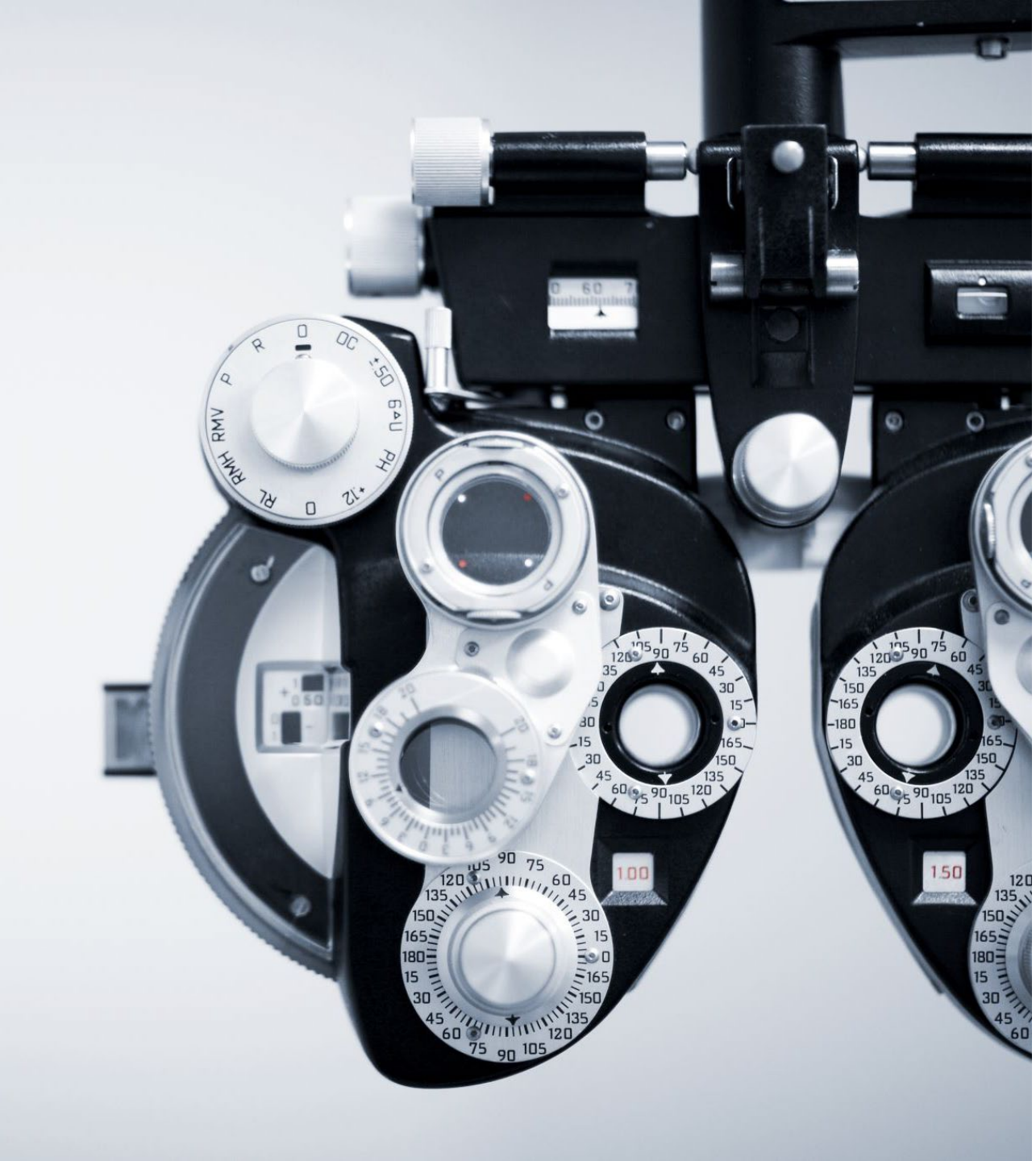


Age Related Changes and the Eye

DIANE F. DRAKE, LDO, ABOM, NCLEM, FNAO

CEC Zoom Guidelines

Please make sure your electronic device sound and camera are on.

Must be in view of camera so monitor can see you are “present”

In order to receive credit, you need to sign on with the first and last name with which you registered to be let in.

For privacy, no screen shots or photos of zoom courses

Microphone on mute except when asked to unmute.

Introduction

The effects of aging

Age related changes of the eye

Age relate vision problems

Other age -related vision concerns

Vision and the senior adult

The Effects of Aging - Age Related Changes of the Eye

Decline of Accommodation

- Presbyopia

Accommodation is the mechanism whereby the visual system changes focus from distant to near.

- Declines as one ages.
- Crystalline lens is most malleable during childhood and early adulthood.
- Theory of von Helmholtz
  - Most of the accommodative change in lens shape (bulging) occurs at the central anterior lens surface
  - Front surface of the capsule is thinner
  - Very little change on the posterior surface

The Effects of Aging - Age Related Changes of the Eye

The ciliary muscle is a ring that when it contracts, rather than tightening its grip, the diameter of the muscle is reduced causing a relaxing of the tension of the zonules of Zinn (zonular fibers).

- Allows the crystalline lens to become more spherical, thereby increasing the power of the lens.

- Contraction of the ciliary muscle increases the diameter of the lens thereby increasing the power of the lens
- Relaxation of the ciliary muscle decreases the diameter of the lens thereby decreasing the power of the lens

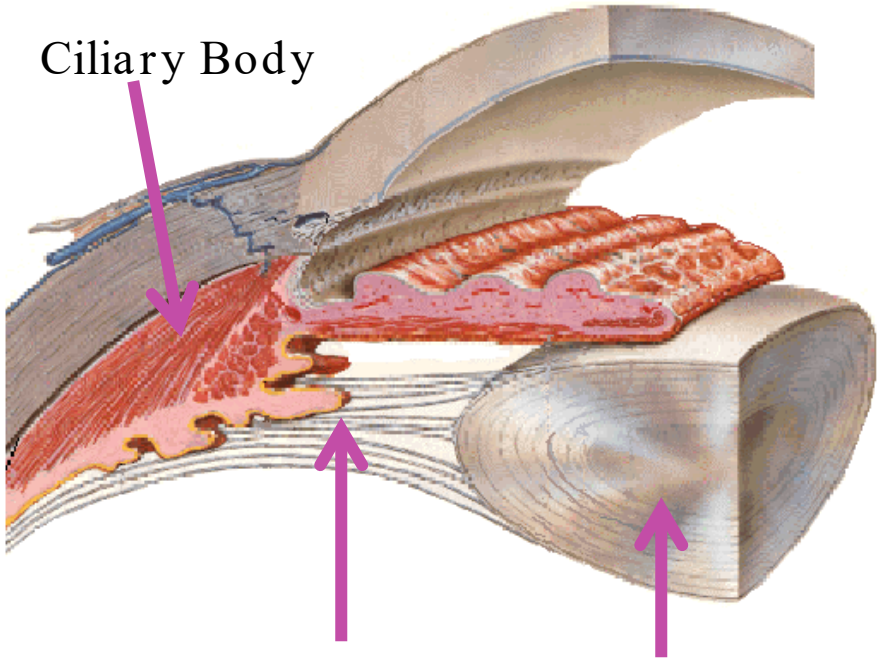
The Effects of Aging - Age Related Changes of the Eye

Decline of Accommodation

Accommodative Anatomy

- Crystalline Lens
- Ciliary Muscle
- Suspensory Ligaments

Accommodative Anatomy



The Crystalline Lens

The Ciliary Body

- Ciliary Muscle

The Zonules of Zinn

- Suspensory Ligaments

Change in the Mean Amplitude of Accommodation With Age

Age (Years)	Amplitude (Diopters)
10	10.6 - 13.5
15	10.1 - 12.5
20	9.5 - 11.5
30	6.6 - 8.9
35	5.8 - 7.3
40	4.4 - 5.9
45	2.5 - 3.7
50	1.6 - 2.0
55	1.1 - 1.3
60	0.7 - 1.0

Measured by moving the target toward the subject until first blur is reported (Borish 1970; Turner 1958)

The Effects of Aging - Age Related Changes of the Eye

Muscle tone

- Changes to ciliary muscle

The Effects of Aging - Age Related Changes of the Eye

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- Changes in muscle that control the pupil – senile miosis

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  - Pupil is smaller and less responsive to changes in light
  - Takes longer to constrict and dilate

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- Changes to Mueller's muscle
  - Lid droops

The Effects of Aging - Age Related Changes of the Eye

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  - Pupil is smaller and less responsive to changes in light
  - Takes longer to constrict and dilate
- Changes to Mueller's muscle
  - Lid droops
- Changes in muscle tone of eyelids in general
  - Can affect contact lens wear

The Effects of Aging - Age Related Changes of the Eye

Decrease in tear film

The Effects of Aging - Age Related Changes of the Eye

Decrease in tear film

On more medications

- Antidepressants, Parkinson's Medications, and Sleeping Pills
  - block some signals between nerve cells
- Antihistamines
- Birth control pills and Hormone Replacement Therapy
- Blood Pressure Medicines
- Diuretics
- Nasal Decongestants
- Pain Relievers

The Effects of Aging - Age Related Changes of the Eye

Decrease in tear film

Poor diet

- Excessive fats, salt, cholesterol, alcohol, protein, caffeine, sucrose

The Effects of Aging - Age Related Changes of the Eye

Decrease in tear film

On more medications

Increase in meibomian gland secretion of lipids
- Opening of meibomian gland changes
  - Puckers
- Changes in lipid secretions – less efficient – produces more drying
- More in men than women
- Women's changes differ from men's changes

The Effects of Aging - Age Related Changes of the Eye

Decrease in tear film

On more medications

Increase in meibomian gland secretion of lipids
- Changes in lipid secretions – less efficient – produces more drying
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Decrease in basic tear secretion
- Almost half as much

The Effects of Aging - Age Related Changes of the Eye

Decrease in tear film

On more medications

Increase in meibomian gland secretion of lipids
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Decrease in basic tear secretion
- Almost half as much

Mucin production is compromised

Age-Related Vision Problems

Cataracts

American Academy of Ophthalmology estimates that ½ of all Americans will develop cataracts by age 75.

Some early signs of cataracts include:

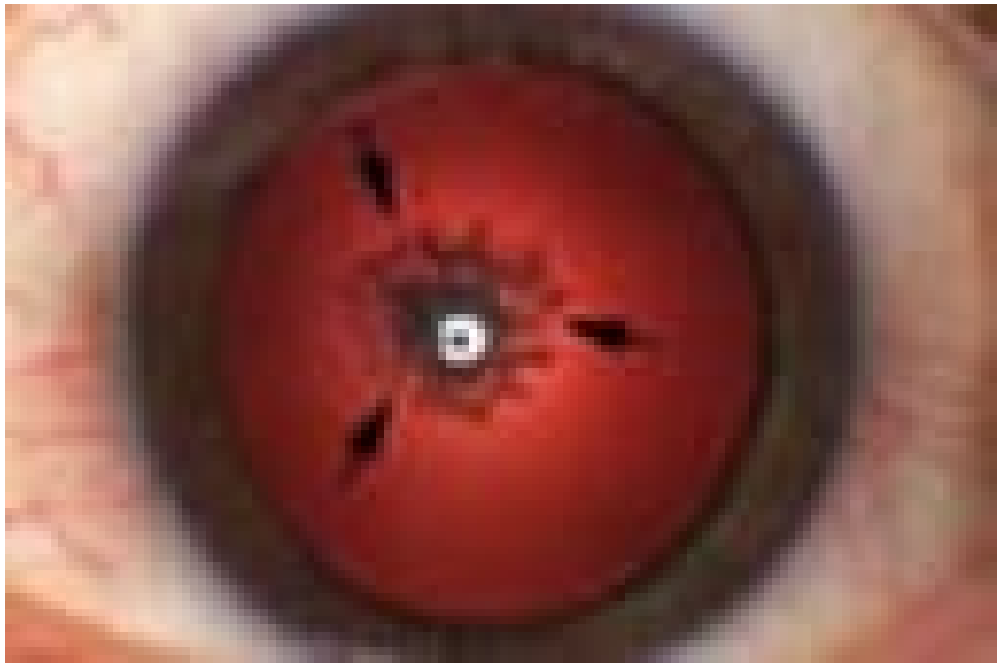
- Cloudy or blurred vision
- Poor night vision
- Colors may not appear as vivid as previously seen

Cataracts

Three types– Age related

- Posterior Subcapsular
  - Taking steroids
  - Diabetes
- Nuclear
  - Center
- Cortical
  - Sides

Posterior Subcapsular Cataract



Nuclear Cataract

Cortical Cataract

Age-Related Vision Problems

Cataracts

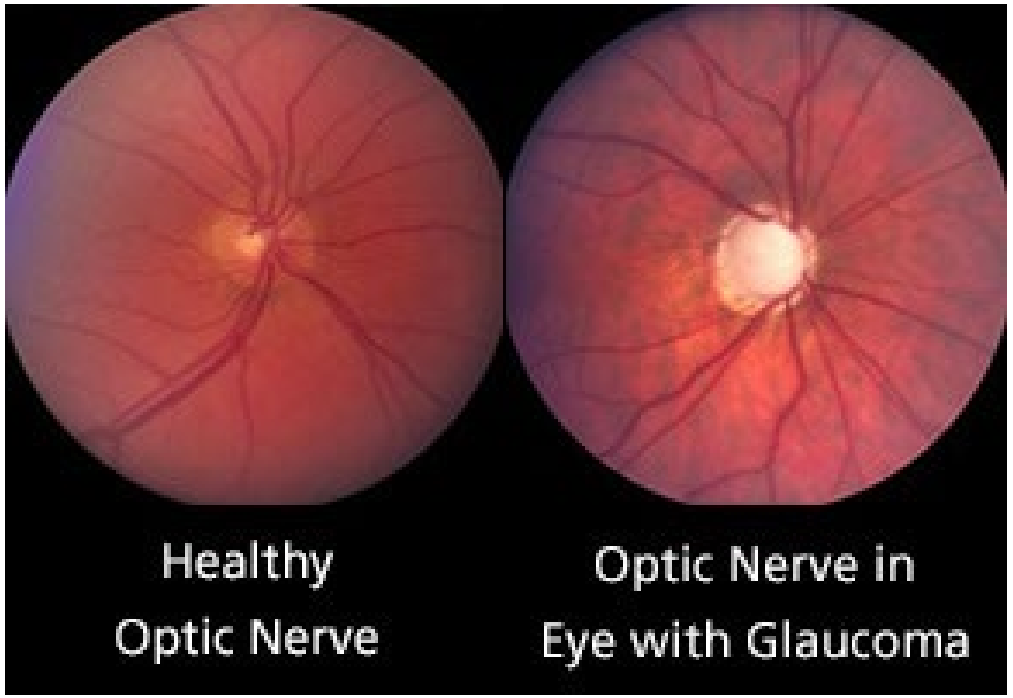
Other changes to crystalline lens– in addition to reduced elasticity

- Decreased optical clarity
- Increased spherical aberrations
- Reduction in transmission of light to the retina
- Generally altered color perception
- Degradation of retinal image quality

Age-Related Vision Problems

Glaucoma

- Increase of intraocular pressure
  - Ocular hypertension
- Reduced visual field
- Cupping
  - May be normal
  - Cup to disk ratio



Types of Glaucoma

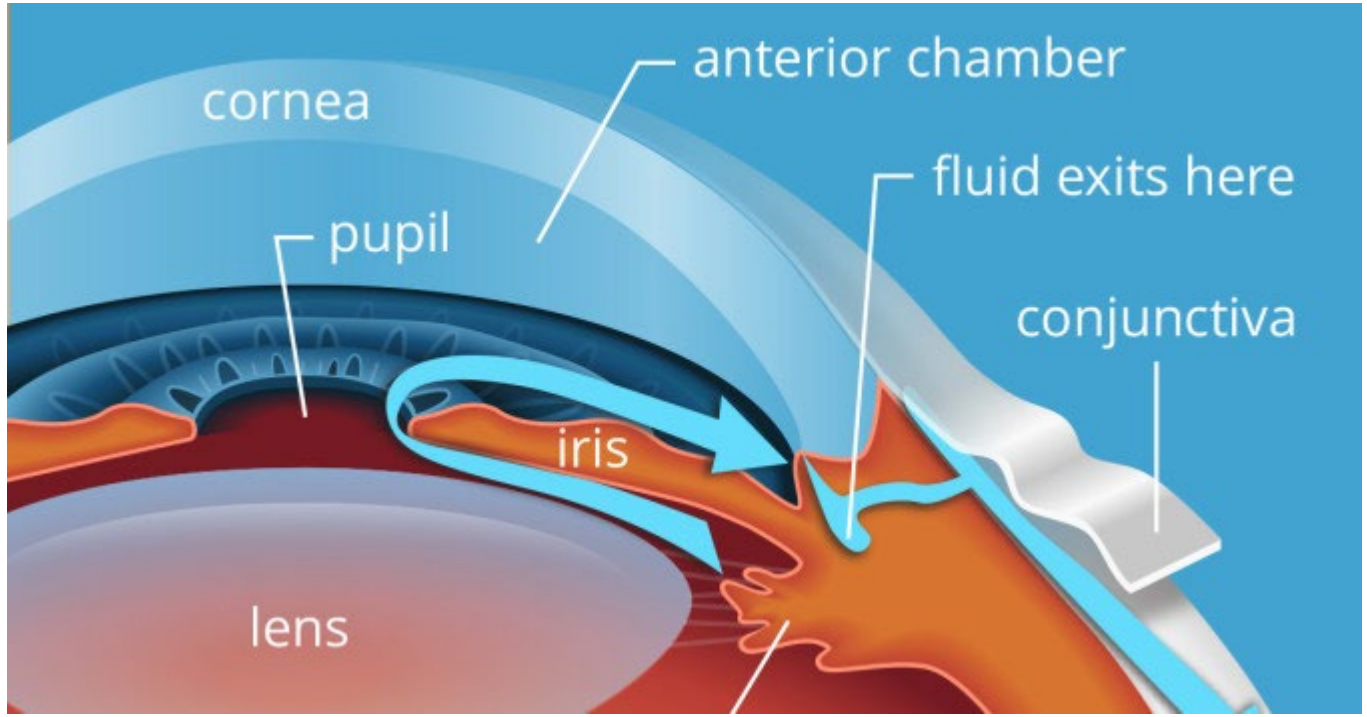
2 main types

Primary open-angle glaucoma

- Aqueous humor exits too slowly

Angle -closure glaucoma

- Less common
- Angle is too narrow for drainage got normal outflow of aqueous humor
- May be chronic or acute
- Narrow-angle glaucoma



Other Types of Glaucoma

Low-tension or normal-tension glaucoma

- optic nerve damage and vision loss occurs even though IOP remains normal. Low blood pressure may be a risk factor.

Congenital glaucoma

- A child may be born with a defect in the drainage angle that prevents the aqueous fluid from exiting the eye normally.
- Usually there are obvious symptoms, such as cloudy corneas, light sensitivity and watery eyes.

Secondary glaucoma

- May be due to complication of medical condition (diabetes and high blood pressure)
- Other eye conditions (such as cataracts and uveitis)
- Side effects of medications
- Trauma to the eye.

Pigmentary glaucoma

Age-Related Vision Problems

Age -Related Macular Degeneration

- Dry
- Wet

Contributing Factors

- Age
- Race (Caucasian)
- Genetic
- History of Smoking
- UV & HEV
- Trauma

Dry ARMD

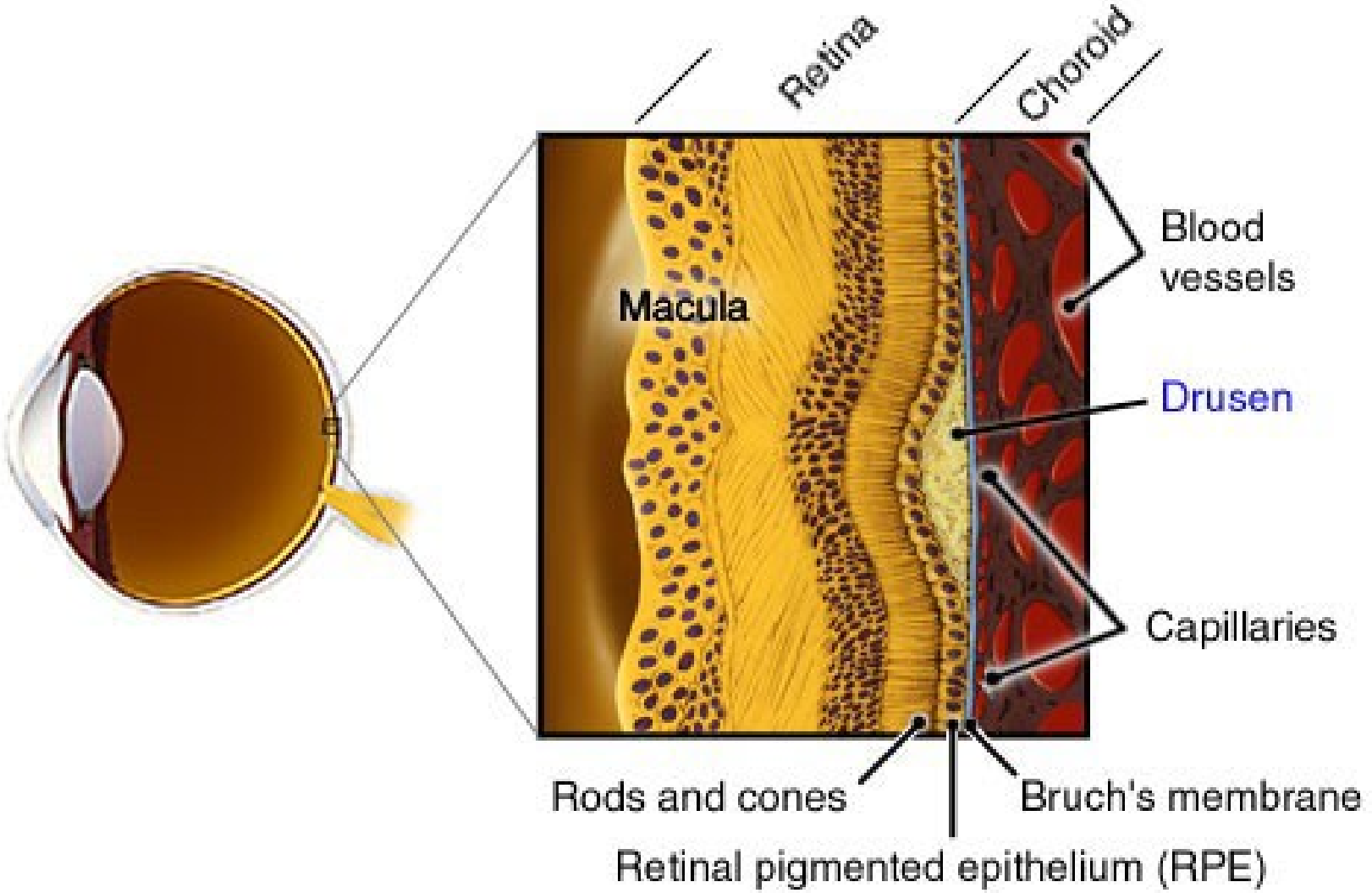
Accounts for about 90% of all cases

Cause is generally unknown although contributing factors

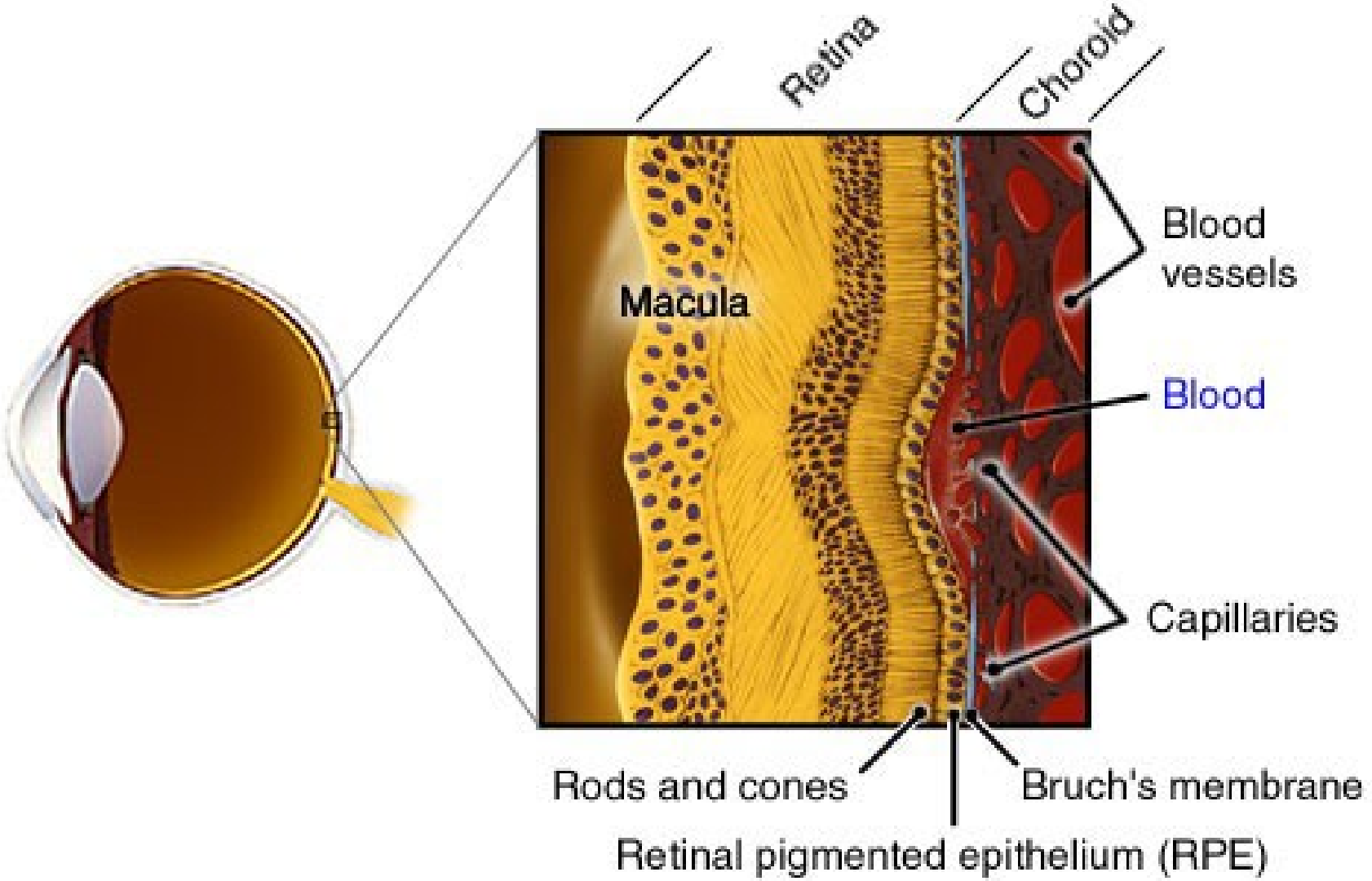
Slow progression in cell damage

Gradual loss of central vision

Dry Macular Degeneration (Cross-Section)



Wet Macular Degeneration (Cross-Section)



ARMD

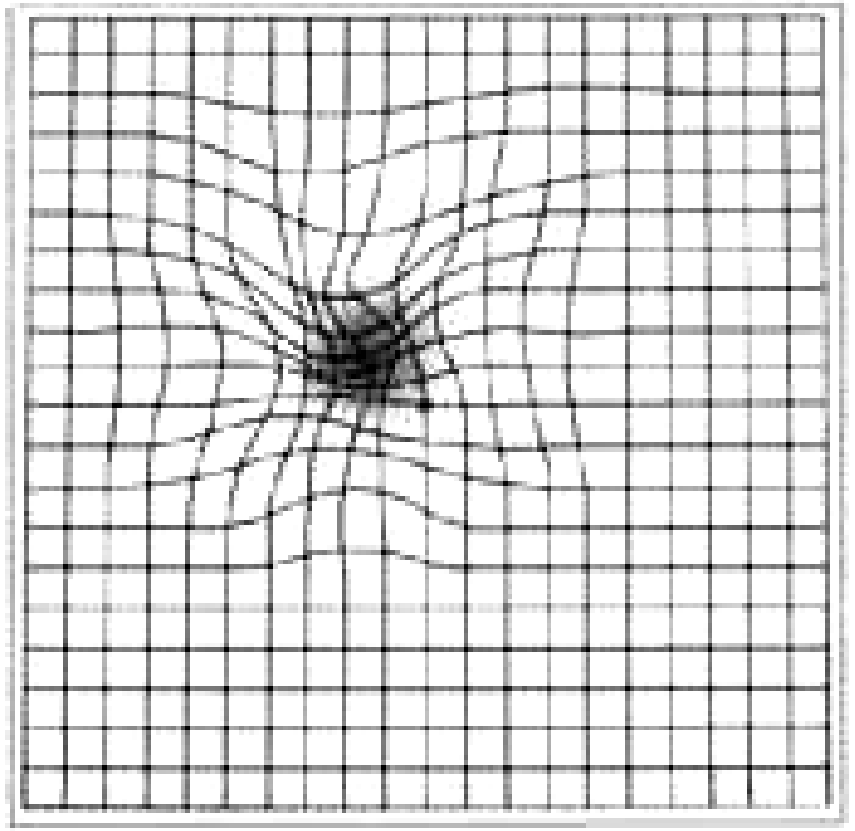
The ARMD patient has a distinct area of vision loss

Loss is typically in central field

Amsler Grid - Patient With ARMD

An example of an armd-related vision loss

Distortion, reduced- clarity or missing areas indicated vision loss



Age-Related Vision Problems

Age-Related Macular Degeneration

Diabetic Retinopathy

- Major cause of blindness
- Visual loss caused by
  - Retinal blood vessel abnormalities (Diabetic retinopathy)

Diabetes – Risk Factors

Family history of diabetes

Over 45 years of age

History of gestational diabetes or delivery of a baby over 4kg (9 pounds)

Race/Ethnicity of African American, Hispanic American, Native American, Asian American or Pacific Islanders

Diabetes – Risk Factors

High Blood Pressure (greater than 139/89)

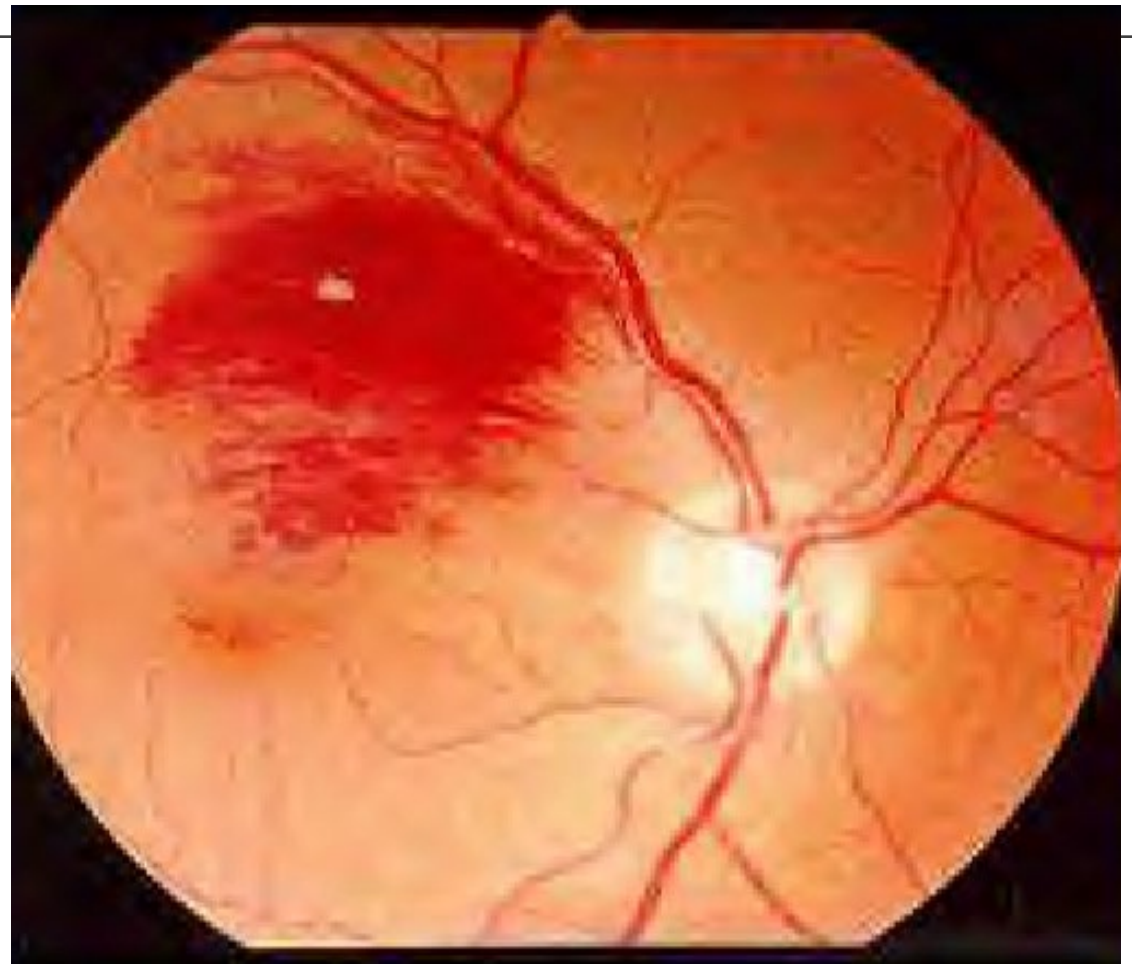
Inactivity, not exercising enough

High cholesterol

Obesity (MBI greater than 27)

Smoking

Diabetic Retinopathy



Age-Related Vision Problems

Optic Nerve Problems

Optic nerve atrophy

- Damage to the optic nerve
- Causes of optic atrophy
  - Poor blood flow
- Optic nerve can also be damaged by:
- Shock
- Toxins
- Radiation
- Trauma
- Glaucoma
- Can also be caused by diseases of the brain and central nervous system
- Brain tumor
- Cranial arteritis (sometimes called temporal arteritis)
- Multiple sclerosis
- Stroke

Age-Related Vision Problems

Manifestations of Cardiovascular Disease – Hypertension and arteriosclerosis

- Retinal vascular occlusions

- Central retinal artery occlusion
  - Blocked due to embolus
- Branch retinal artery occlusion
  - May have fair outcome
- Central retinal vein occlusion
- Branch retinal vein occlusion

- Some can not only be sight threatening but include life threatening

Age-Related Vision Problems

Corneal Dystrophies

Age-Related Vision Problems

Corneal Dystrophies

Lattice corneal dystrophy

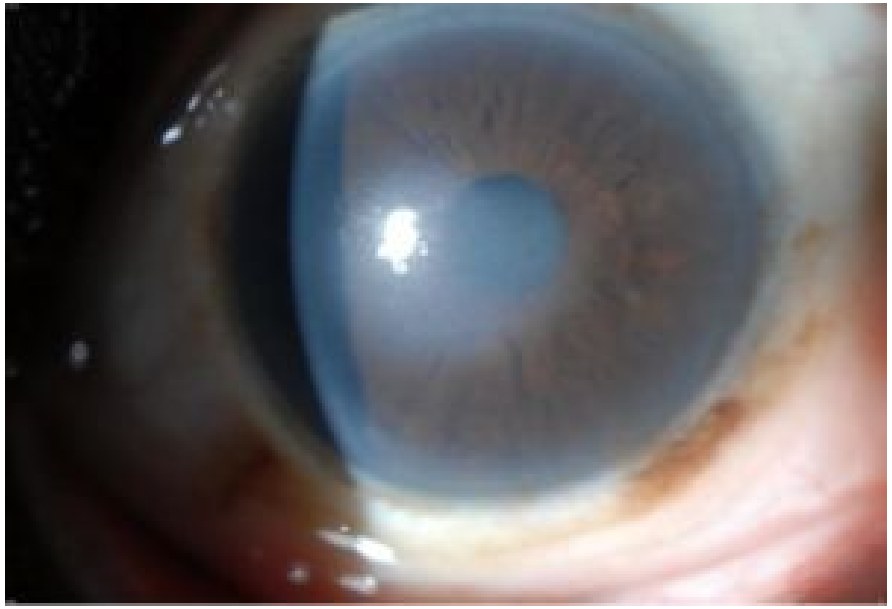
- is classically a bilateral condition
- Generally have epithelial corneal erosions
  - May need bandage contact lenses

Age-Related Vision Problems

Peripheral or marginal degeneration of the cornea

Fuch's dystrophy

- May wear contact lenses
- Generally most need them after corneal transplant



Age-Related Vision Problems

Degenerative Diseases of the Brain

Parkinson's and Alzheimer's diseases can have effects on the eye and vision

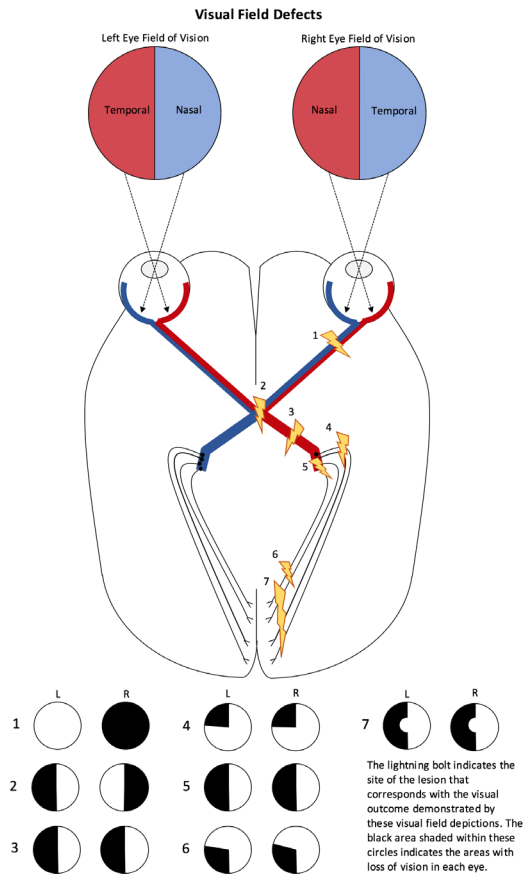
The eyes are extensions of the brain

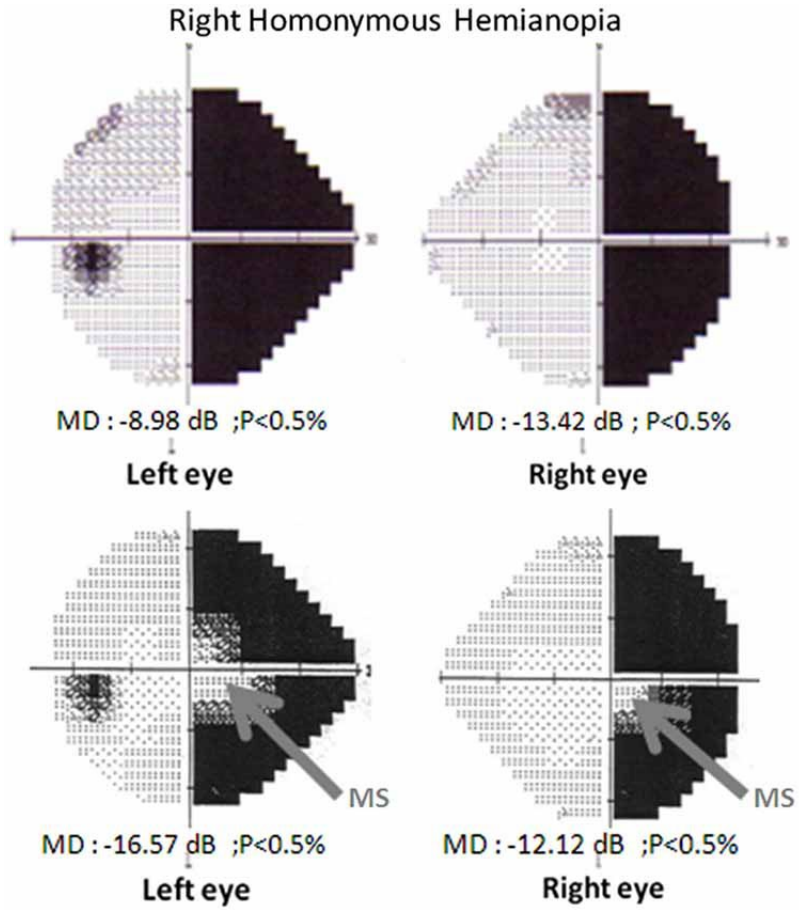
- Tests using optical coherence tomography (OCT) are promising in studies

- Eye exams are already useful in diagnosing other systemic health issues
  - Cardiovascular disease
  - Risk factors for stroke
  - Diabetes
  - High Blood pressure
  - Autoimmune diseases
  - Sexually transmitted diseases
  - Some cancers
  - Others

Age-Related Vision Problems

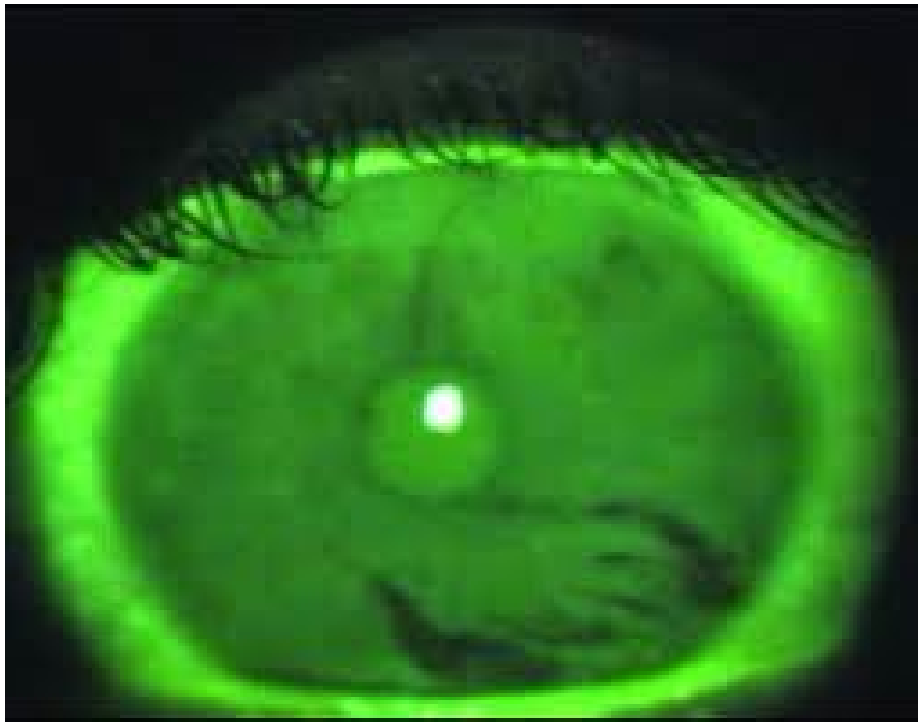
Stroke can cause loss of vision called hemianopia – Loss of a hemisphere of vision





Other age-related vision concern

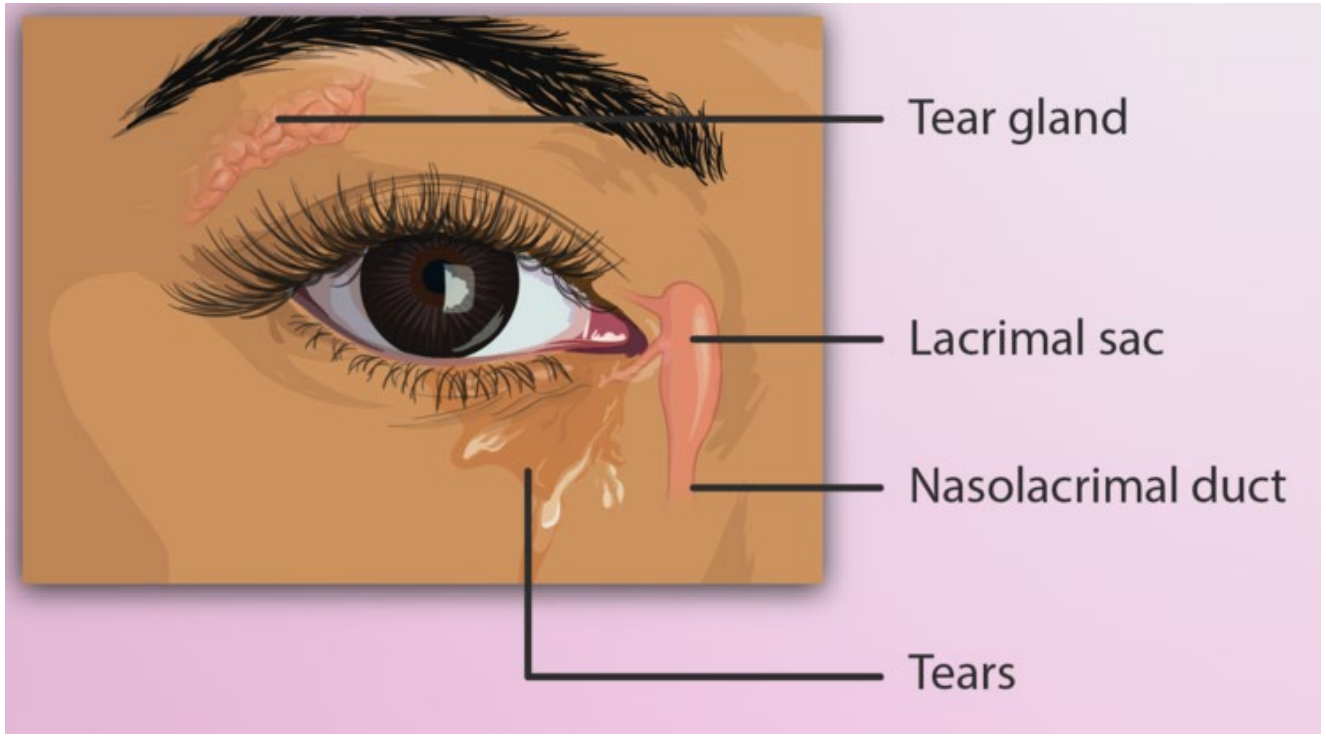
Dry eye



Other age-related vision concern

Excessive tearing

- Epiphora



Other age-related vision concern

Blepharitis

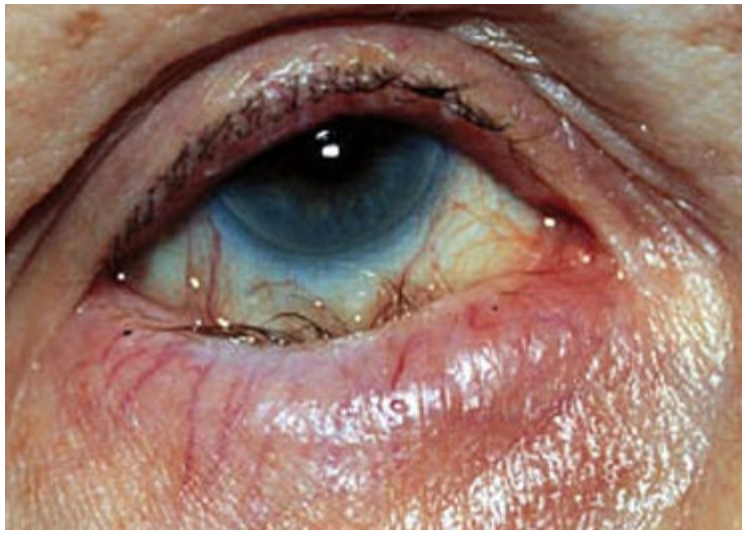
Other age-related vision concern

Eyelid disorders

Ptosis

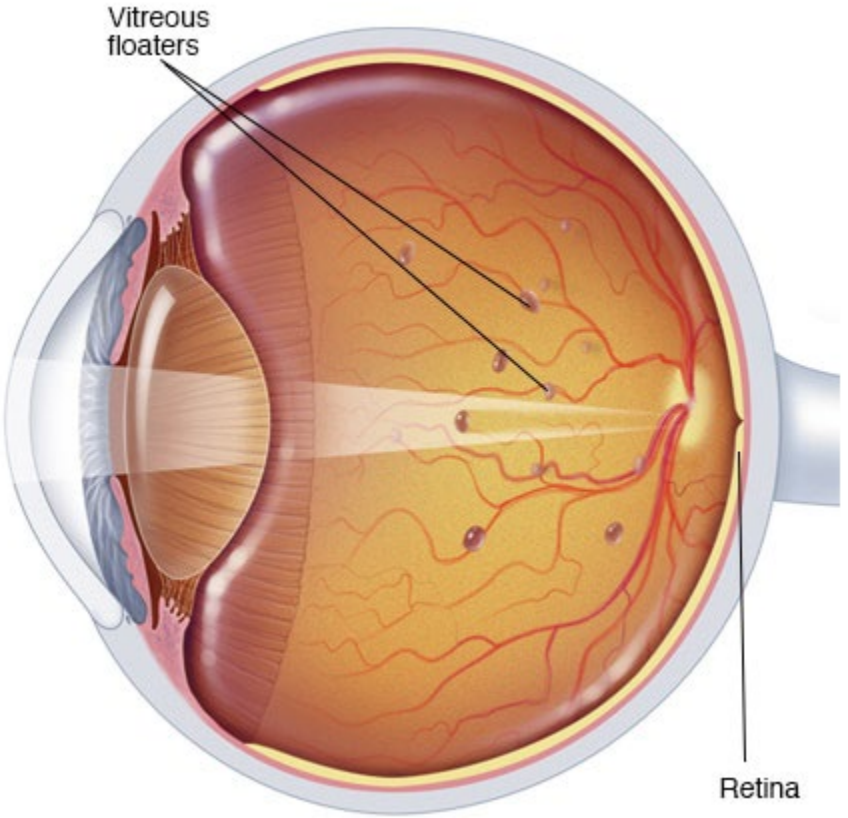
Entropion

Ectropion



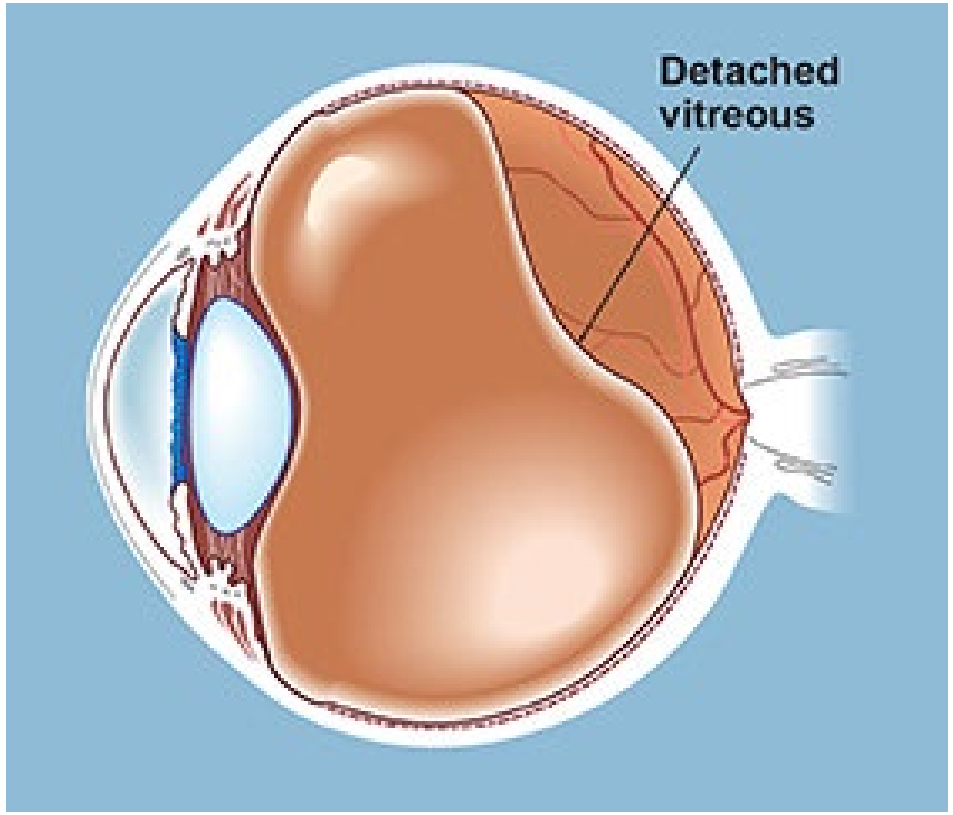
Other age-related vision concern

Floaters



Other age-related vision concern

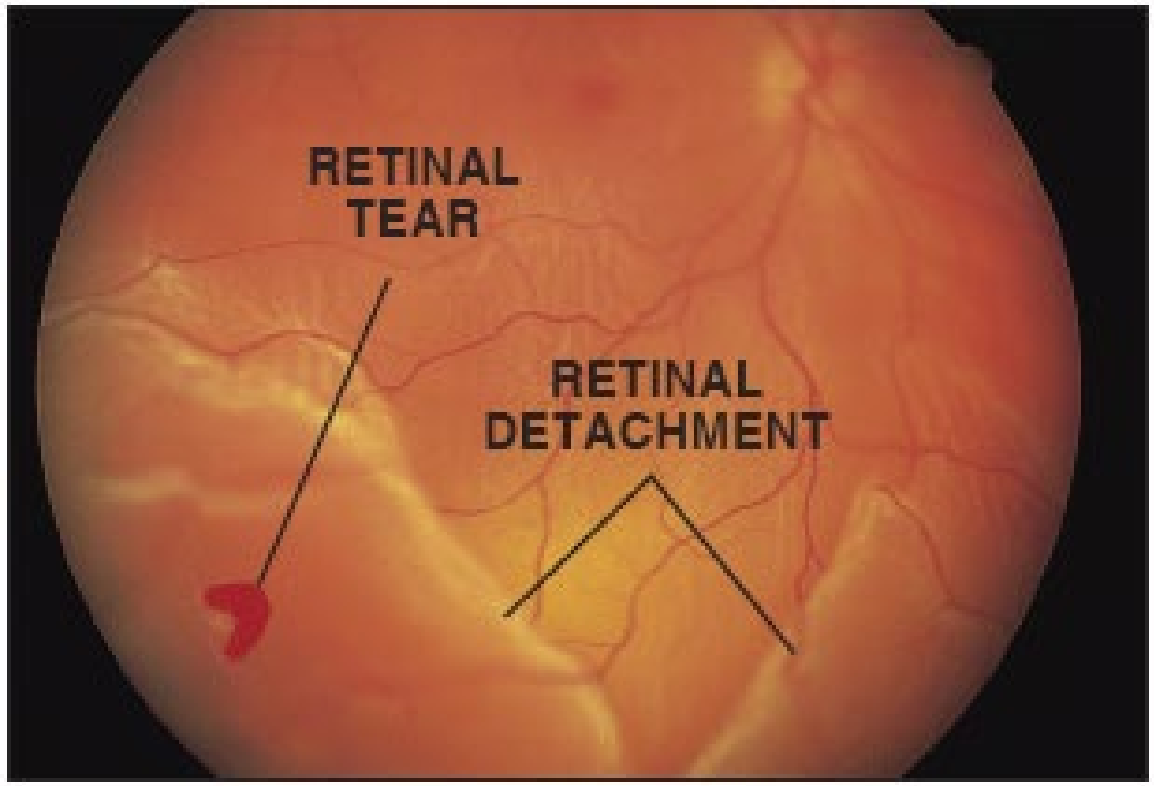
Vitreous detachment



Other age-related vision concern

Retinal holes and tears

Retinal detachment



Other age-related vision concern

Cystoid Macular Edema

- Leakage of fluid into the retina
- Forms cysts
- Seen with fluorescein angiography and OCT
- Usually caused by inflammation from other conditions including cataract surgery, retinal detachment, uveitis, diabetic retinopathy and macular degeneration

Corneal Arcus – Corneal Arcus Senilis

Caused by lipid deposits

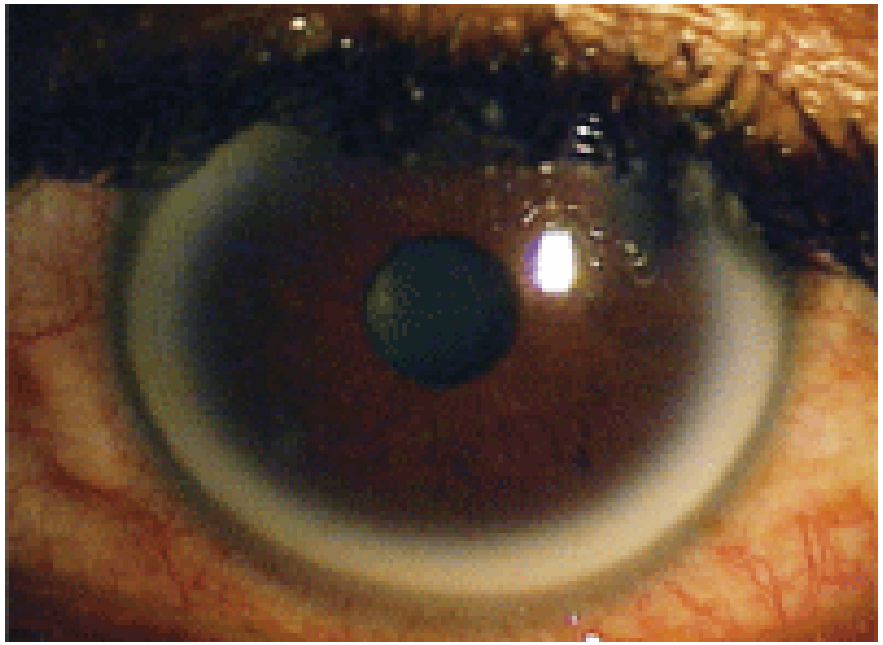
Fats and cholesterol enter eye

Generally begin at 6:00 and 12:00 and fill in

Most people will develop some arcus if they live long enough

May need to refer for lipid testing if under 40

- Younger patient – termed arcus juvenilis



Vision and the Senior Adult

How do these changes affect vision?

How do these changes affect contact lens wear?

:

Other Considerations

Conclusion/Questions/Answers