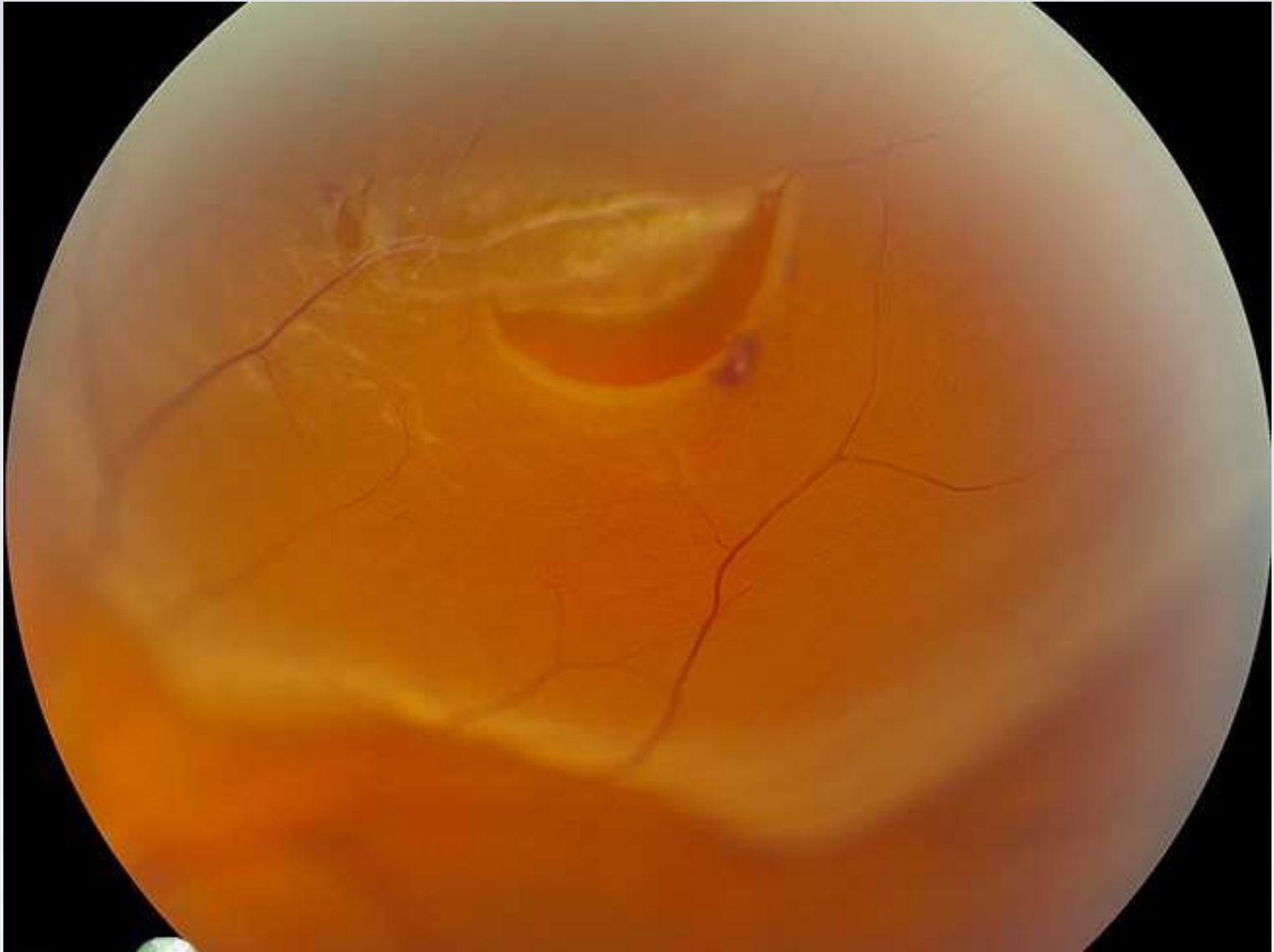
## Wet age related macular degeneration

→ MCC in developed world

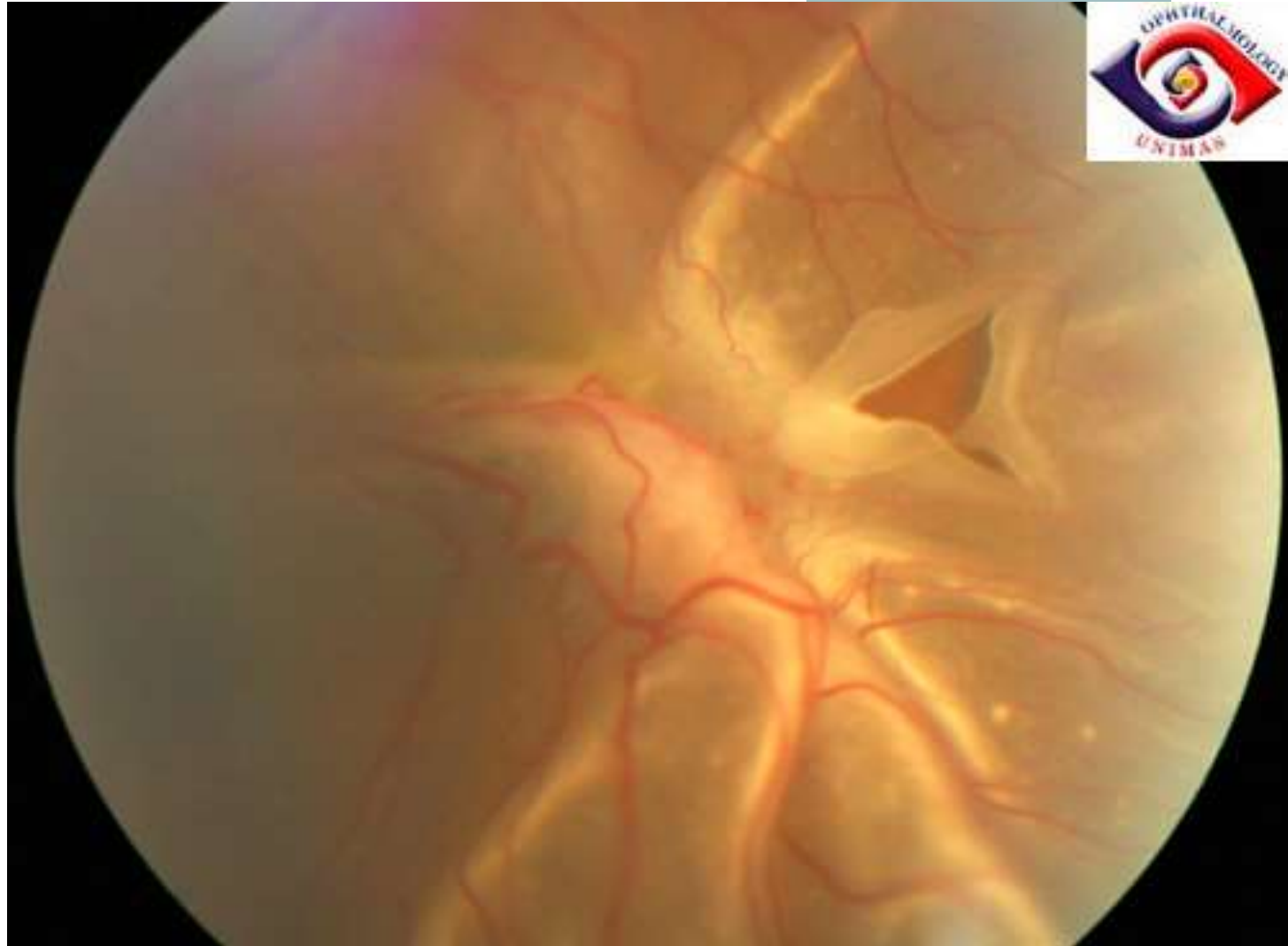
(subretinal hemorrhage) not vitreous for sure as we can see the different structures  
Sub or pre retinal? blood vessels crossing over (front) to the hemorrhage

MCC ⇒ presence of abnormal choroidal neovascularization

- **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



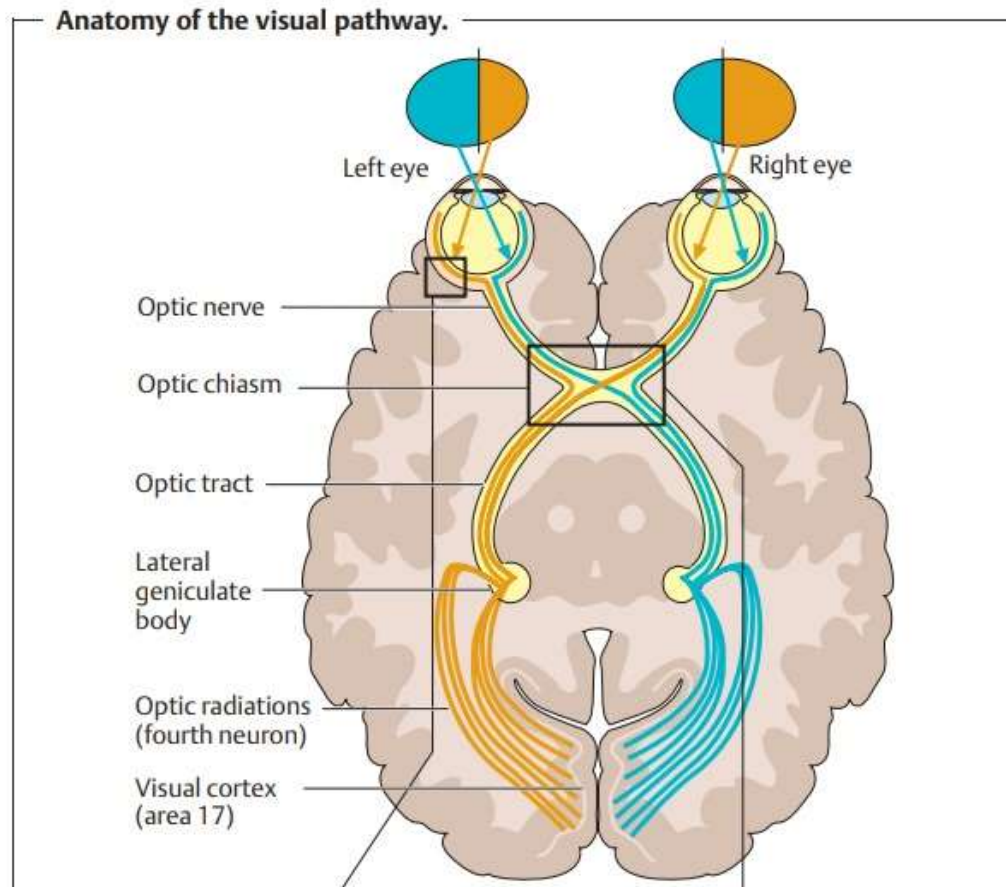
Rhegmatogenous retinal detachment













Rhegmatogenous retinal detachment



# Virtual pathway problems:



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

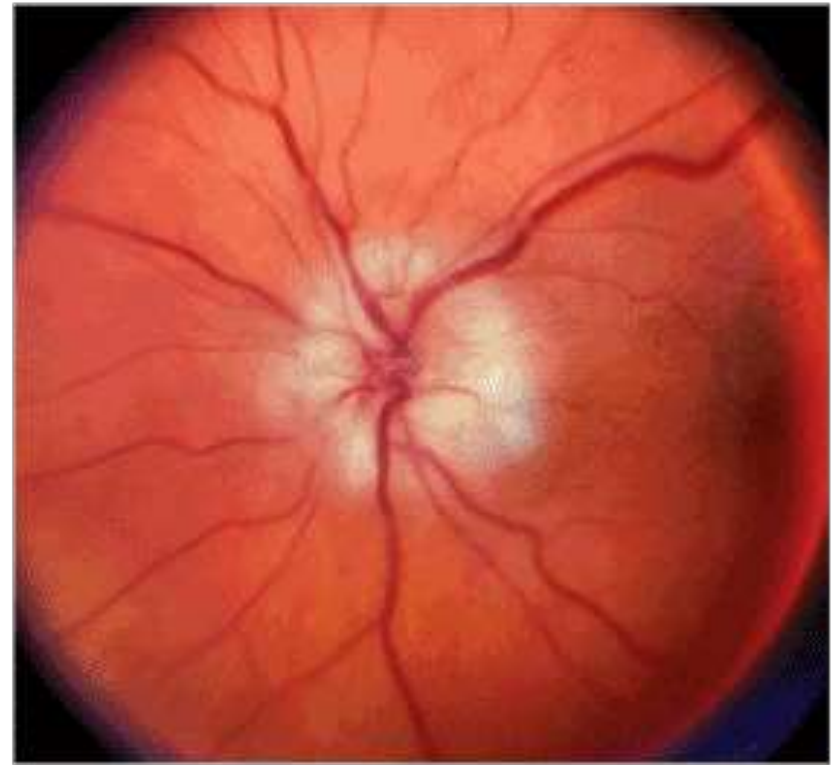
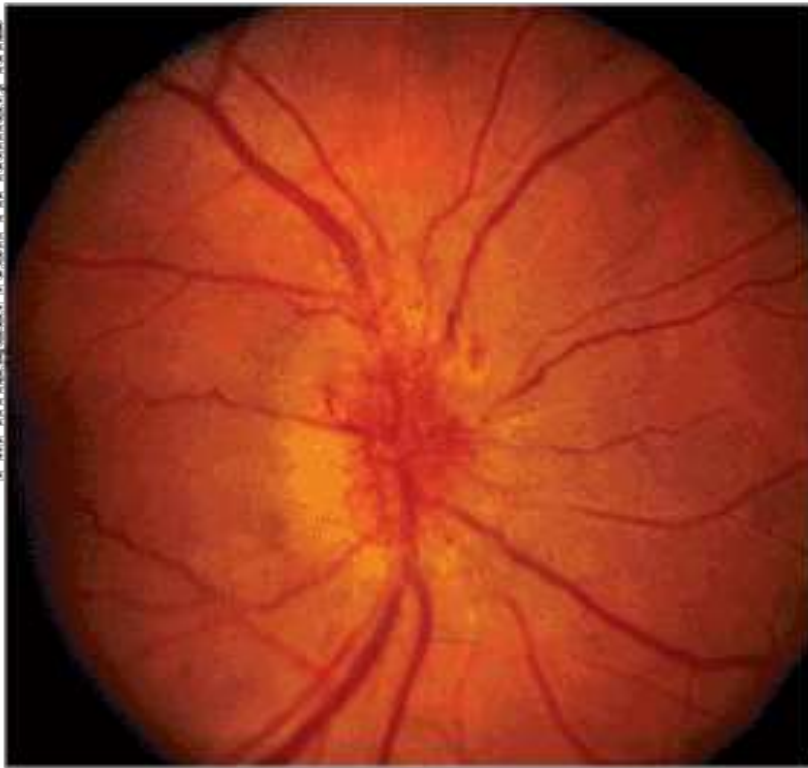
Presentation :

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.**

→ severe ischemia (pale/white)

## **Papilledema :**

Bilateral optic disc swelling secondary to increased intracranial pressure

*any bilateral disc swelling is papilledema until proven otherwise*

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

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

*\* ↑ ICP need to be ruled out *



## 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

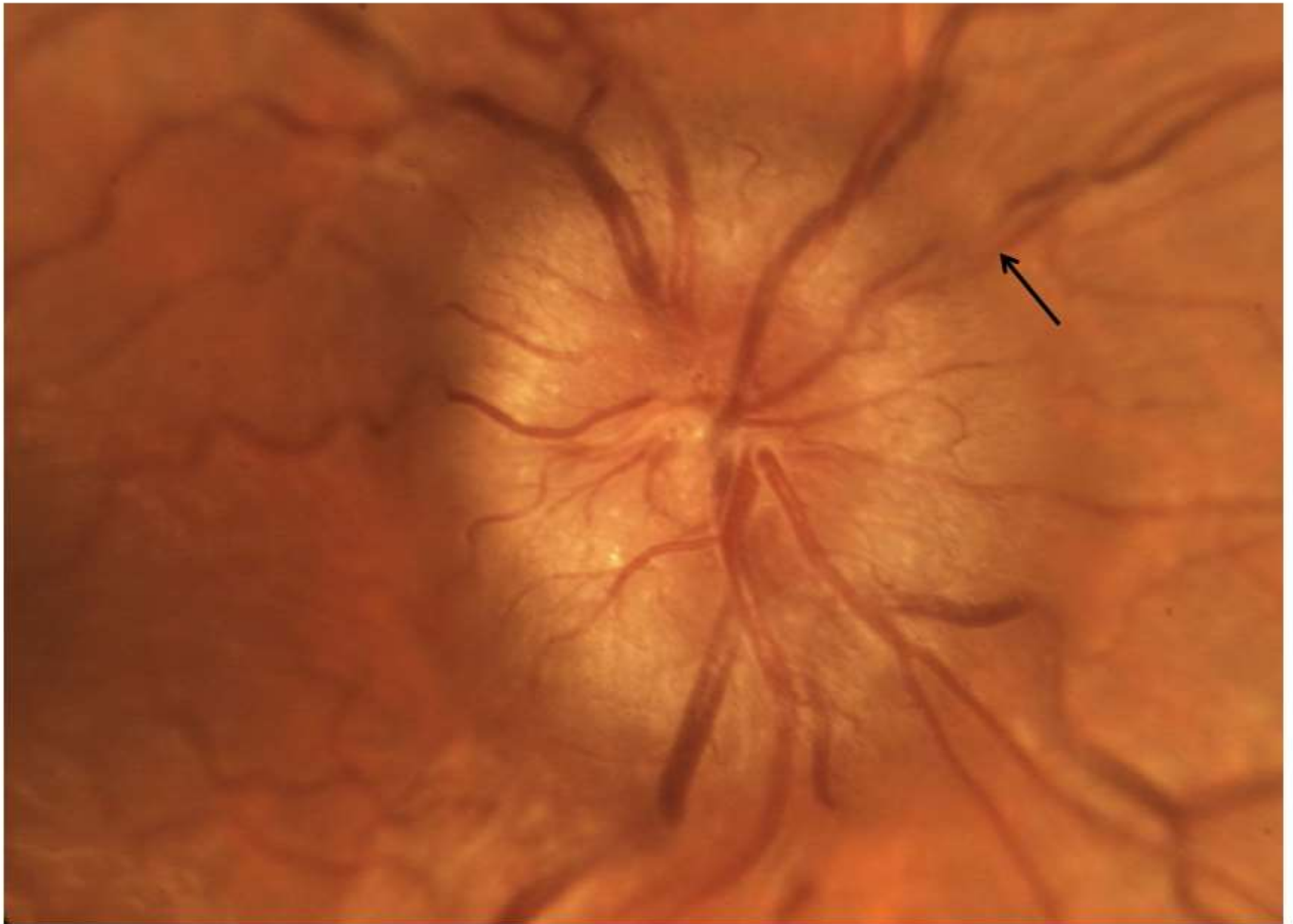
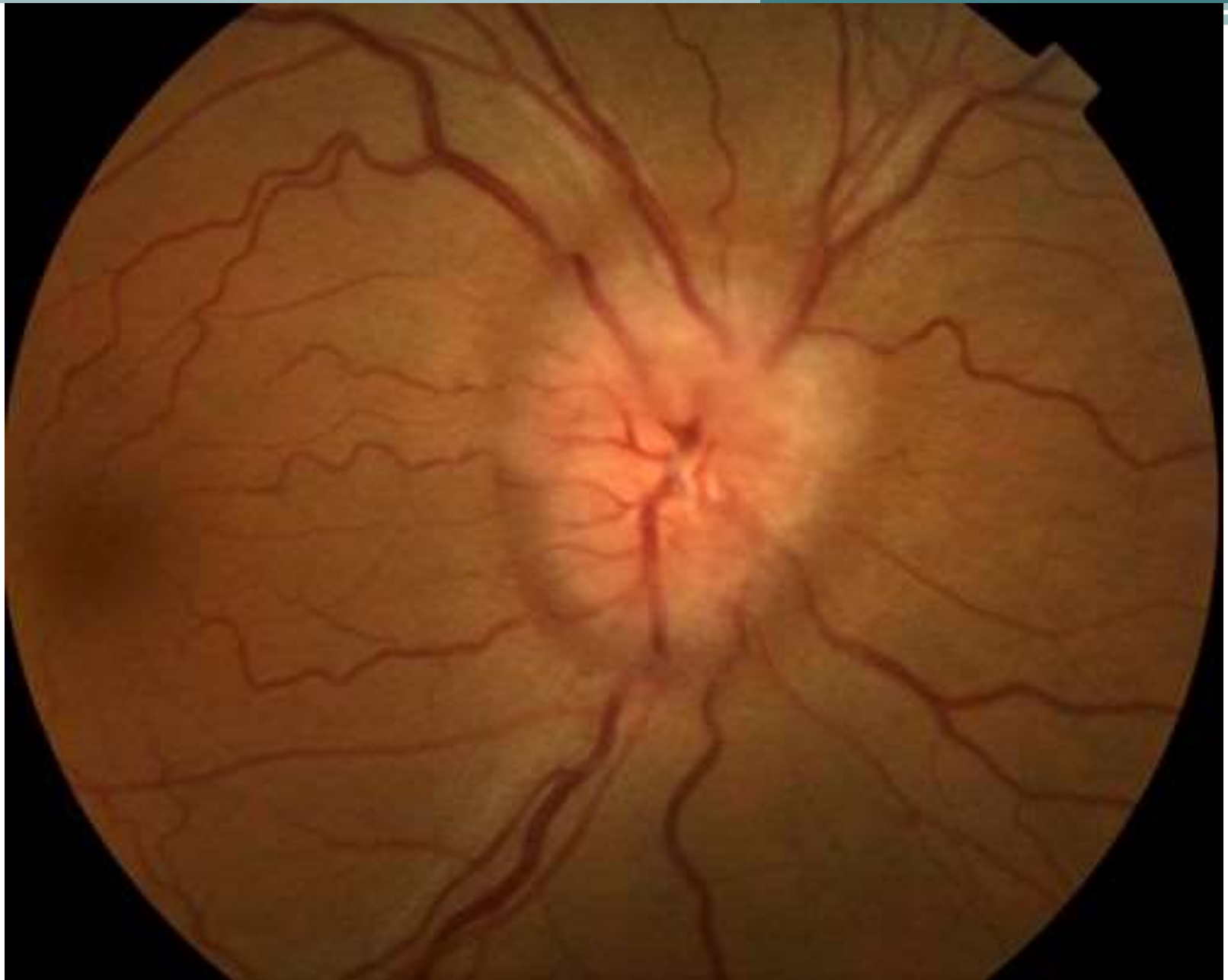
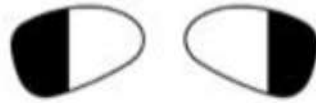


Figure 8. Grade III papilledema is characterized by Loss of major vessels as they leave the disc (arrow). *inclined margins, this is disc swelling, it was bilateral → papilledema*



Chiasm



**Bitemporal hemianopia**

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

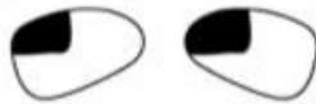
Optic tract



**Incongruous left homonymous hemianopia**

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

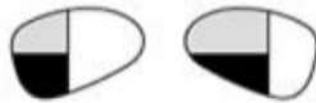
Meyer's loop



**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

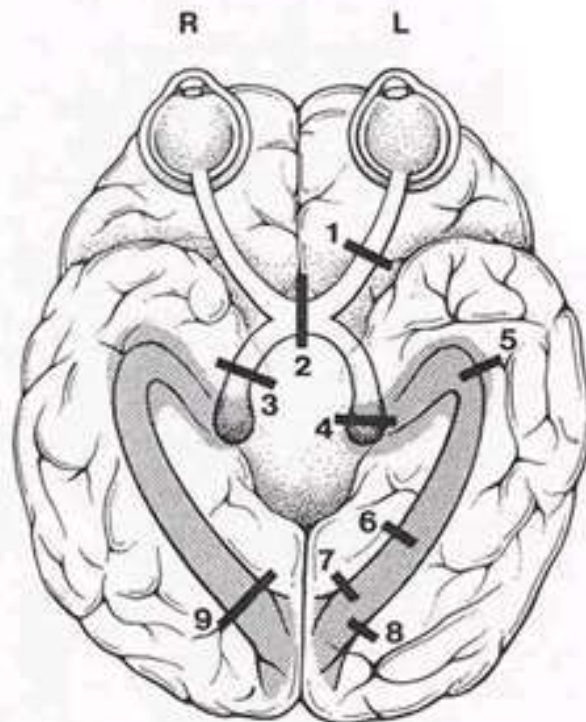
*macular fibres receive dual blood supply*

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 hemianopsia
4 Left Lateral Geniculate Nucleus			Right homonymous sectoranopia (lateral chorioidal artery) - or - Incongruous right homonymous hemianopsia
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 hemianopsia (macular sparing)

*Thank you*