

The Eyes Have It: Maintaining Vision in Health and Disease

Virtual Format (Online)

Wednesday evenings, May 12 – June 16

7:00 – 8:30 pm PT, Live Streamed

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Osher Mini Medical
School

Spring 2021

Introduction to the Eye and Ocular
Disease

Disclosures

No financial interest in any of the topics being presented



<https://whole-lifeleadership.com/wp-content/uploads/bigstock-Clear-forest-in-glasses-on-the-54563738.jpg>

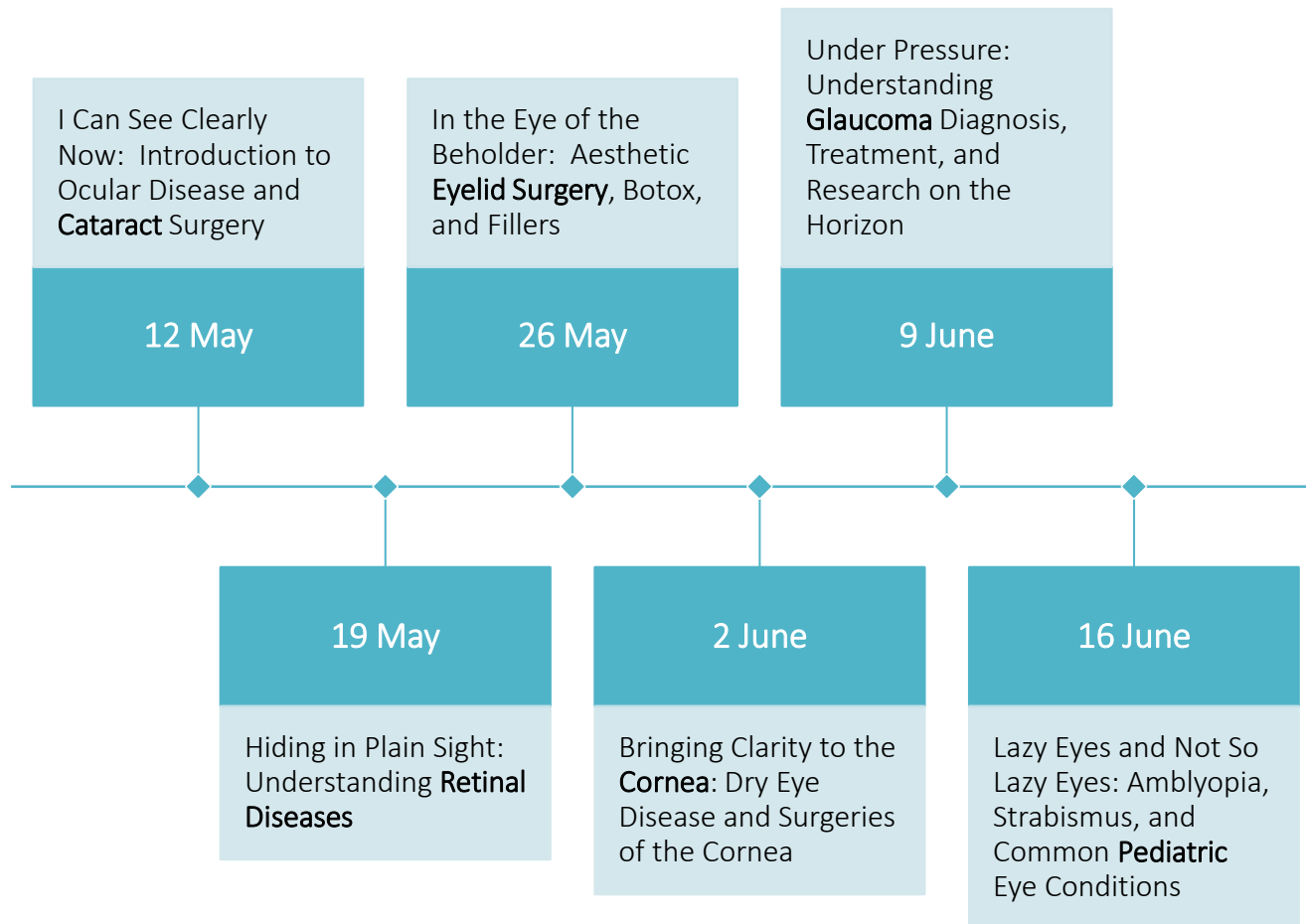
I Can See Clearly Now Introduction to Ocular Disease and Cataract Surgery

Saras Ramanathan, MD & Neeti Parikh, MD

Dept of Ophthalmology, UCSF

The Eyes Have It: Maintaining Vision in Health and Disease

Osher Mini Medical School
Spring 2021



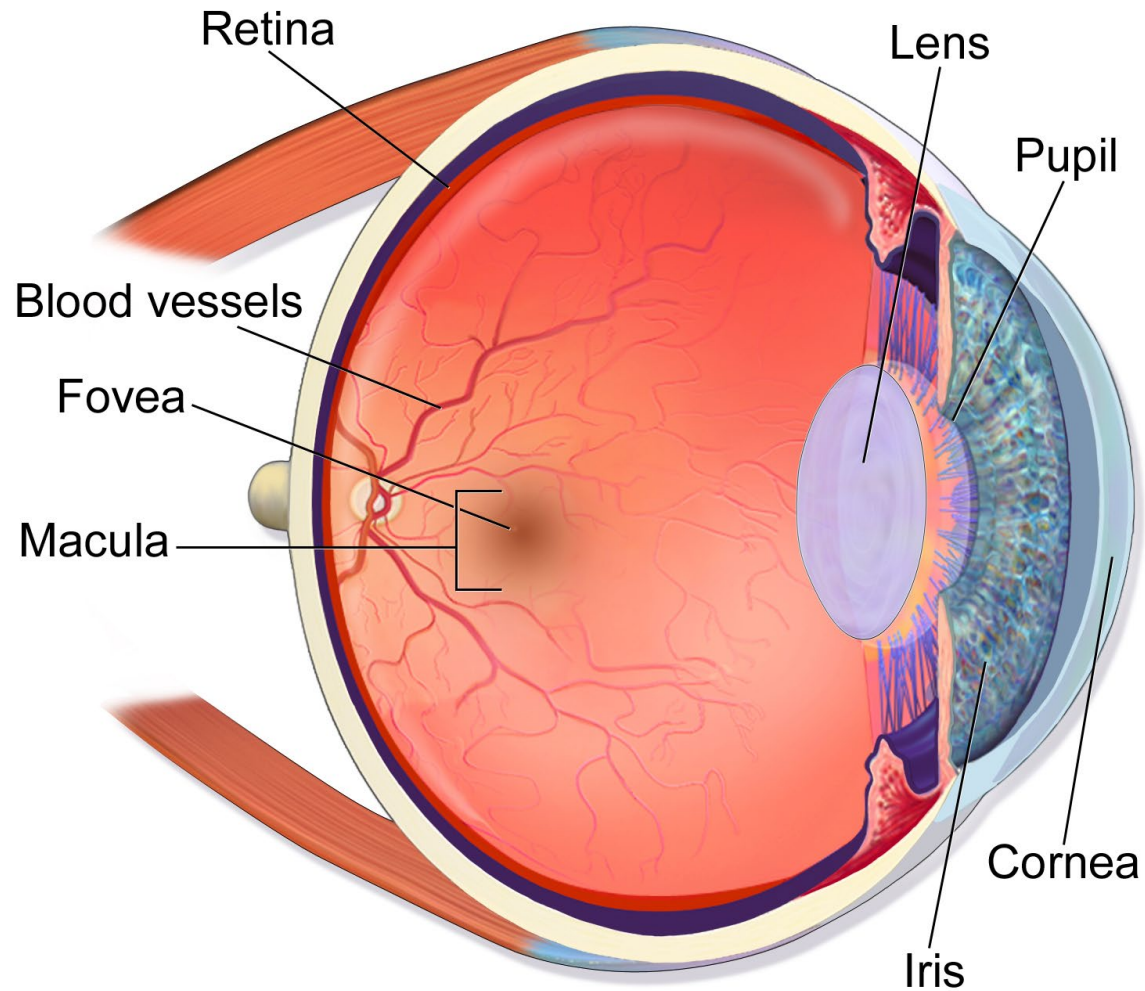


Course Objectives

Identify major ocular structures and their functions

Understand fundamental disease processes of major eye diseases

Identify current treatment regimens for these diseases



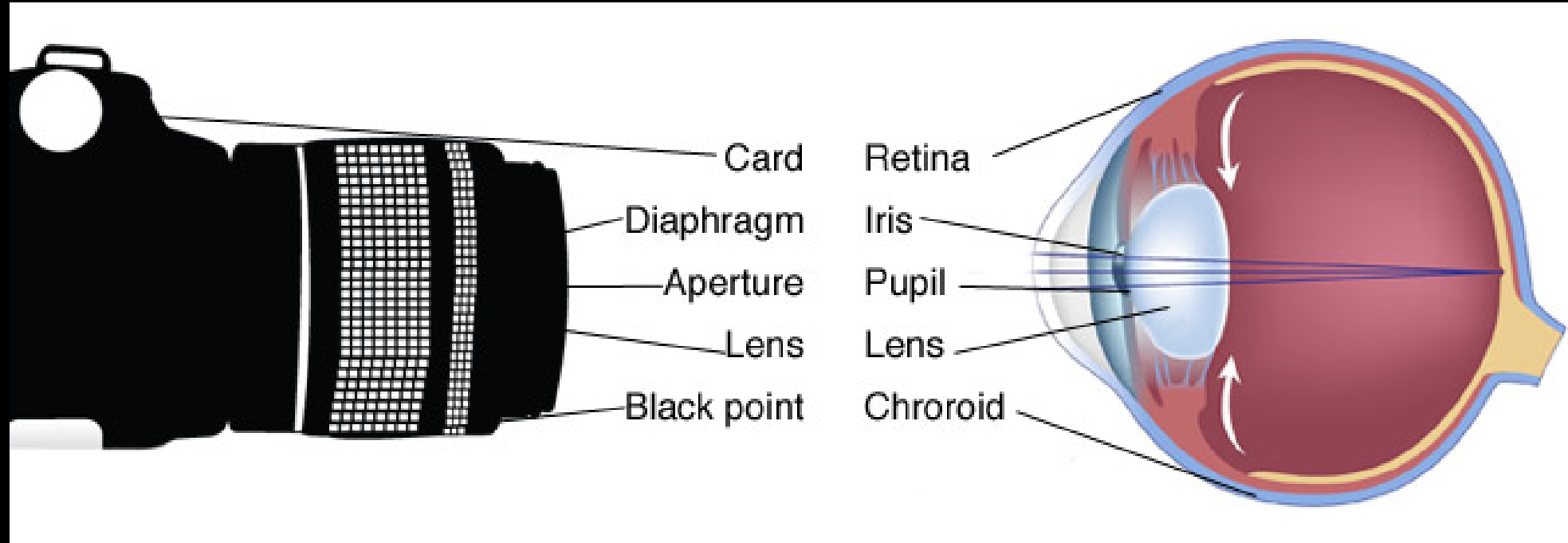
Eye Anatomy

Let's start at the beginning...

Ocular anatomy

Focusing elements

Image Transduction



Eye = Camera

Lens Cap

Diaphragm

Lens

Aperture

Film/SD card

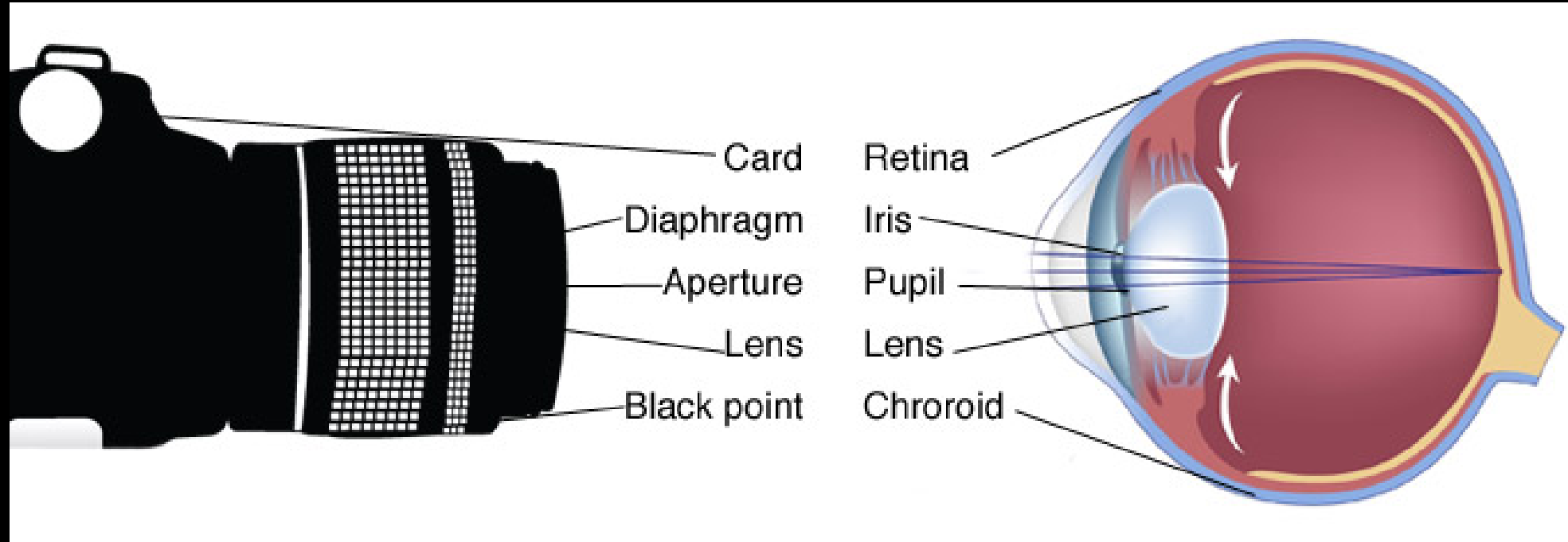
Eyelids/Ocular Surface

Iris/Ciliary Body

Lens

Pupil

Retina



Lids and Ocular Surface

Lens Cap

Diaphragm

Lens

Aperture

Film/SD card

Eyelids/Ocular Surface

Iris/Ciliary Body

Lens

Pupil

Retina

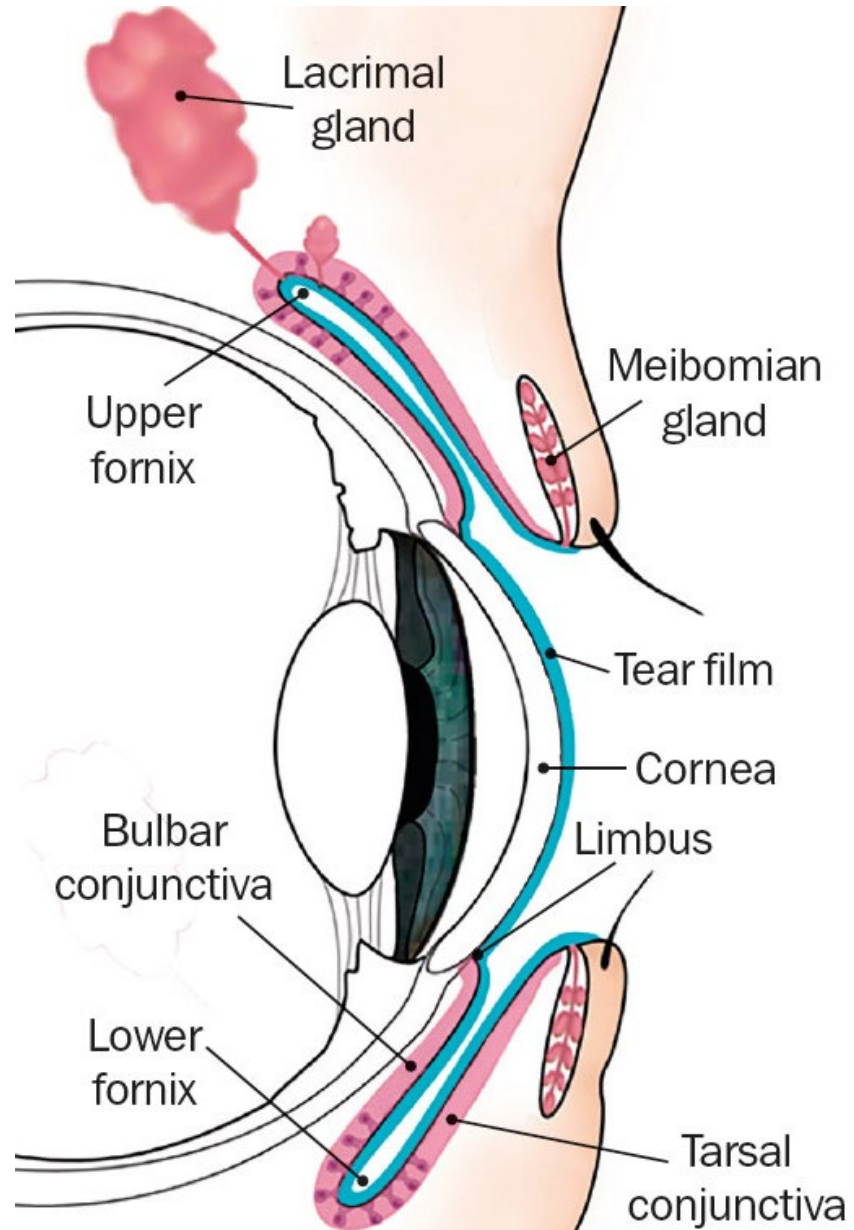


Photo Credit: Peter Mallen www.schepens.harvard.edu

External Structures

Structures

- Eyelids
- Conjunctiva
- Tear Layer

Function

- Protect
- Lubricate
- Tear glands
- Oil Glands

Dysfunction

- Dry Eye
- Blepharitis
- Eyelid Malposition



Dry Eye

Not enough tears to keep eye moist

Decreased production

Primary disease

Inflammation of ocular surface structures

Infection

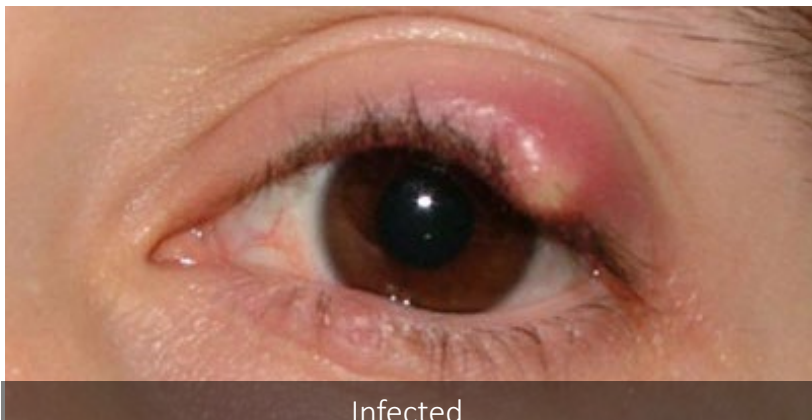
Drug related

Increased evaporation

Loss of oil layer

Eyelid malposition

Blepharitis

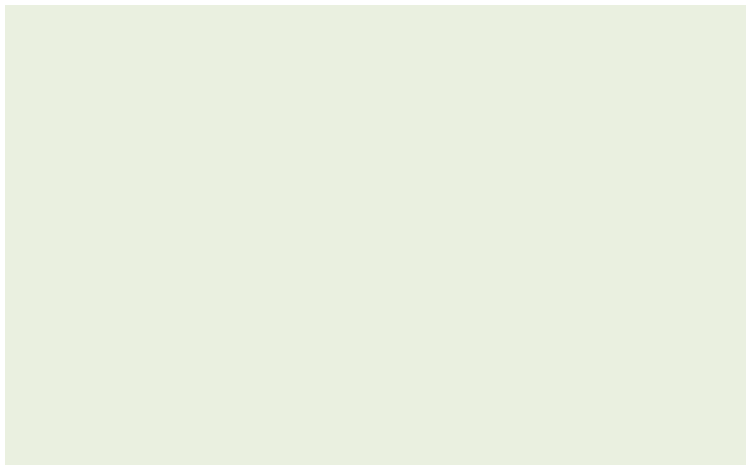


Burning

Foreign body sensation

Redness

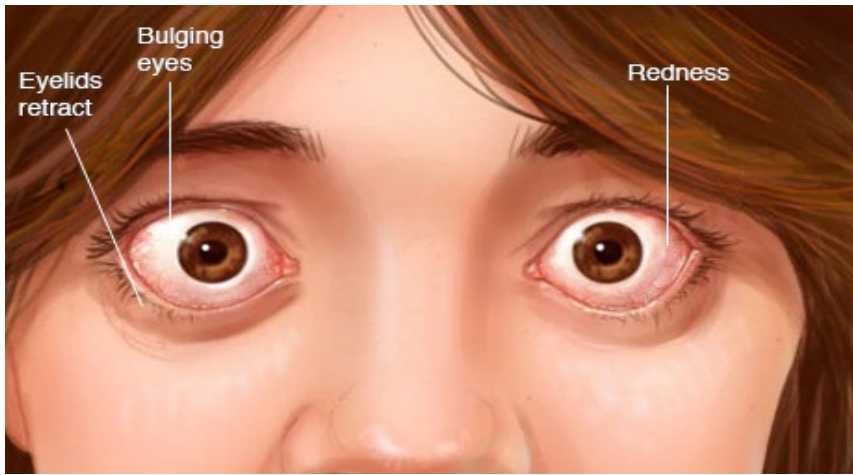
Chronic vs. Acute infection



Gerami Seitzman, MD
Julie Schallhorn, MD

Bringing Clarity to the Cornea
Dry Eye Disease and Surgeries of the
Cornea

June 2, 2021



https://www.mayoclinic.org/-/media/kcms/gbs/patient-consumer/images/2013/08/26/10/47/ds00181_im02688_exophthalmos_gif.jpg

Eyelid Malposition



<https://www.bopss.co.uk/bopss-uploads/Right-lower-lid-ectropion.jpg>

Drooping

Sagging

Bulging

Swelling



https://lh3.googleusercontent.com/proxy/o_FHcf6iWfV5F1NZPwvxPnSTMmR6uTcMoo hvXl0F1JZmestEVbPSPH_hMFMxfVyPG3KUa4MKEQ6CDRkUKmVz97enUikSAQX0vL4PwC plDaGv511Xxo7Dr_gOvxZhVIZkanj8pg

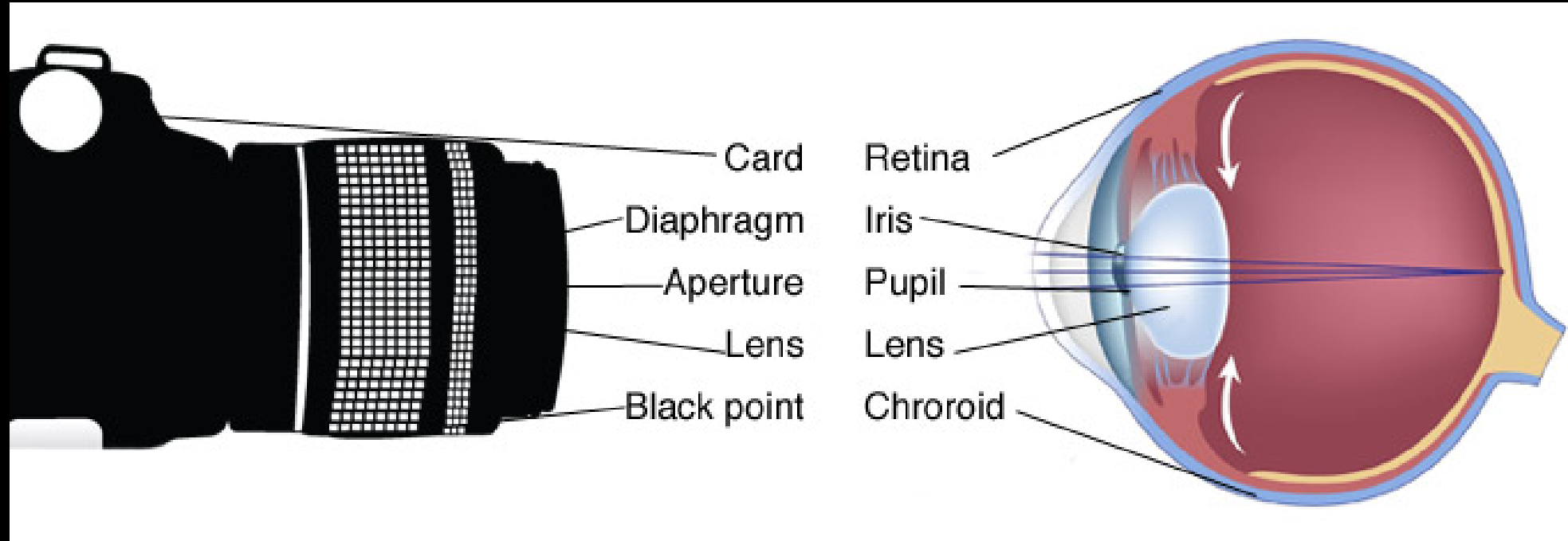


Bryan Winn, MD

In the Eye of the Beholder

Aesthetic Eyelid Surgery, Botox, and
Fillers

May 26, 2021



Glaucoma

Lens Cap

Diaphragm

Lens

Aperture

Film/SD card

Eyelids/Ocular Surface

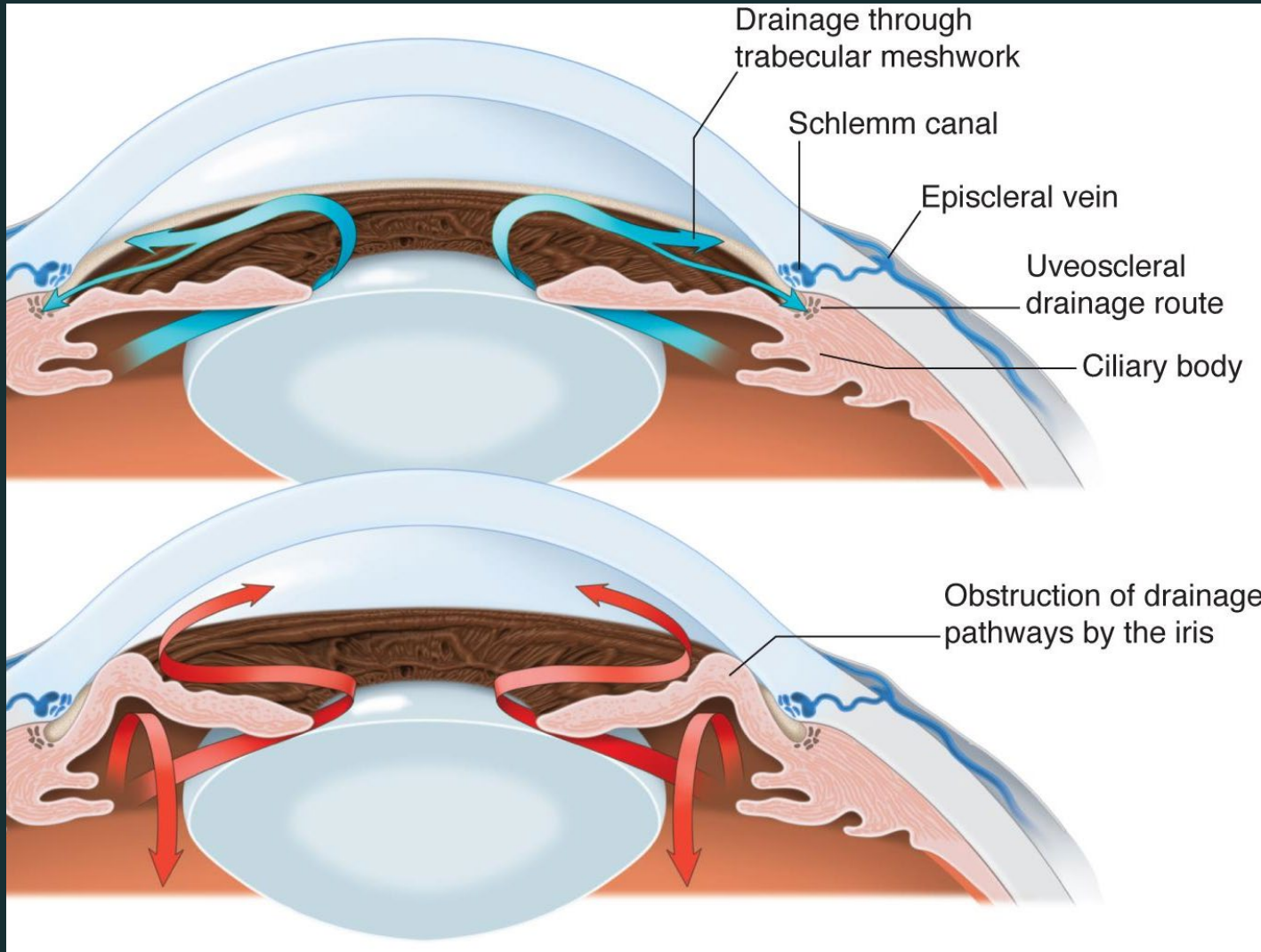
Iris/Ciliary Body

Lens

Pupil

Retina

Aqueous Humor and the Angle



Blockage of fluid flow anywhere along the path results in Glaucoma



Glaucoma

Silent

Characteristic loss of peripheral vision with associated optic nerve damage

Often with high eye pressure

Symptom-free until very late

- Early peripheral vision loss goes unnoticed

- Only end stage vision loss is symptomatic

Often undiagnosed for several years

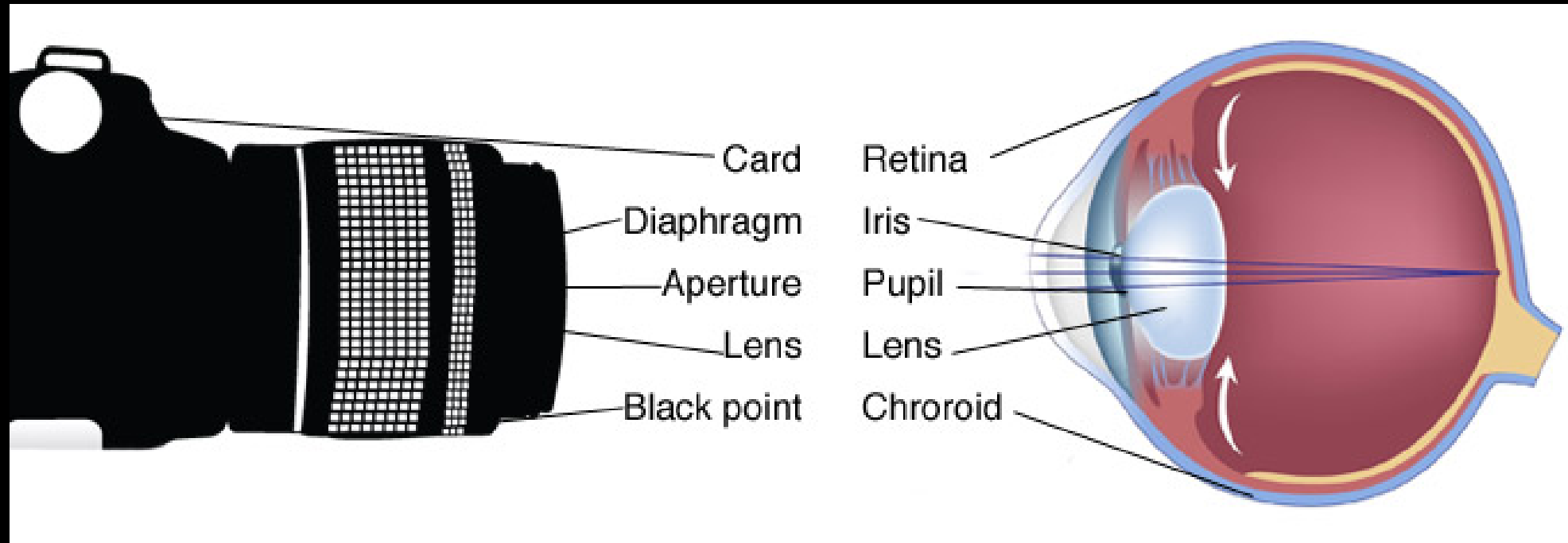


Yvonne Ou, MD
Cathy Sun, MD
Sri Padmanabhan, MD

Under Pressure!

Understanding Glaucoma Diagnosis,
Treatment, and Research on the
Horizon

June 9, 2021



Retinal Disease

Lens Cap

Diaphragm

Lens

Aperture

Film/SD card

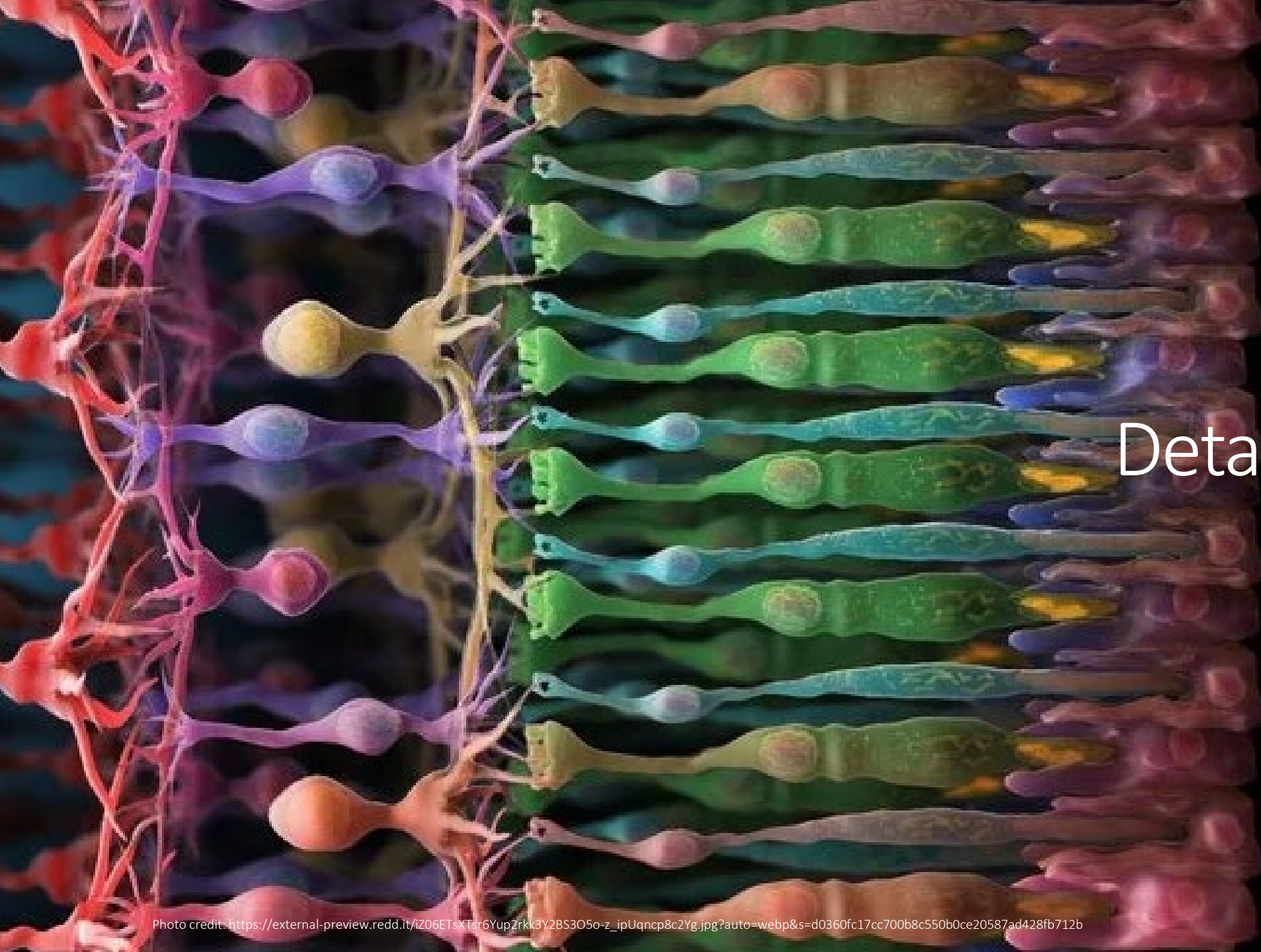
Eyelids/Ocular Surface

Iris/Ciliary Body

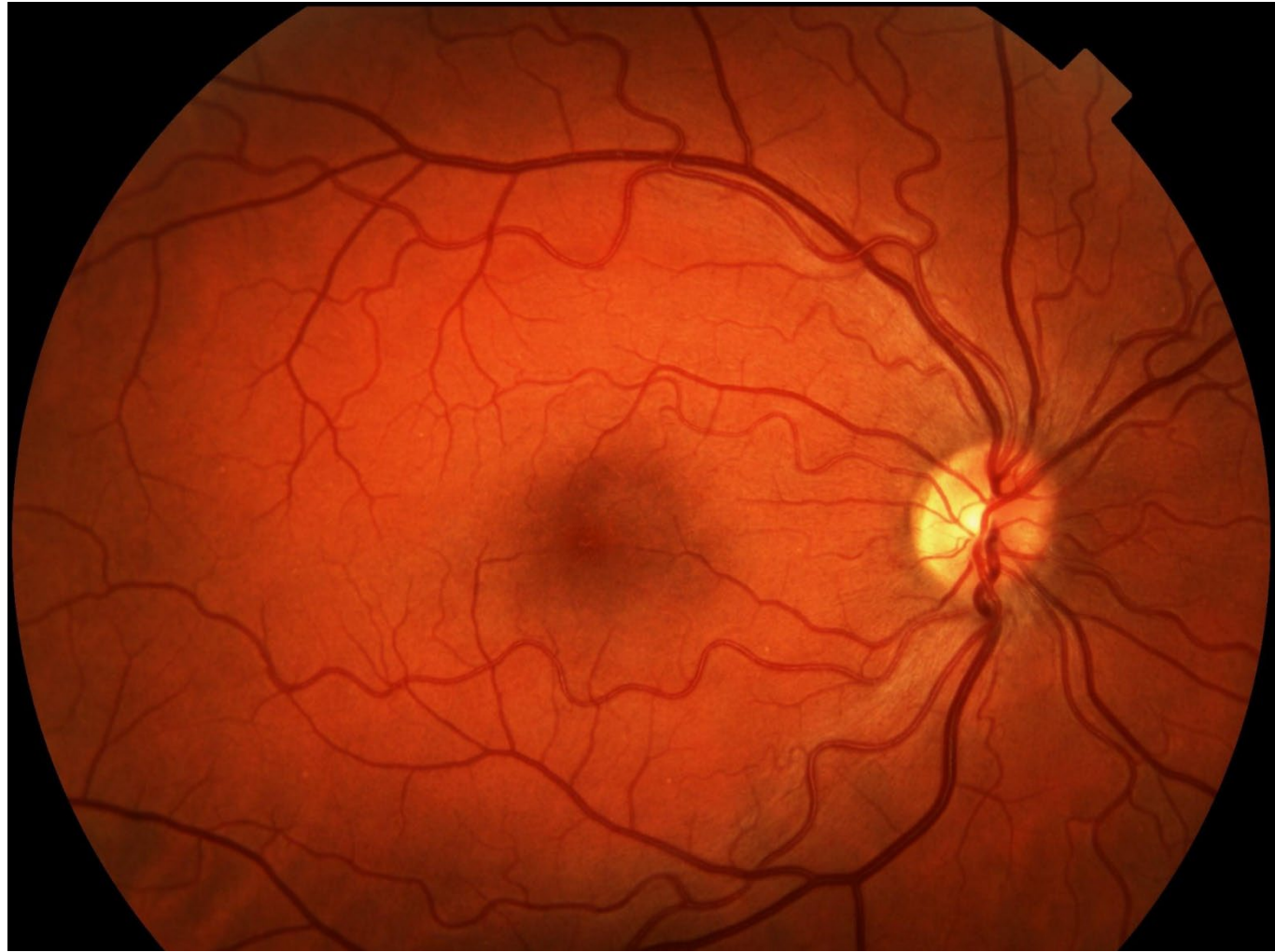
Lens

Pupil

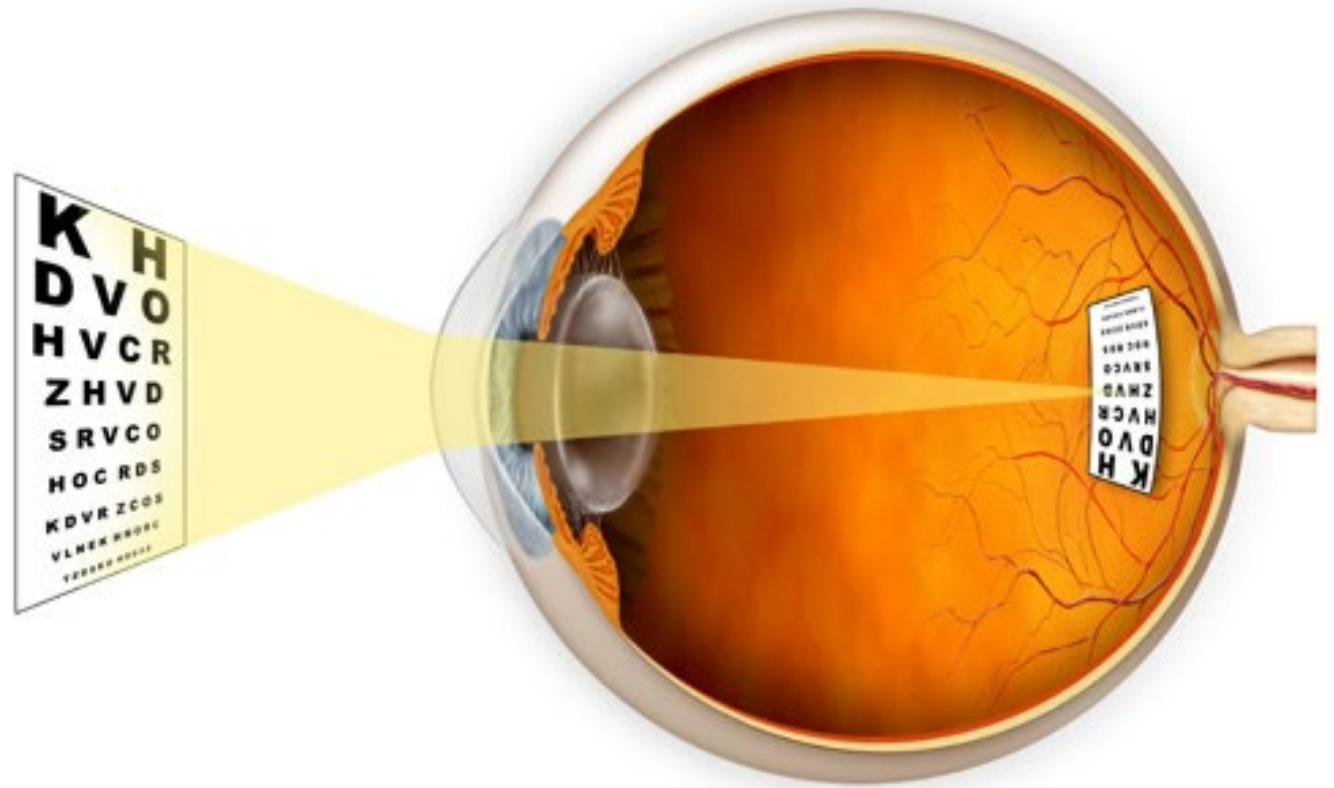
Retina



Details, details...



“Macular Vision”



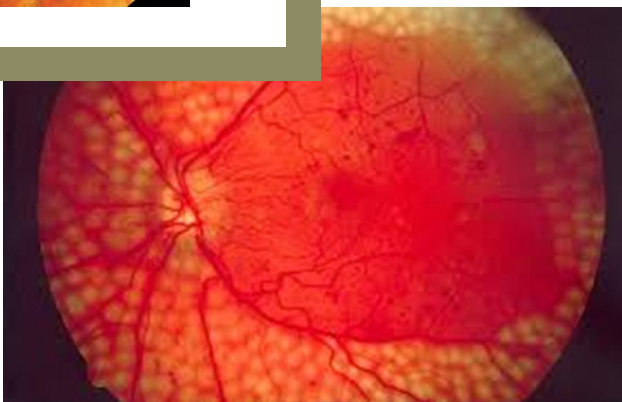
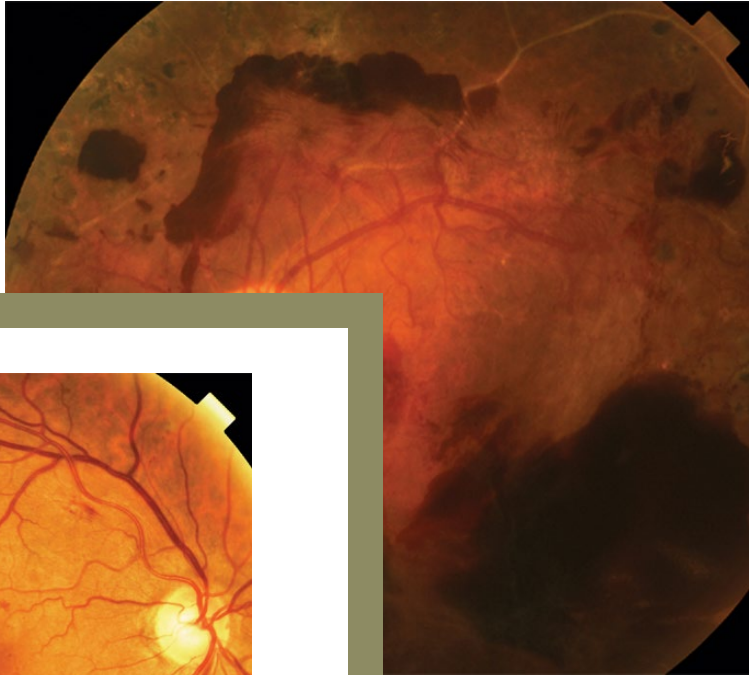
Age Related Macular Degeneration

Disease in which there is degeneration of the nutritive layer of the retina, resulting in atrophy of the overlying photoreceptors.

May or may not be associated with ingrowth and bleeding of abnormal blood vessels

Preferential loss of neurons in the macula





Diabetic Eye Disease

Damage to small blood vessels

Growth of new/incompetent vessels

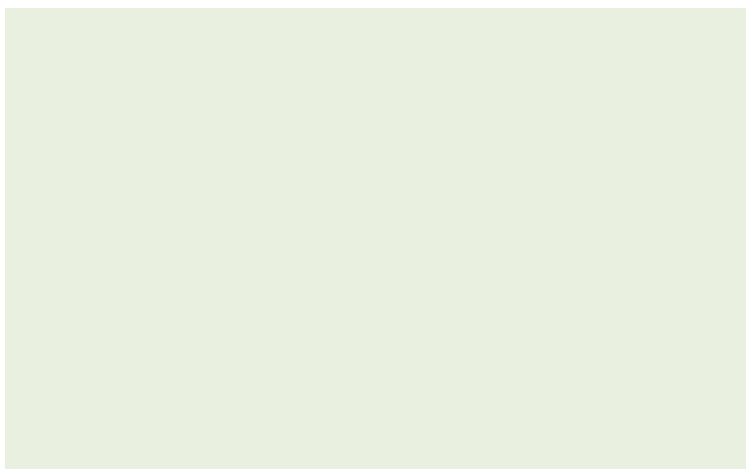
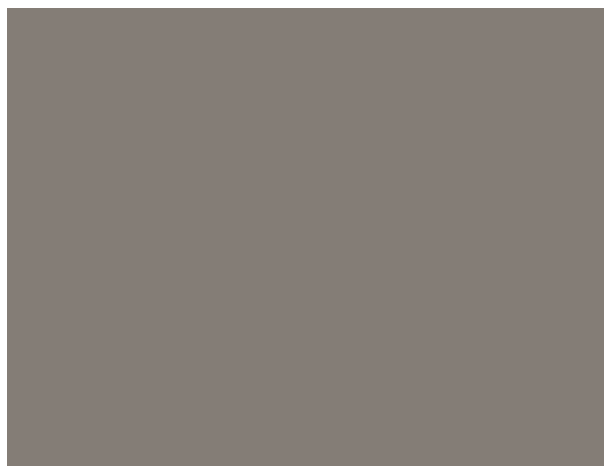
Leakage of fluid

Hemorrhage

Treatment

Laser

Anti-VEGF injection

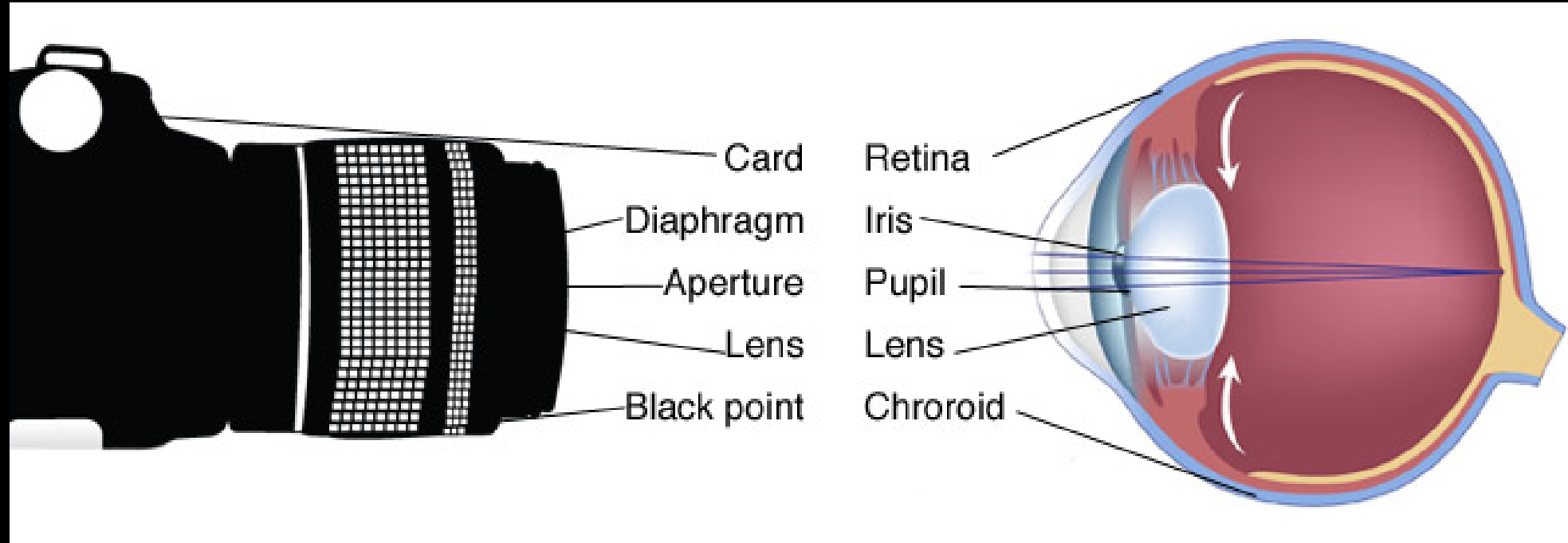


Melissa Neuwelt, MD Jacque Duncan, MD

Hiding in Plain Sight

Understanding Retinal Diseases

May 19, 2021



Pediatrics and Strabismus

Lens Cap

Diaphragm

Lens

Aperture

Film/SD card

Eyelids/Ocular Surface

Iris/Ciliary Body

Lens

Pupil

Retina

Eye Movement, Strabismus, and Amblyopia

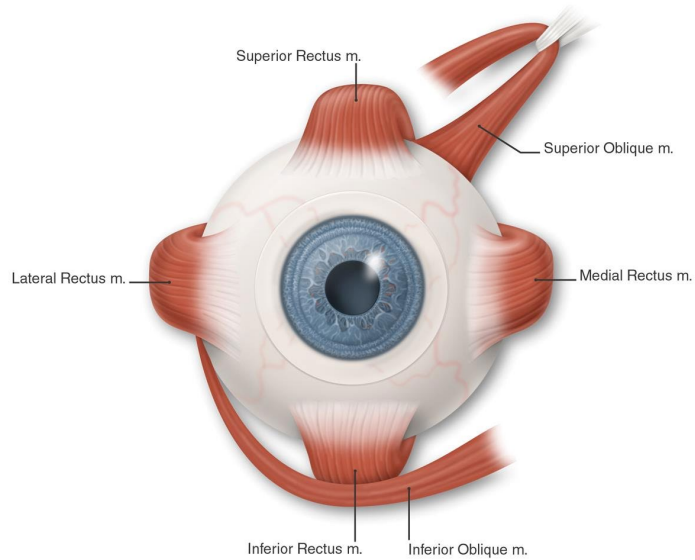
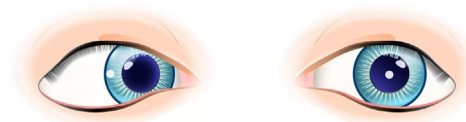


Photo credit: <https://www.aaopt.org/image.axd?id=4ac021fd-7f8e-4712-a5b5-759a5e68f505&t=636999441026030000>

STRABISMUS

Esotropia



Exotropia

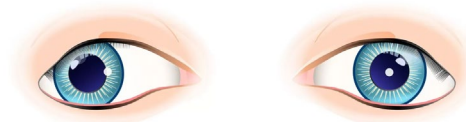


Photo credit: <https://ocvt.info/wp-content/uploads/2019/10/strabismus.jpg>

Six Eye Muscles

Coordinated movement

Strabismus = Loss of alignment, which results in loss of optimal binocularity

Use of spectacle prisms and muscle realignment surgery to straighten eyes and restore binocularity

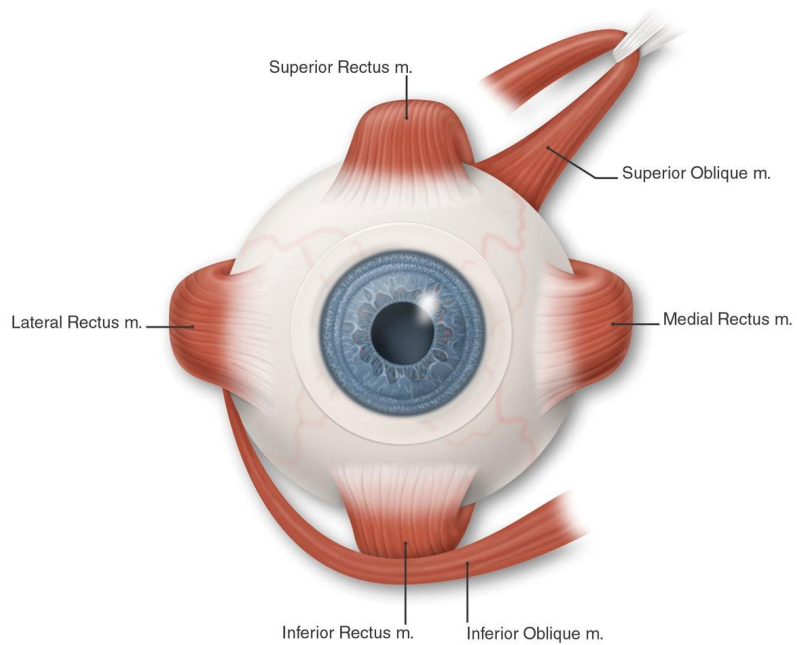


Photo credit: <https://www.aao.org/image.axd?id=4ac021fd7f8e-4712-a5b5-759a5e68f505&t=636999441026030000>

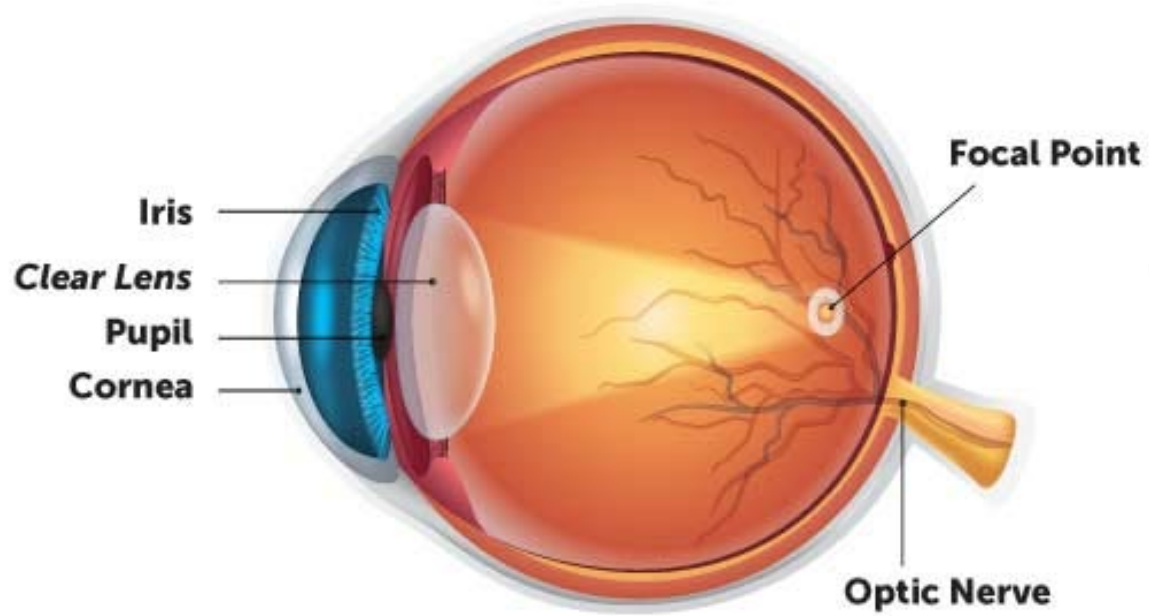


Maanasa Indaram, MD

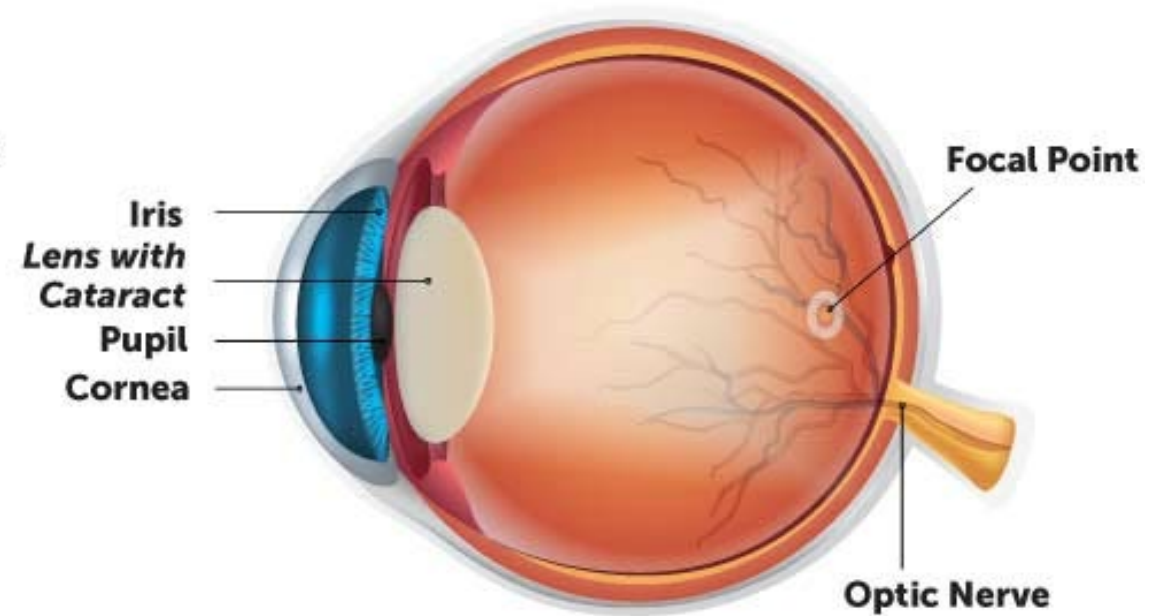
Lazy Eyes and Not So Lazy Eyes
Amblyopia, Strabismus, and
Common Pediatric Eye Conditions

June 16, 2021

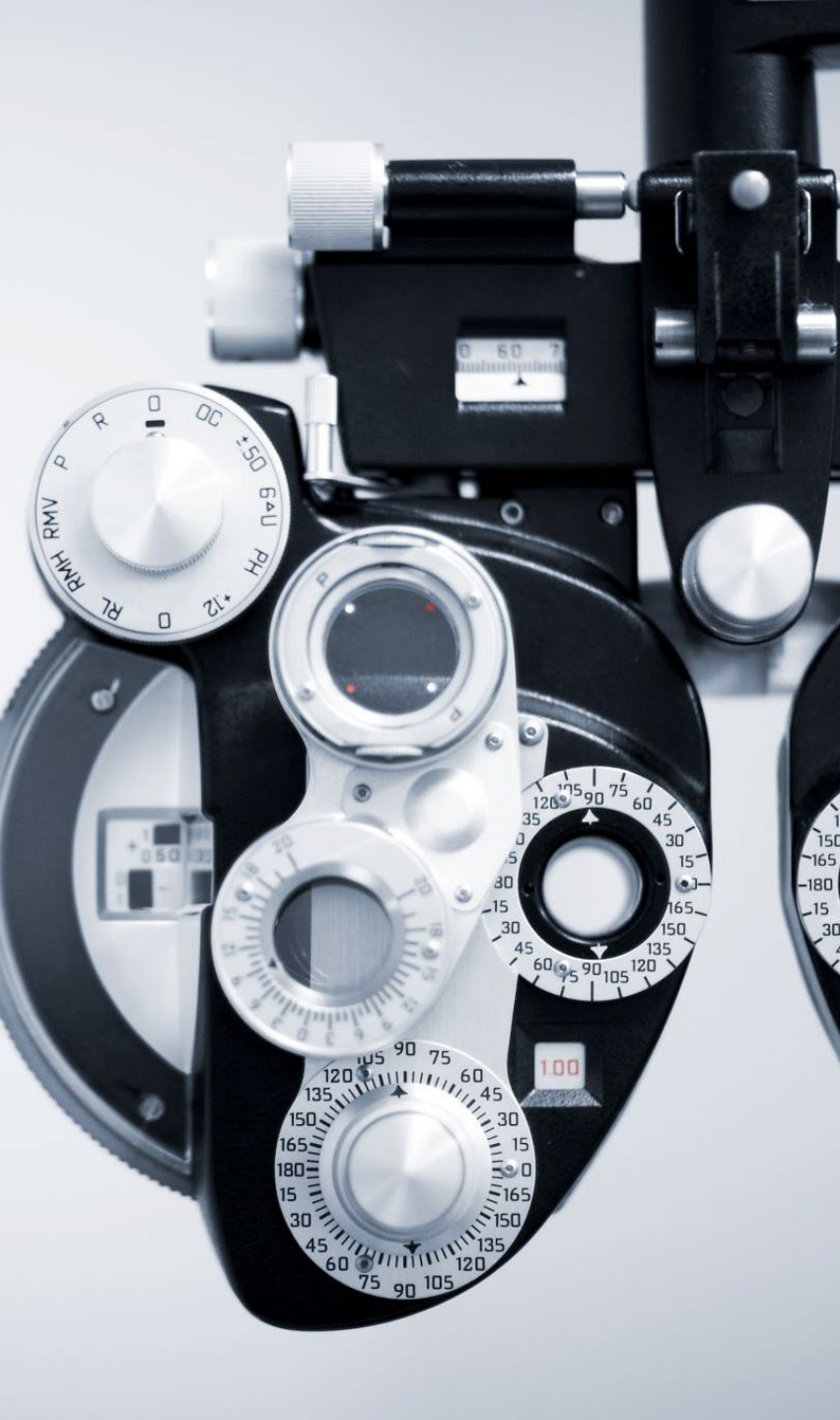
HEALTHY EYE



EYE WITH CATARACT



Cataract



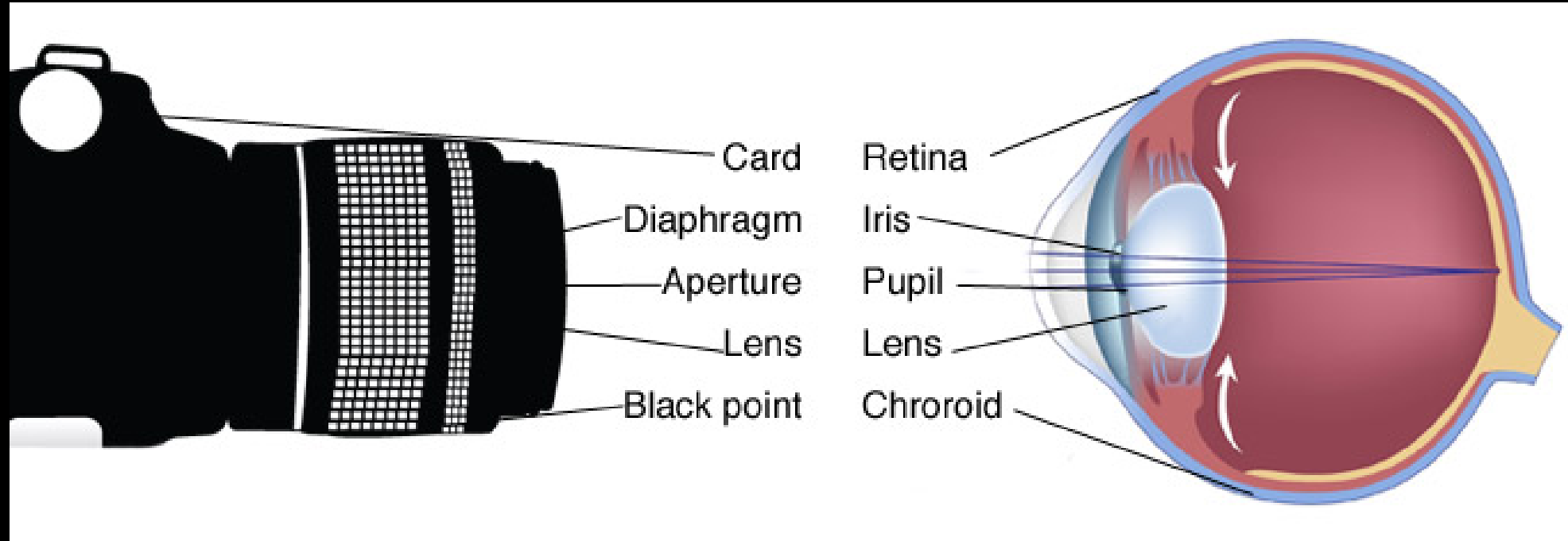
Objectives

Introduce major **ocular structures**, their **functions** and **common diseases**

Define Cataract and identify its symptoms

Describe surgical and non-surgical **treatments for cataract**

Introduce different **lens implant** choices and decision-making process around selecting these



Lens

Lens Cap

Diaphragm

Lens

Aperture

Film/SD card

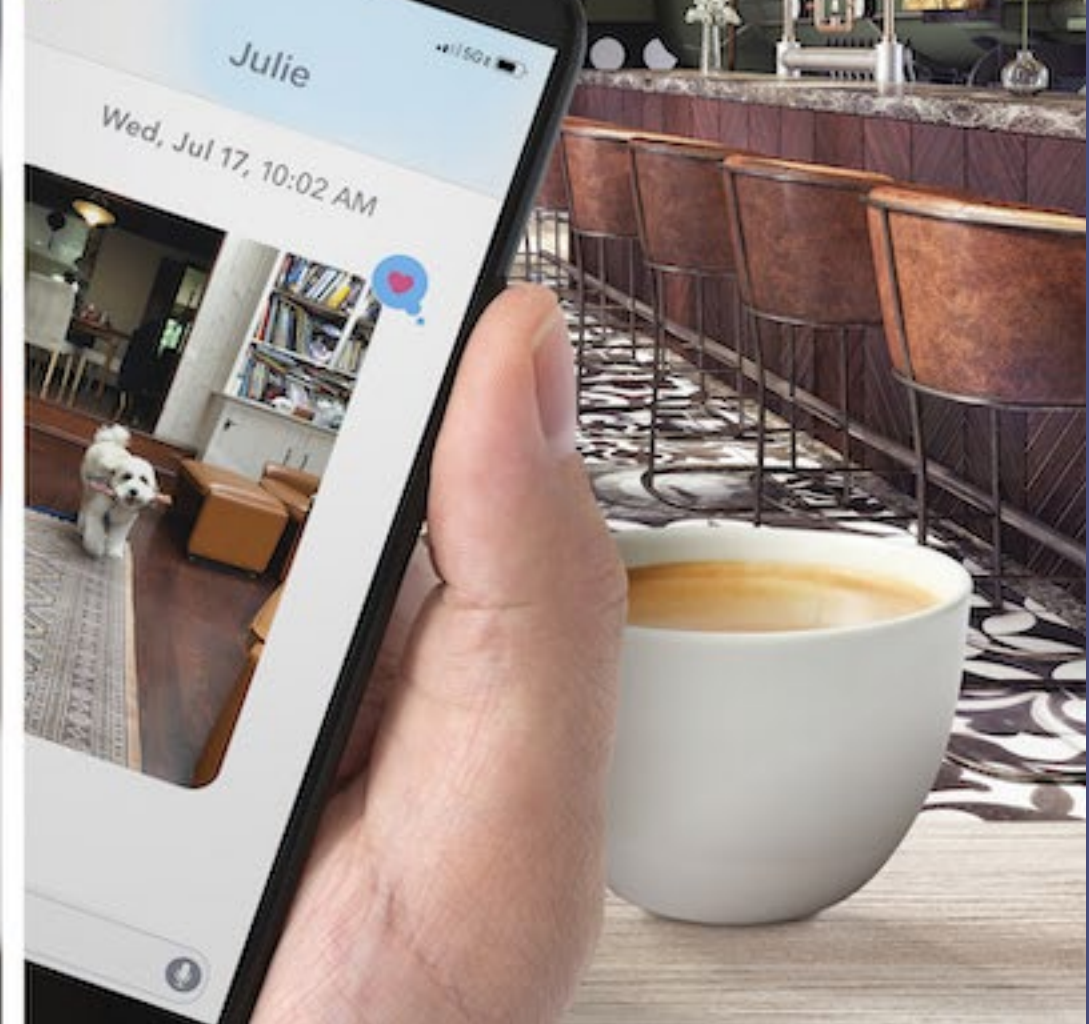
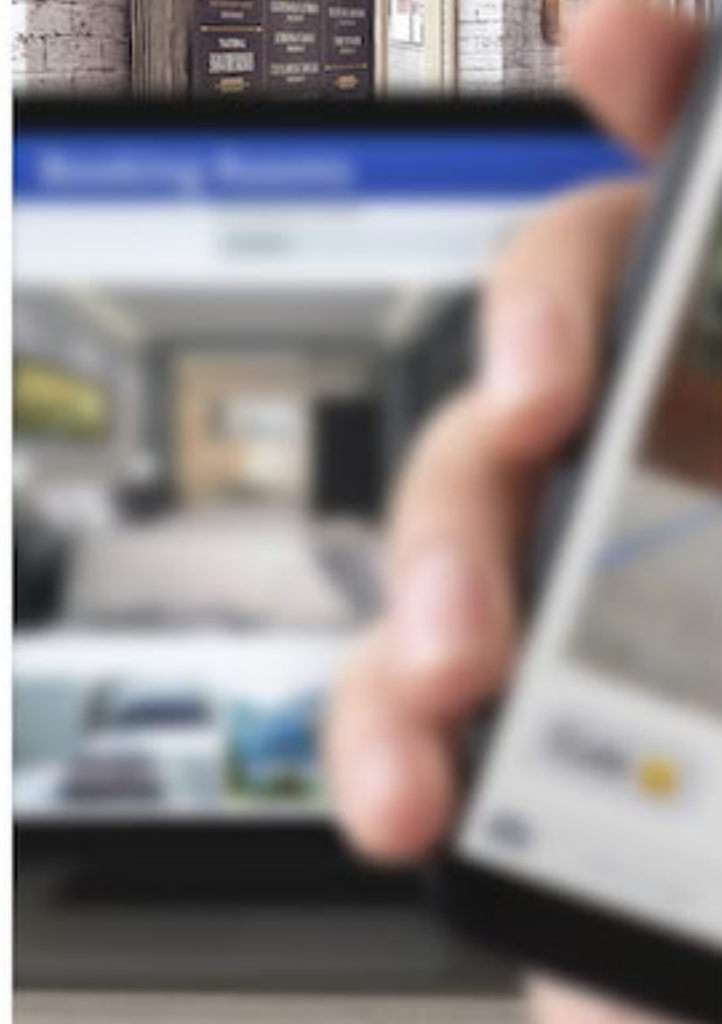
Eyelids/Ocular Surface

Iris/Ciliary Body

Lens and Cornea

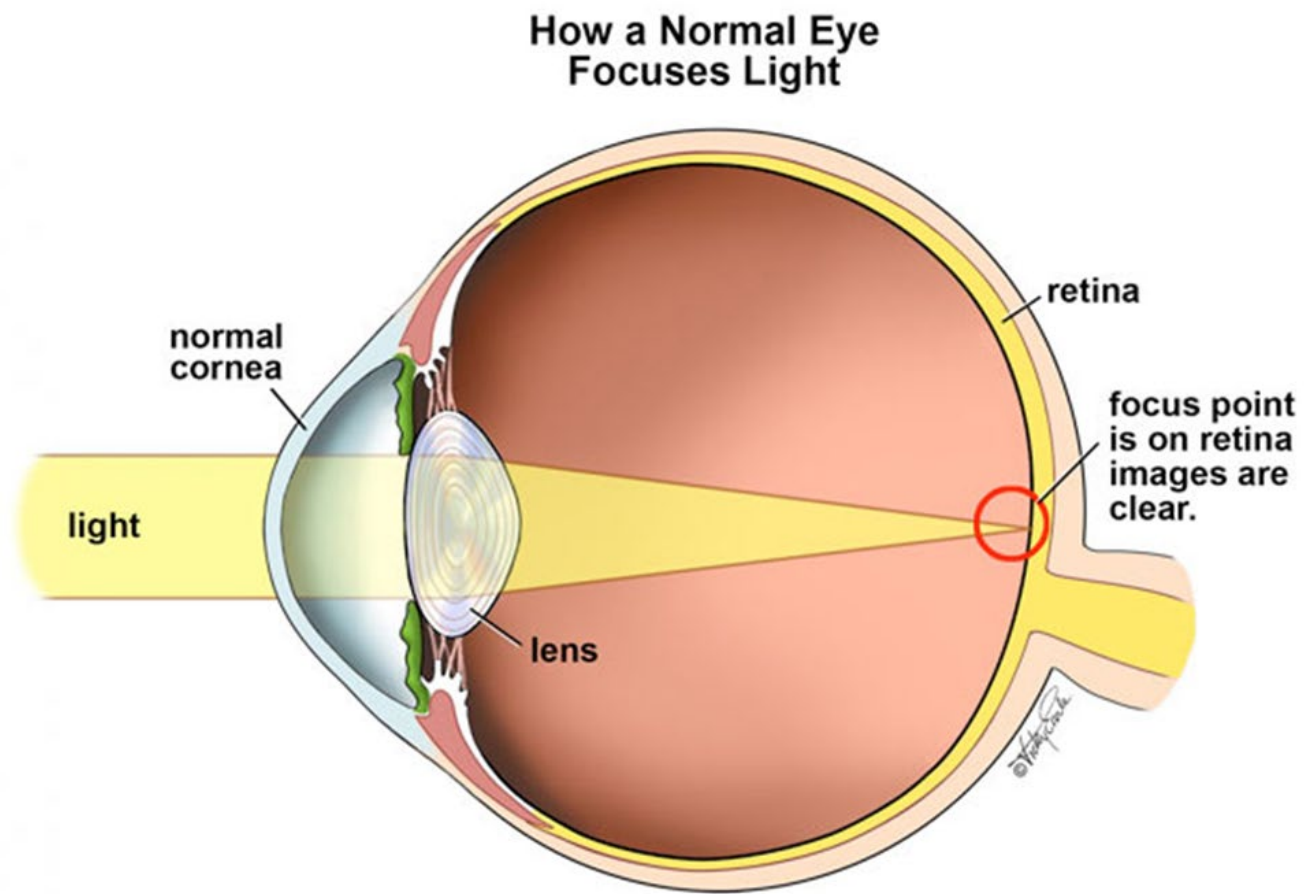
Pupil

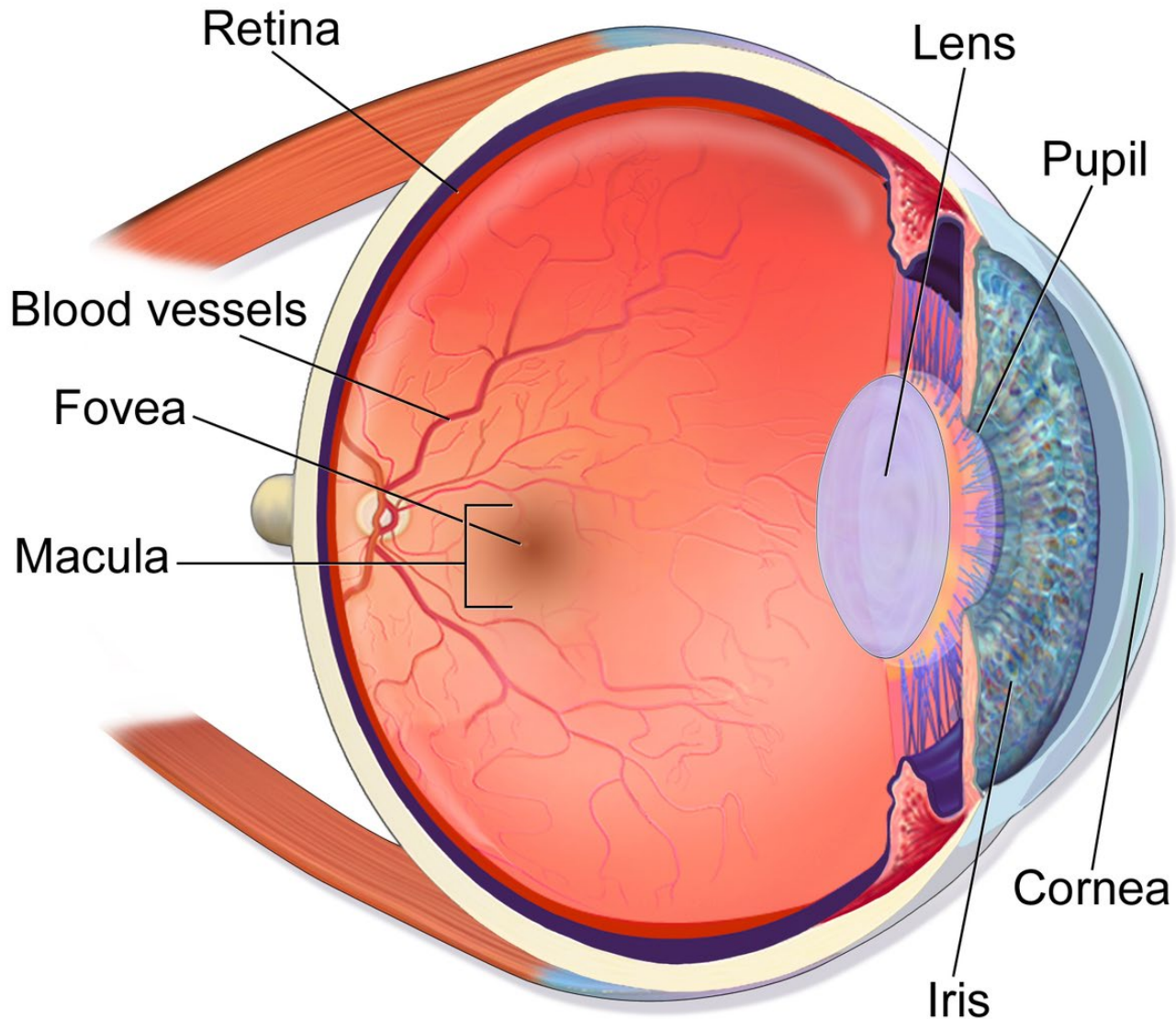
Retina



Treatment Options Decision-Making around Cataract and Cataract Surgery

Focusing

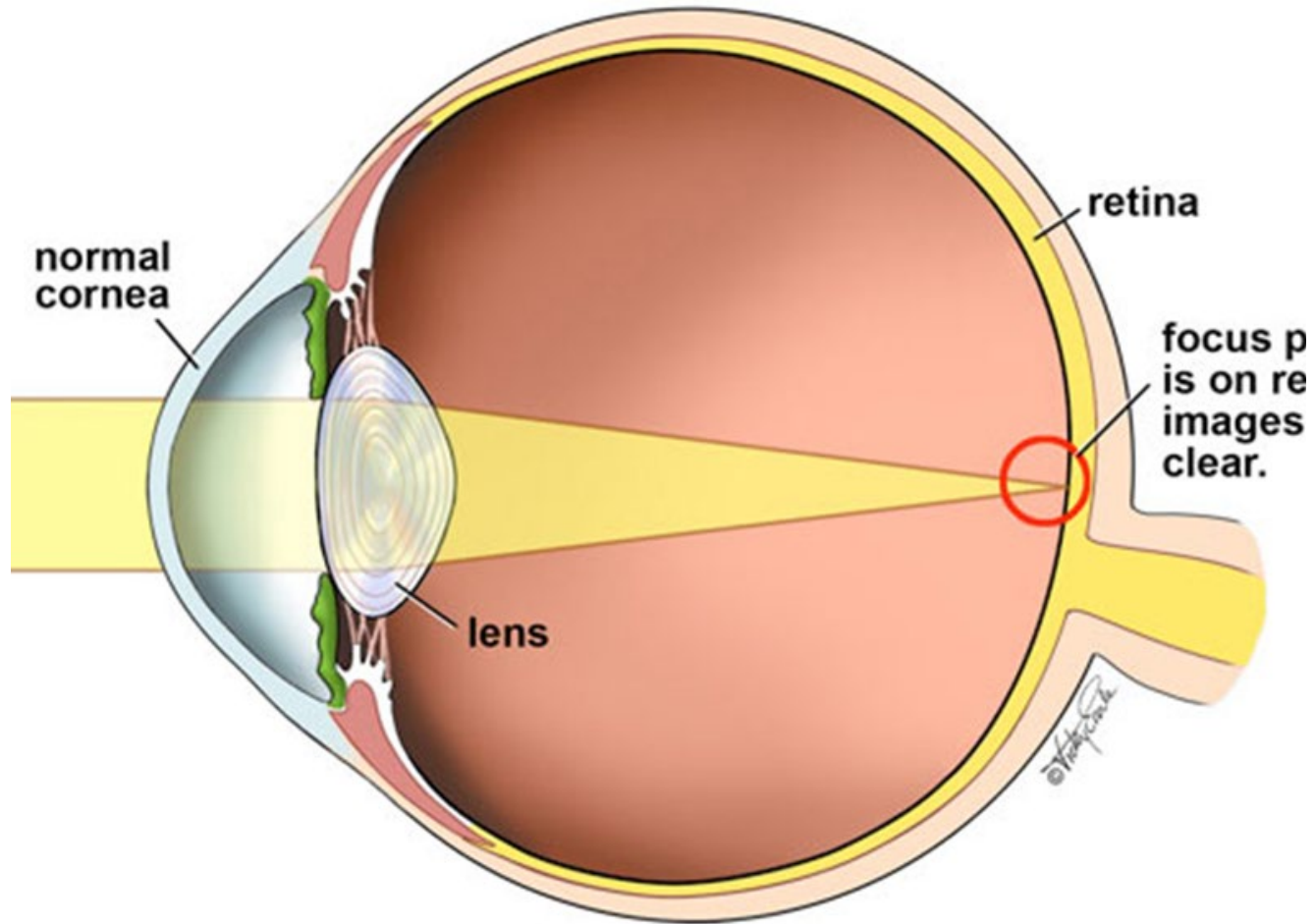




Structures necessary for Focus

- Cornea**
 - Does 70% of the focusing
- Lens**
 - Accounts for 30% of the focusing
 - Accounts for differences in near and far vision
- Pupil**
 - Provides the aperture
 - allows for better focus and depth of field

How a Normal Eye Focuses Light



Abnormalities of Focus

Refractive Error

Nearsightedness

Farsightedness

Astigmatism

Cloudy Lens = Cataract



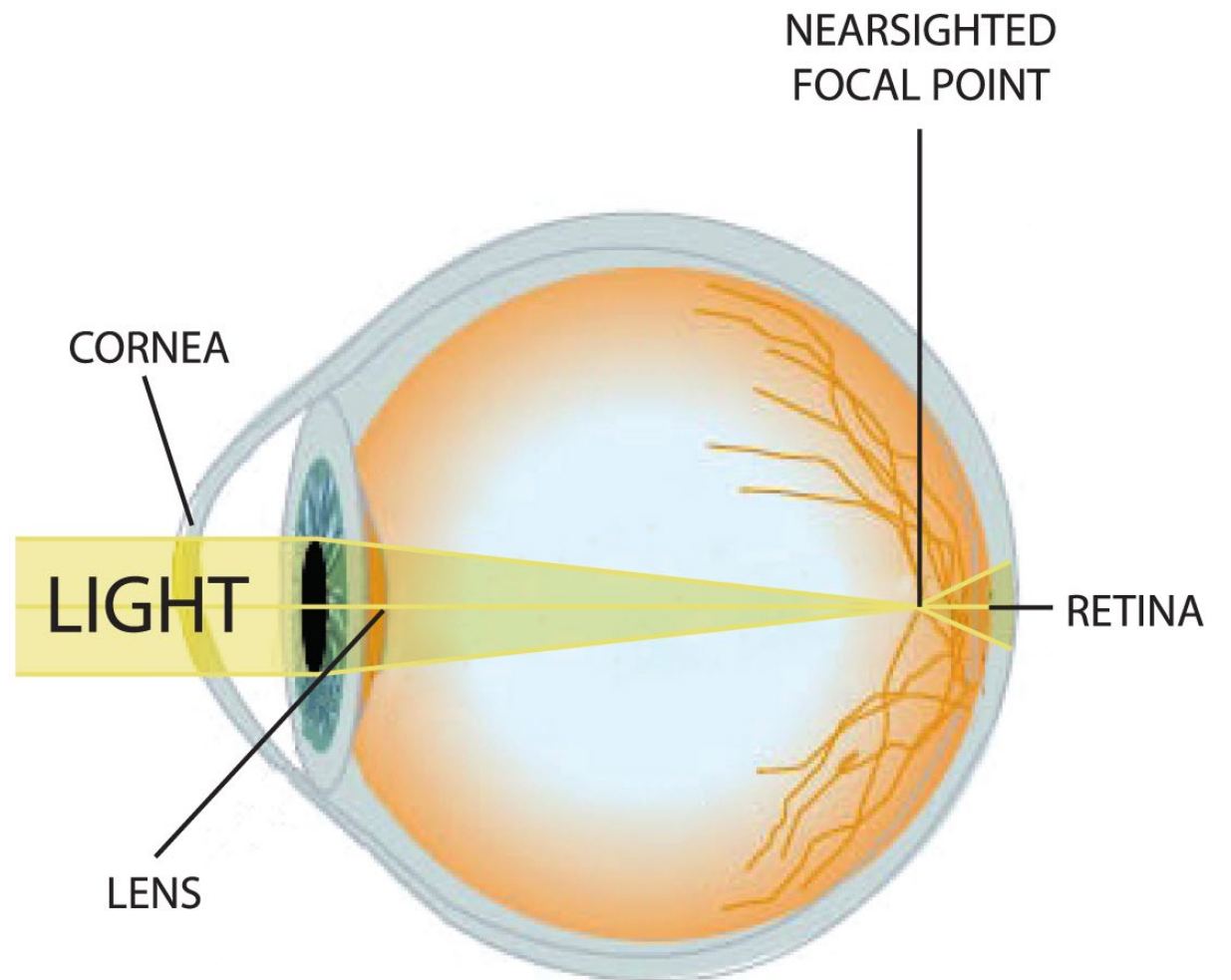
Abnormalities of Focus

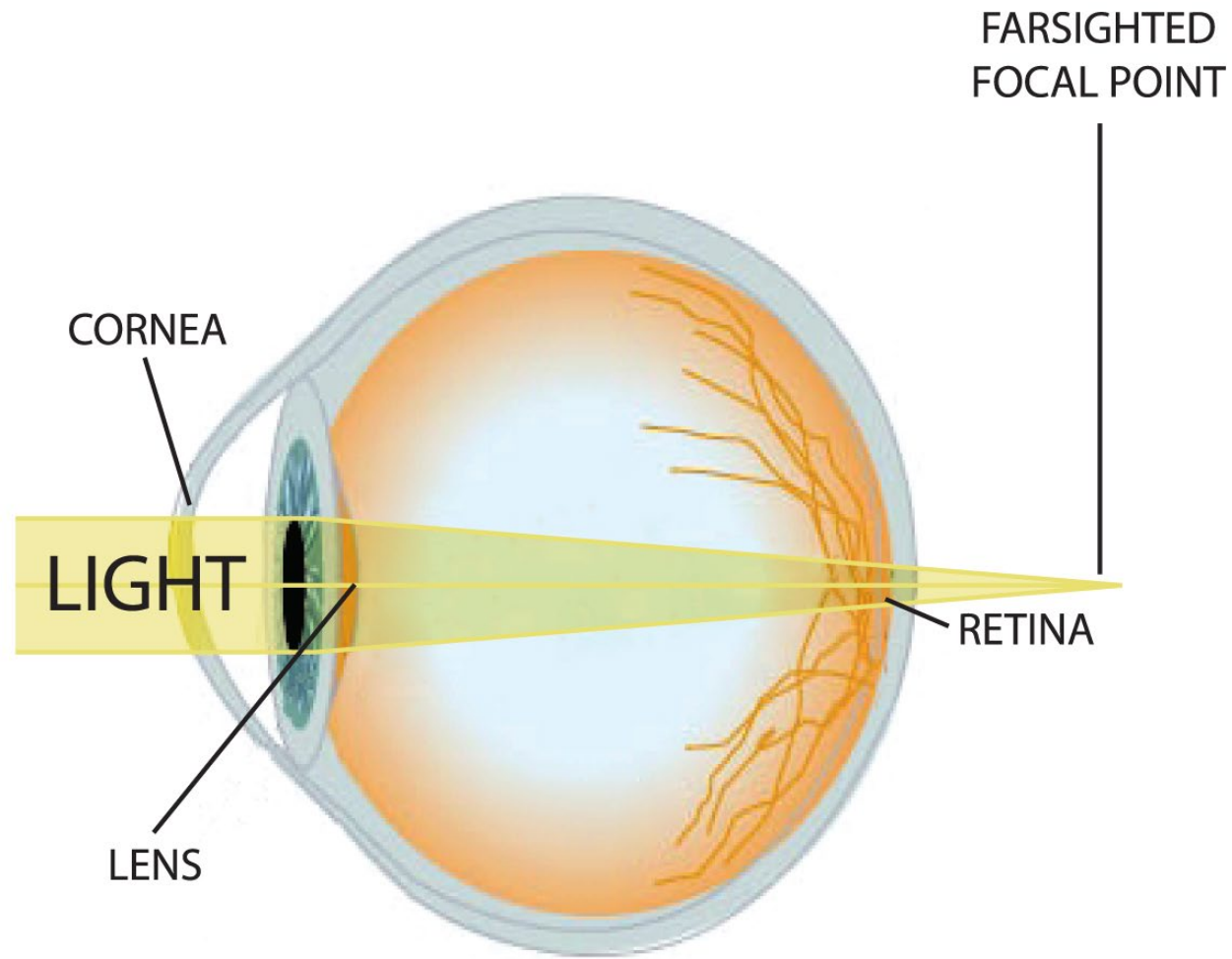
Refractive Error

- Nearsightedness
- Farsightedness
- Astigmatism

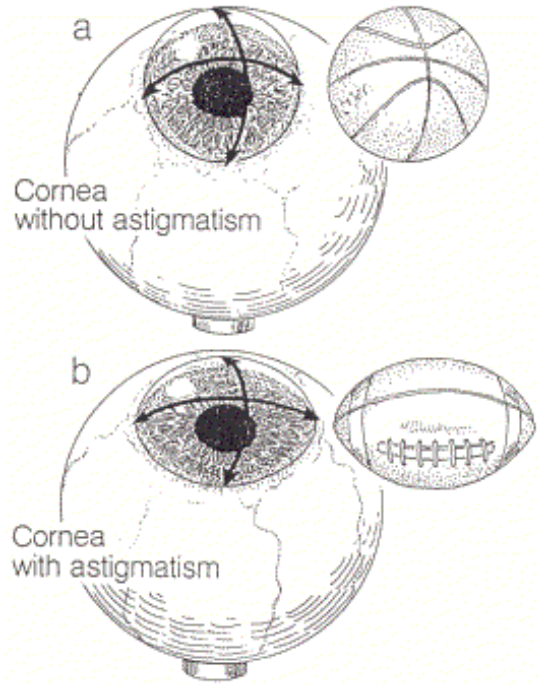
Cloudy Lens =
Cataract

Nearsighted Patient



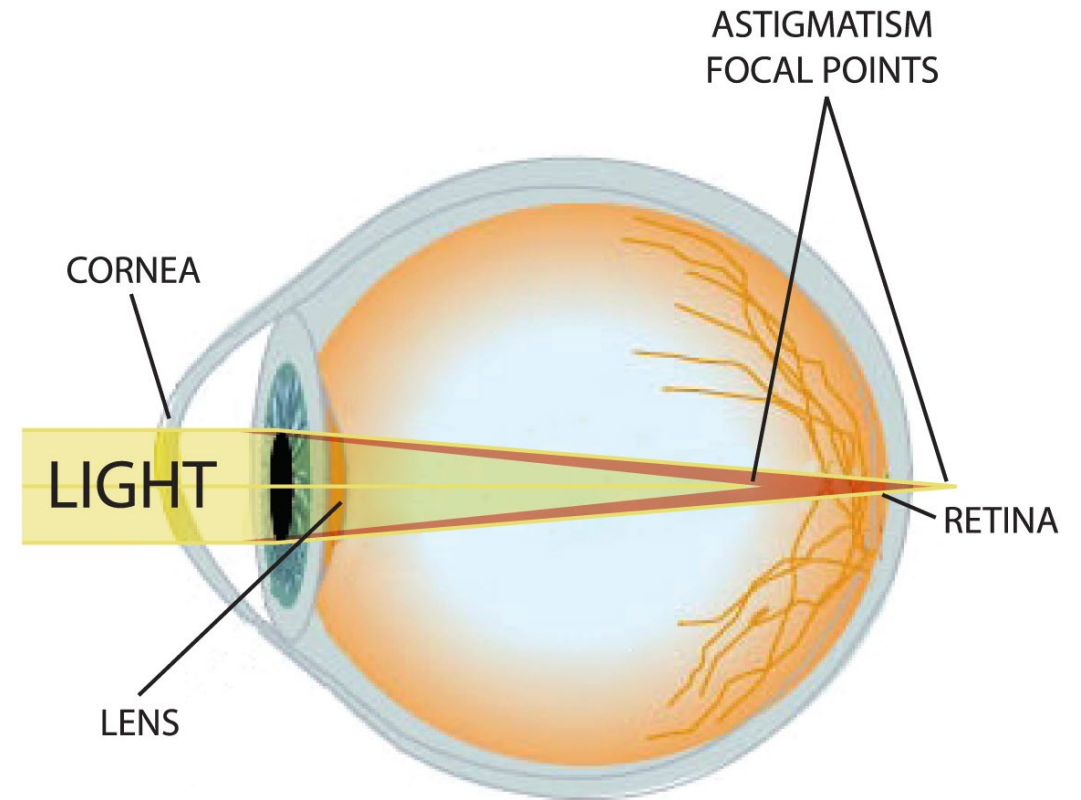


Farsighted Patient



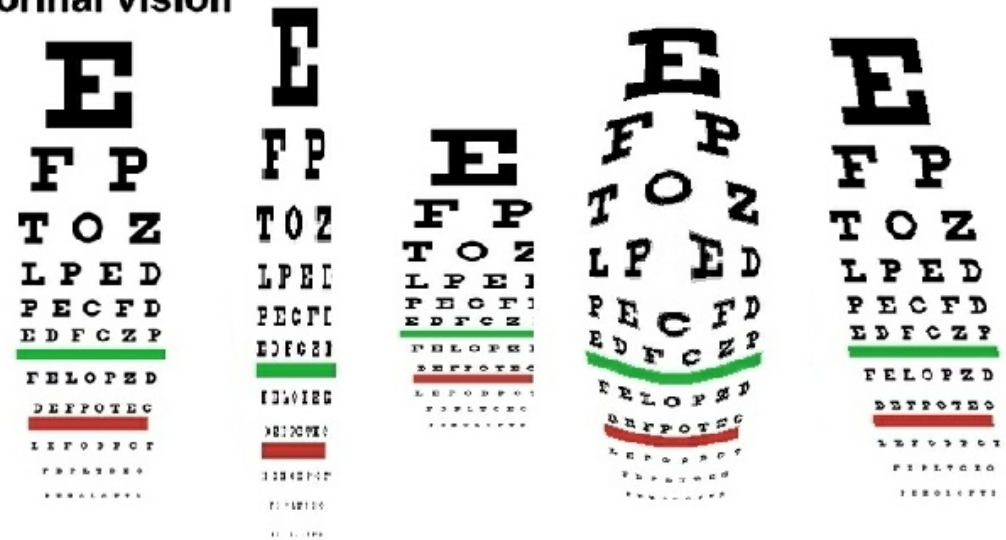
Astigmatism

Patient with Astigmatism



Vision with Astigmatism

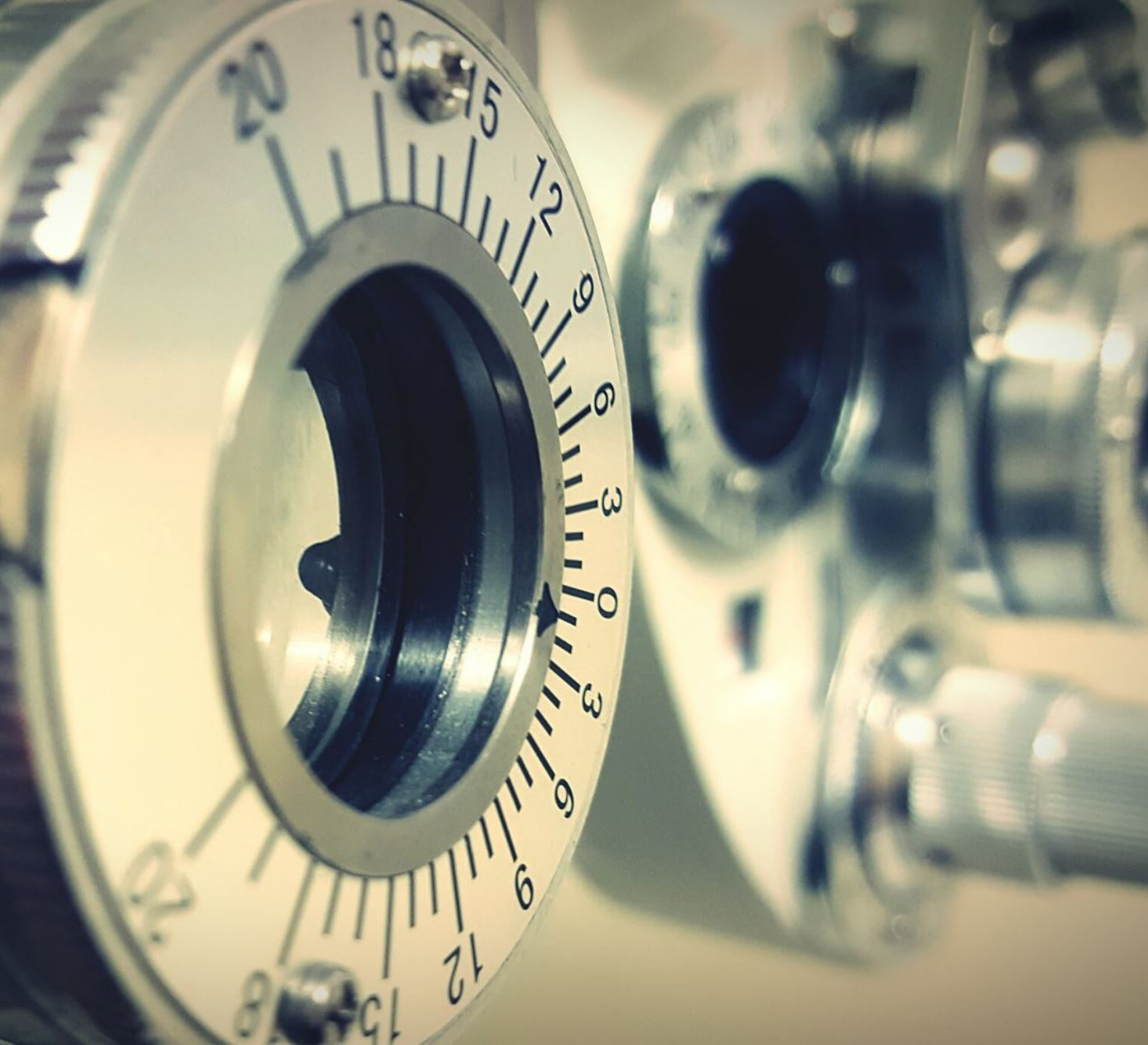
Normal vision



Above: Left to right, diagram showing exaggerated illustrations of image distortion due to astigmatism



Vision with
Astigmatism



Treatment for Errors of Focus

Spectacles

Contact Lenses

Vision Correction Surgery (Cornea)

LASIK

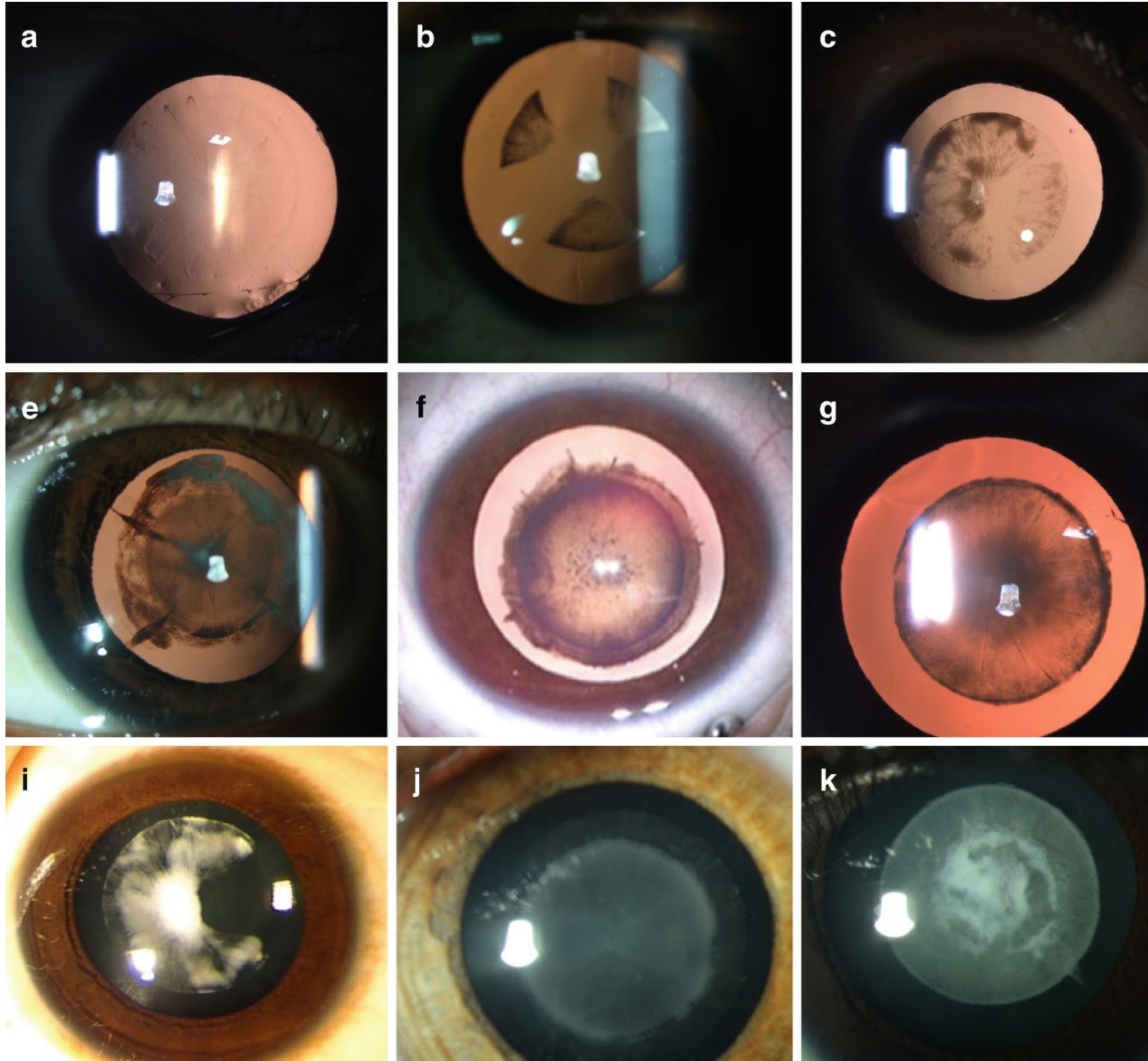
PRK

Cataract Surgery

Cataract in American Seniors

Cataract number one
cause of vision loss
worldwide

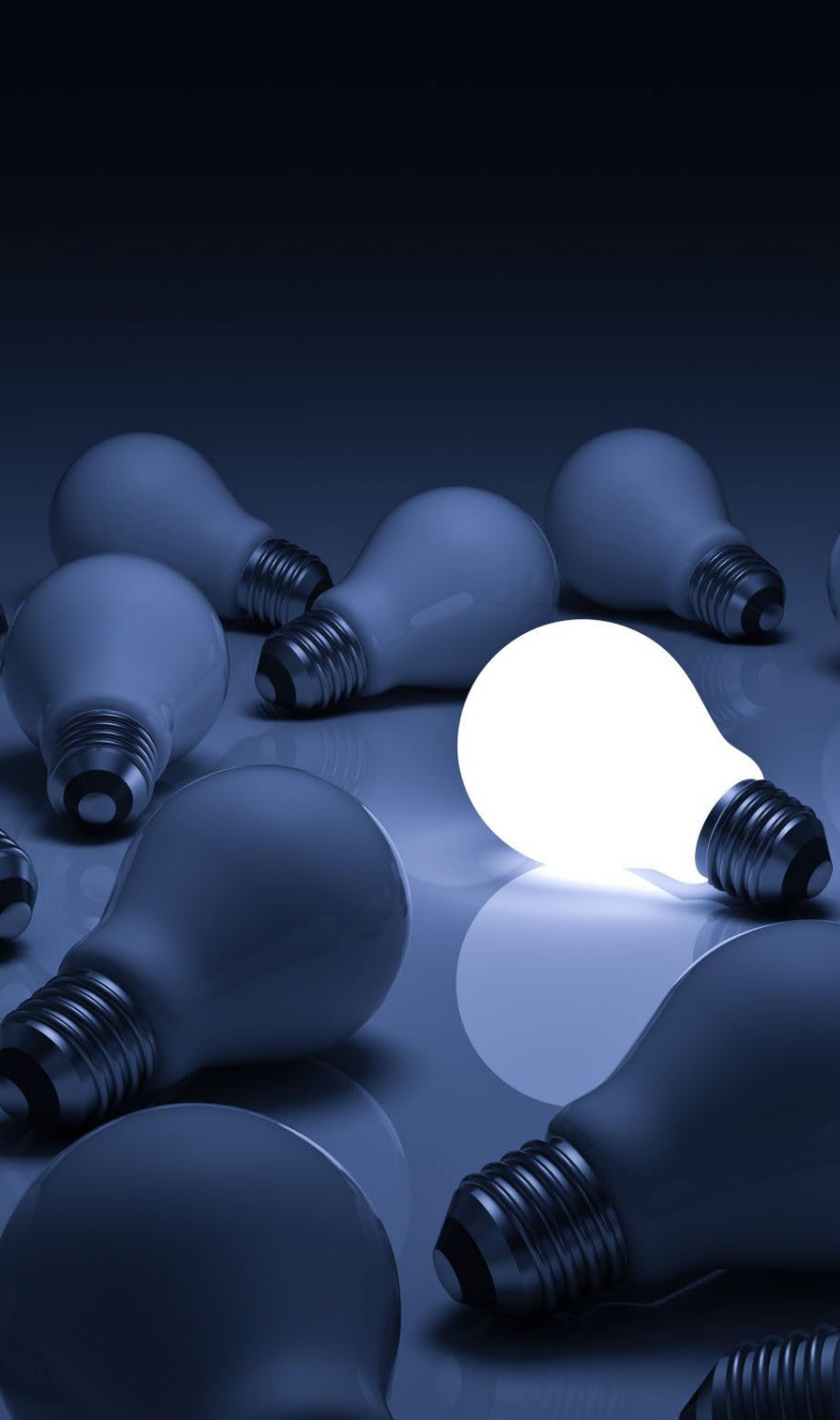
Most US Seniors get
appropriate and timely
care of cataract



Cataract Types

All types result in changes in focus

Changes in Refractive Index



Symptoms

Blur

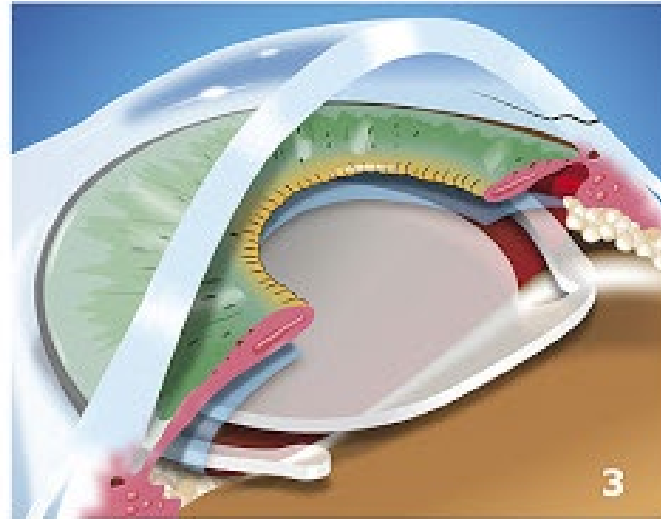
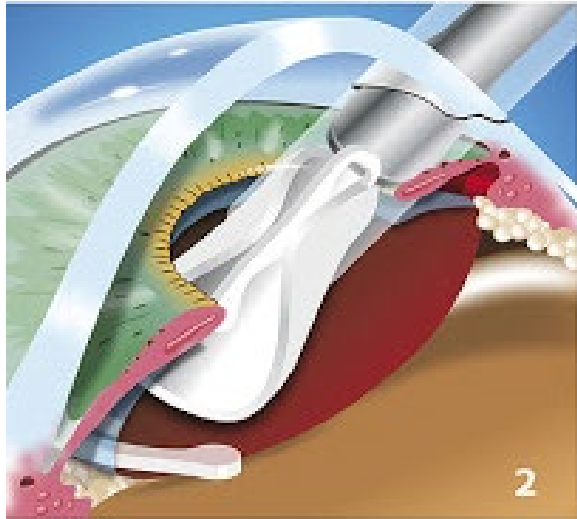
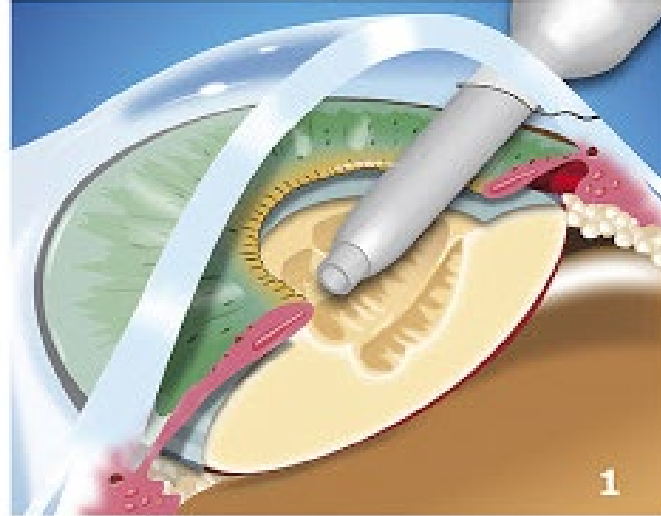
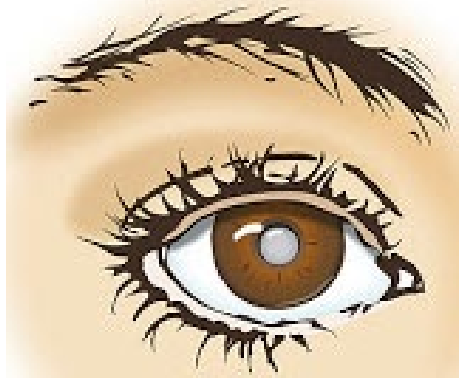
Glare

Dull/Dim vision

Need for more light

Change in glasses Rx

Much worse at night (most cataracts)



Cataract Surgery

Surgery is indicated when the lens opacification is significant enough to impair activities of daily living

No hard rule about visual acuity

Glasses no longer improve visual impairment

Risks & benefits

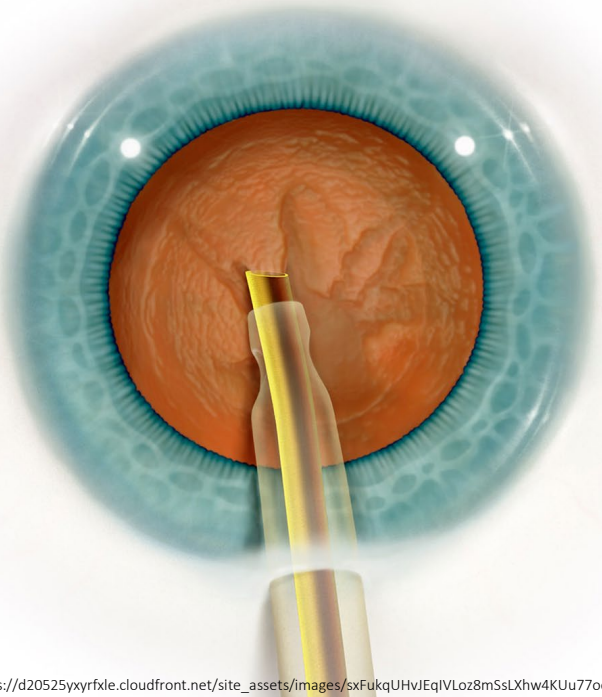


Image credit: https://d20525xyrflxle.cloudfront.net/site_assets/images/sxFukqUHvJEqIVLoz8mSsLXhw4KUu77ocxCskSZV.jpeg

Types of Surgery

Phacoemulsification (small incision)

Ultrasound-assisted

Standard of Care

Laser

Used as adjunct

Extracapsular Surgery (larger incision)

Larger incision, lens removed whole

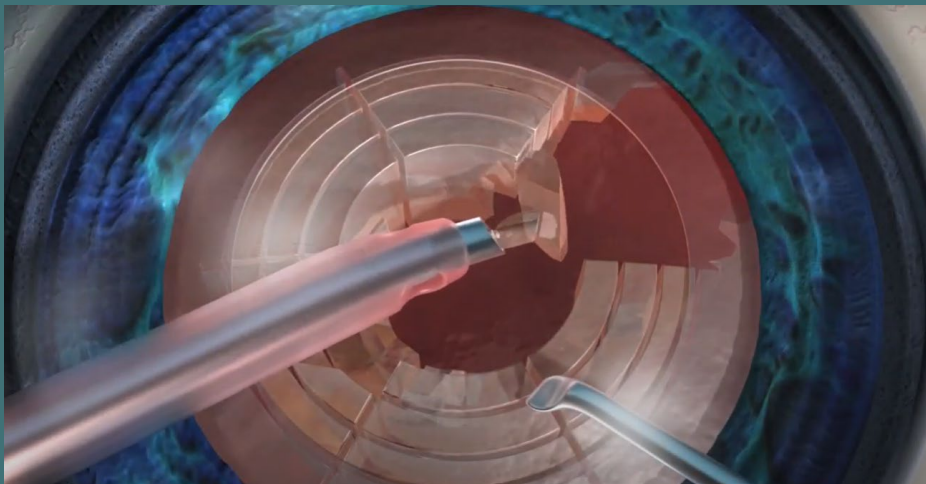


Image credit: <https://img.youtube.com/vi/pv33THj9ggM/maxresdefault.jpg>

Phacoemulsification

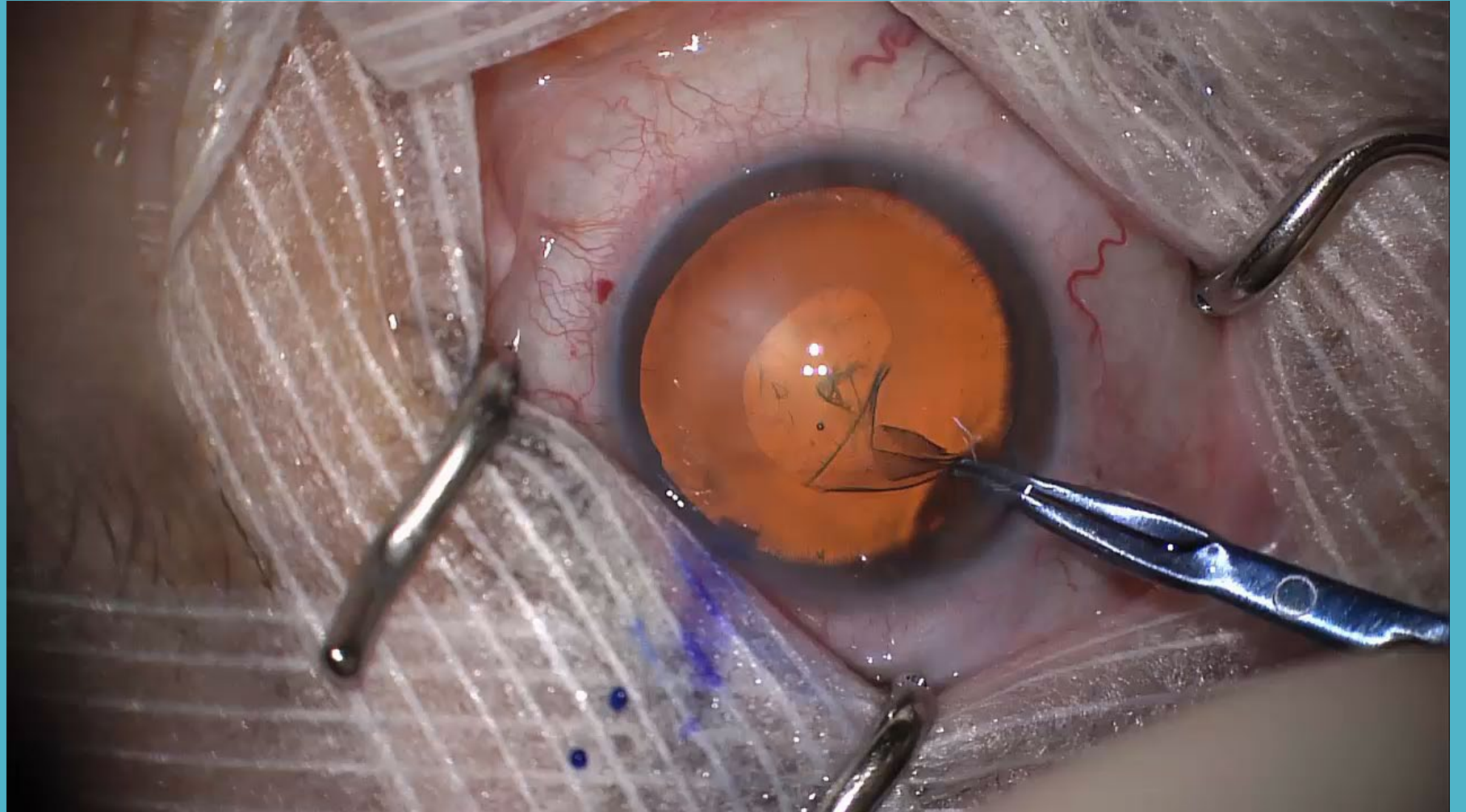


Photo credit: candywarehouse.com

Points to remember

Cataract = Opacification of Lens

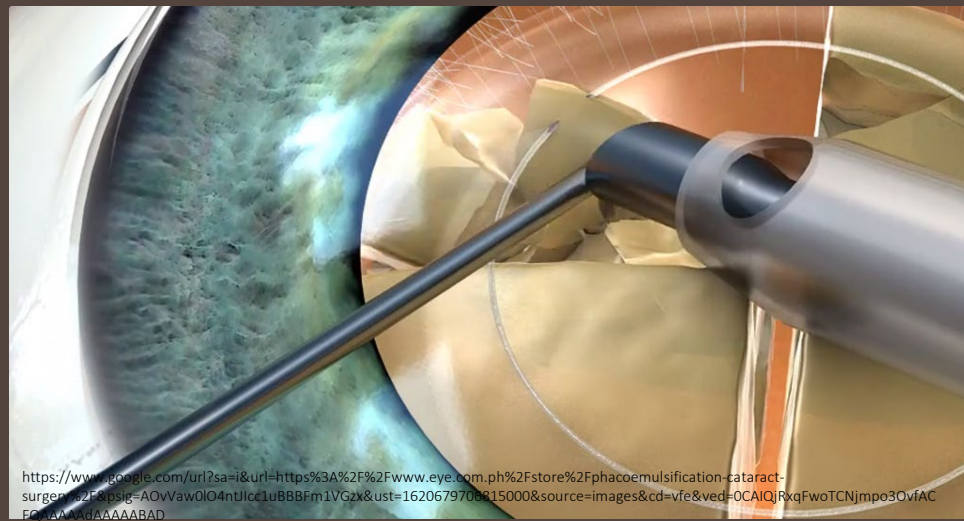
Vision decline with impairment of activities

Non-surgical approach (new glasses) if possible

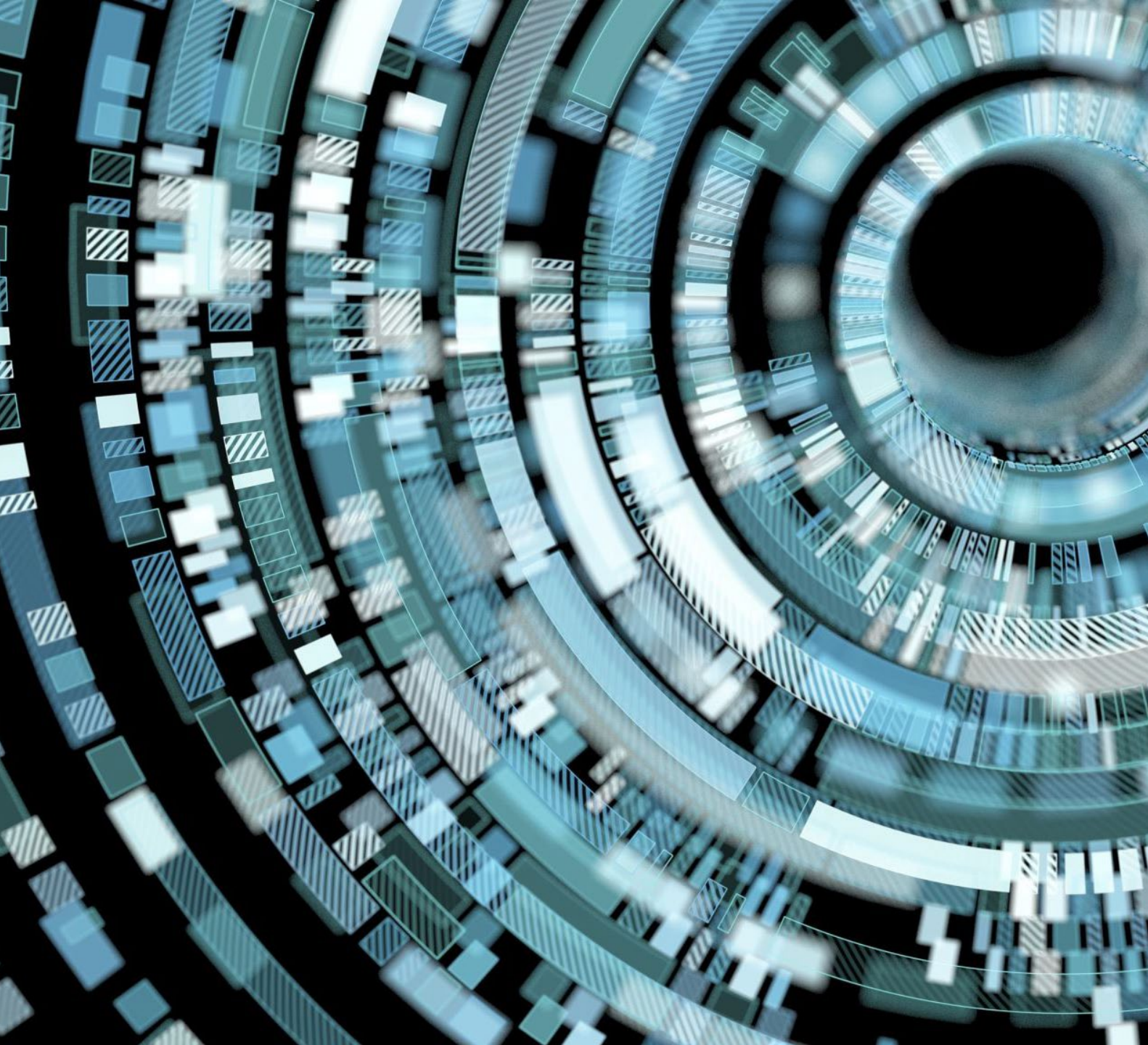
Cataract Surgery when inability to perform visual tasks and benefits outweigh risk



<http://www.dclaser.pl/images/zacma-dojrzala>

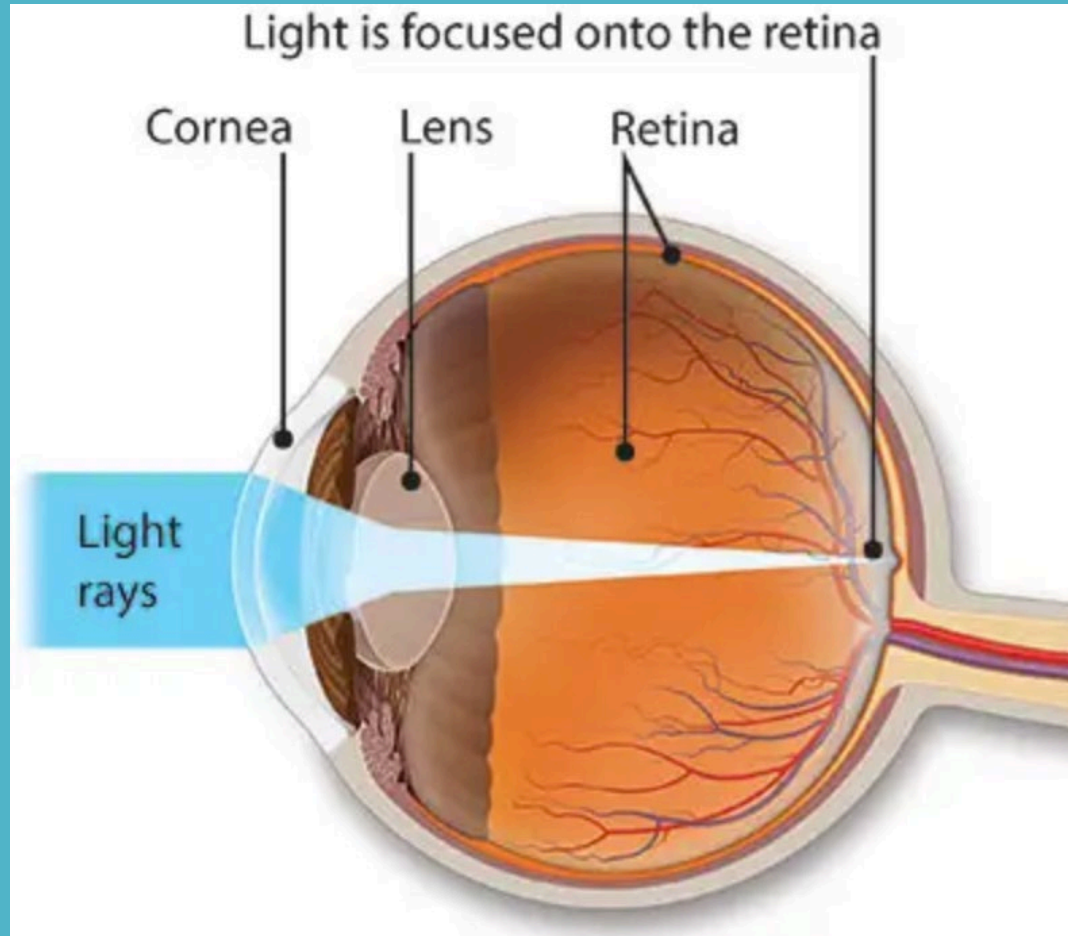


<https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.eye.com.ph%2Fstore%2Fphacoemulsification-cataract-surgery%2F&psig=AOvVaw0IO4ntllc1uBBBFm1VG2x&ust=1620679706815000&source=images&cd=vfe&ved=0CAIQRxqFwoTCNjpmo3OvfACFQAAAAAdAAAAABAD>

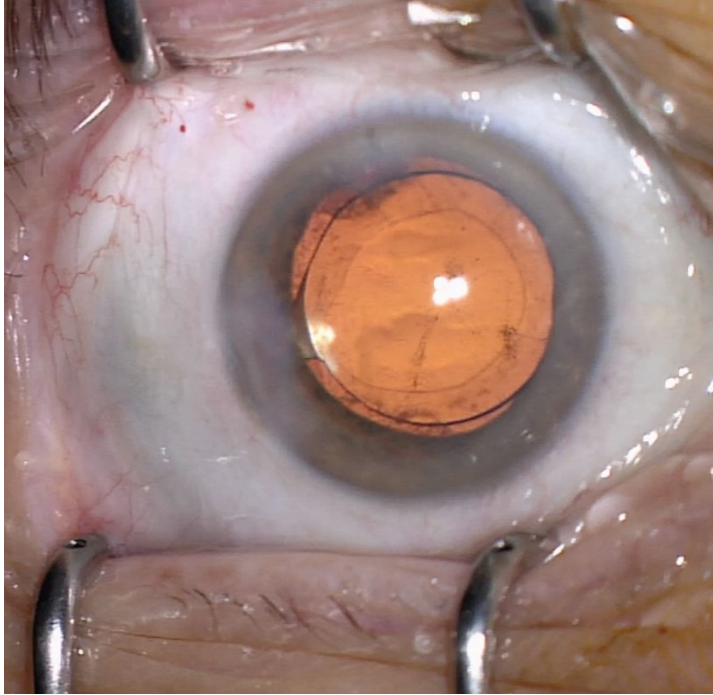


The Intraocular Lens Implant

The lens bends (refracts) light rays that enter the eye so they focus onto the retina and you can see clearly



www.aaopt.org



The Intraocular Lens (IOL)

A thin, artificial lens that replaces the eye's natural lens (which is removed during cataract surgery)



Most are made of plastic compositions and coated with special material to help protect from ultraviolet (UV) rays

IOLs



There are various IOL types to choose from



Choosing the right IOL can be difficult



You must consider your lifestyle (what activities are important to you), your overall eye health and budget before making a decision

What are the different types of IOL options for cataract surgery?

Types of IOLs

- Monofocal
- Toric
- Monovision
- Light Adjustable Lens
- Accommodative lenses
- Multifocal
- Extended depth-of-focus

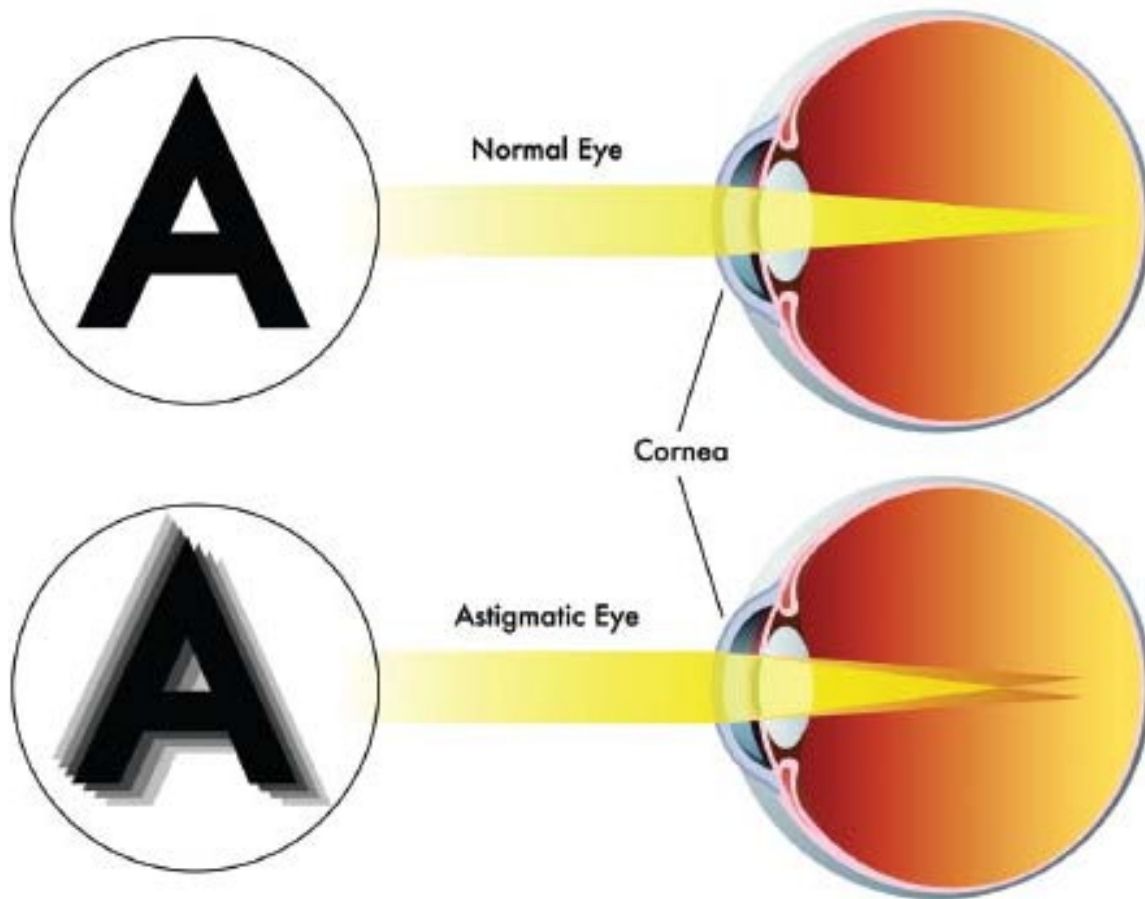


Traditional Monofocal IOL

Monofocal lenses are designed to provide the best possible vision at one distance

Limited in range- one focal point

Most common: target distance in both eyes and use reading glasses for near tasks



Toric Lens

Toric lenses have extra built-in correction for astigmatism

Astigmatism is an imperfection in the curvature of your eye and causes blurred vision at all distances



Toric lens

A toric lens will correct for astigmatism so the image is clear

Almost all the various IOLs have a toric option

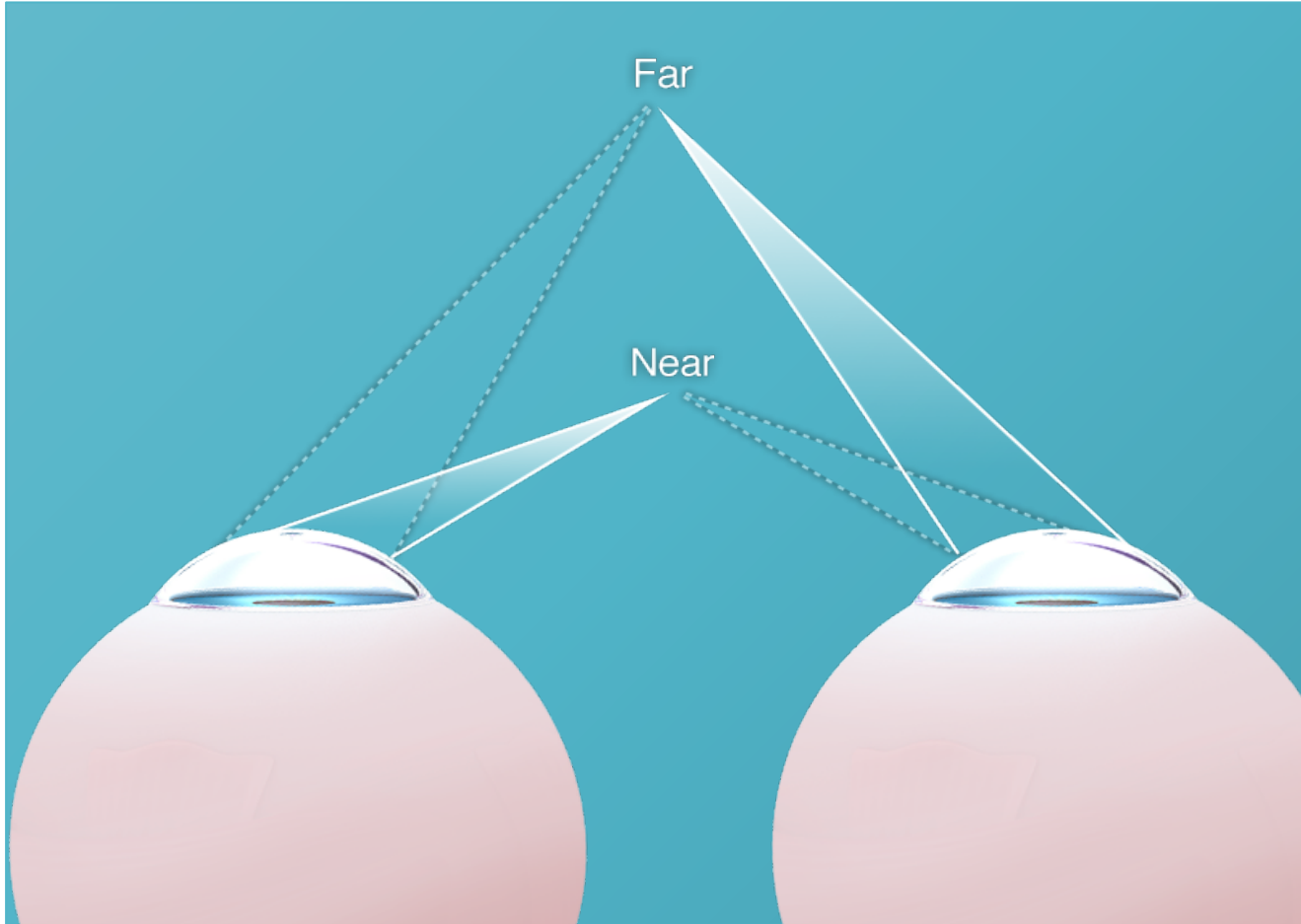


IOLs

Monofocal and Toric
Monofocal: will still have
to wear glasses for
something...

Reducing glasses dependence- what's out there?

- Monovision
- Premium IOLs: Light Adjustable Lens, Accommodating, Multifocal, Extended Depth of Focus IOLs



<https://www.docshop.com/education/vision/procedures/monovision>

Monovision

Monofocal IOL: has one focal point

Monovision: A different focal point for each eye

Monovision

- Target dominant eye for distance and nondominant for a degree of myopia (near sightedness) at which you can read
- Monovision offers a less costly option for those who want to reduced glasses dependence (Premium IOLs can be costly)
- Side effect profile of multifocal IOLs not an issue

Monovision- Considerations

There is slight loss in depth perception

May be an intermediate blur zone

Still have to consider and correct for astigmatism- especially in the distance eye

Will need time to adjust

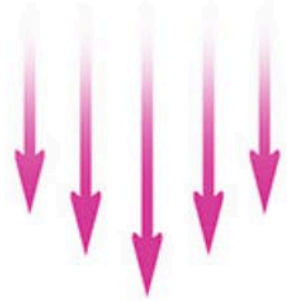
May need glasses for certain things



The Light Adjustable Lens

- The Light Adjustable Lens, (LAL, RxSight, Aliso Viejo, California)
- A lens made of a special photosensitive material that can be reshaped by directing a low intensity beam of UV light onto the lens
- Can make adjustments to the lens power after cataract surgery to treat residual refractive error

UV Light
Exposure



Modified
Shape



Light Adjustable Lens

Typically done in the office 3 weeks after the initial cataract surgery and multiple adjustments can be made before it becomes permanent

Can be useful to treat residual refractive error and/or to customize monovision

Premium IOs

Premium IOLs

Accommodating IOL

Multifocal IOL (Bifocal, Trifocal)

Extended depth of Focus IOL



Crystalens®



Trulign Toric®



Tecnis®
Multifocal



ReSTOR®
Multifocal



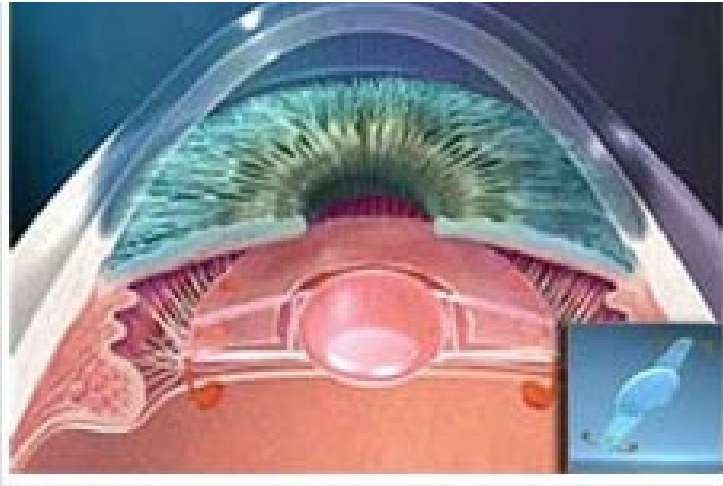
PanOptix®



Tecnis Symphony®



AcrySof® IQ
Vivity™



Accommodating IOL

Uses the natural movements of your eye's muscles to change focus

Uses hinges at both ends to "latch on" and move forward and backward in the eye using the same mechanism as normal accommodation

Accommodating IOL

Light comes in and is focused on a single focal point, reducing halos, glares, and does not cause loss of contrast sensitivity

May not provide as much of a range of focus (near to far) as multifocal IOLs, people may still need reading glasses



Multifocal IOL



Have multiple corrective zones built in, allowing you to see you to see both near and far objects



Designed using various optical principals



Splits light rays and provides both a distance and near focus; or distance, near and intermediate focus at all times



Your brain learns to automatically select the focus that is appropriate for the task at hand

Multifocal IOL



One example:
PanOptix®



Based on a 4 foci design



Uses a proprietary optical technology, to redistribute the focal point at 120 cm to the distance focal point



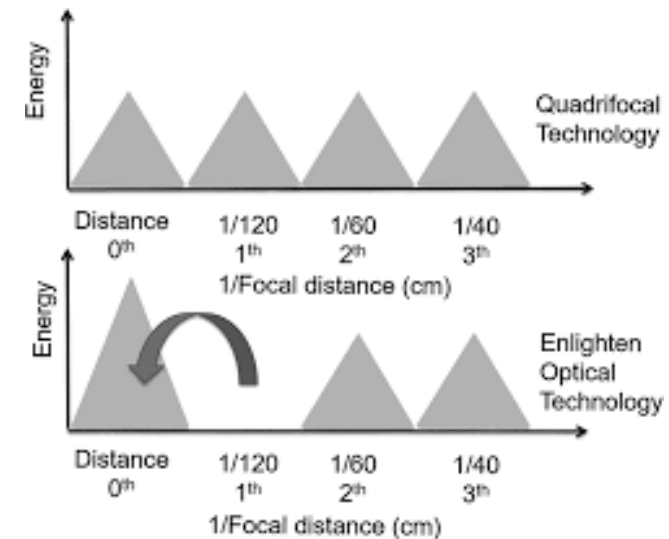
Light is split to 3 foci



This light energy is distributed 25% each for near and intermediate and 50% for distance vision.



AcrySof IQ PanOptix





Multifocal IOLs



Reduce spectacle dependence but at the expense of some clarity and quality

glare, halos, reduced contrast sensitivity



Neuroadaptation- brain adapts to new stimuli- takes time



There is a learning curve

Have to learn the optimal distance for holding reading material

Extended Depth of Focus IOL (EDOF)



Have only one corrective zone



Create a single stretched or elongated focal point to enhance and improve range of vision



Unlike multifocal IOLs, they don't split light rays



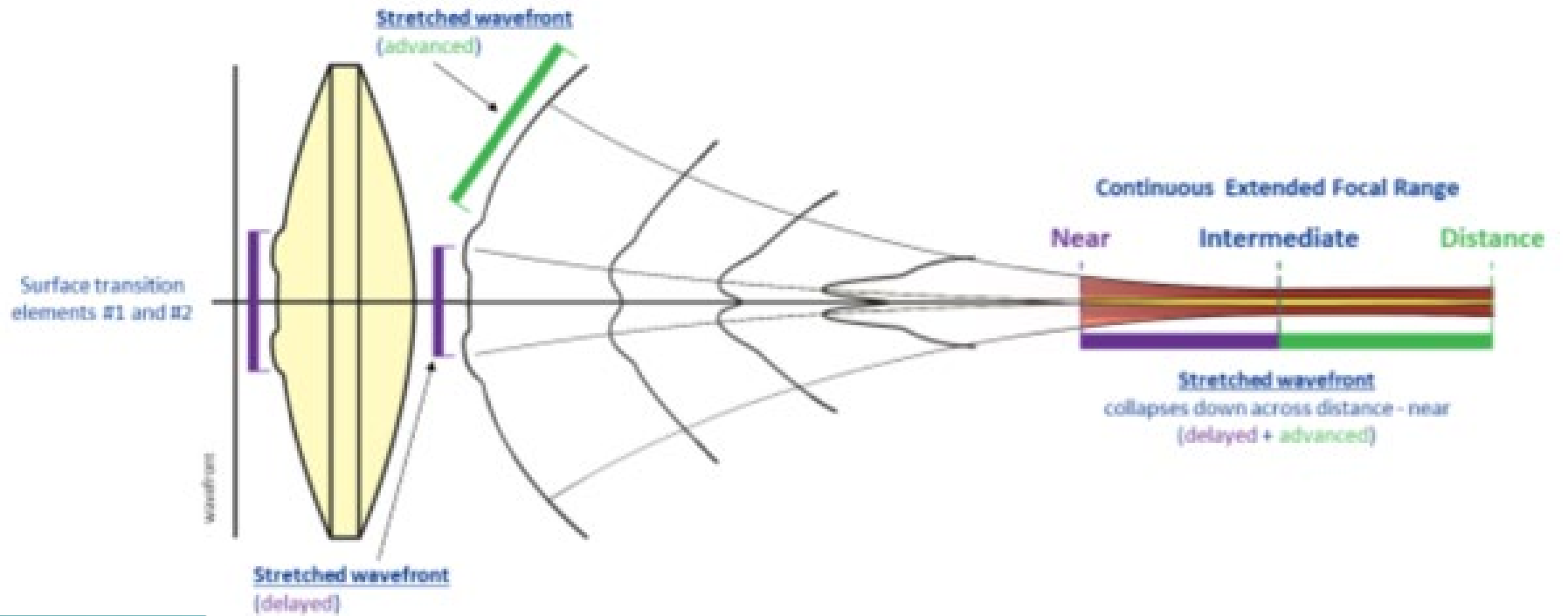
The elongated focus allows a more continuous spectrum of sharp vision from distance through intermediate



Still need glasses for near

Extended Depth of Focus IOL

One example: AcrySof® IQ Vivity™



AcrySof® IQ Vivity™
EXTENDED VISION IOL

<https://us.alconscience.com/>



Extended Depth of Focus IOL



Overall, there should be less glare and halos and less loss of contrast



Good distance and intermediate

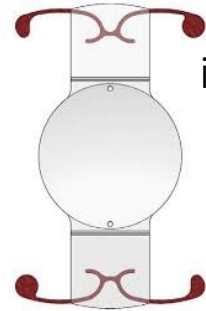


Will be a need for low power reading glasses postoperatively

Premium IOLs



Crystalens®



Trulign Toric®



Tecnis®
Multifocal



ReSTOR®
Multifocal



PanOptix®



Tecnis
Symphony®



AcrySof® IQ
Vivity™

Accommodating IOL
“Low add”

Multifocal, Bifocal

Multifocal, Trifocal

Extended Depth of
Focus
“Low add”

High, Intermediate,
and Low Add

Toric available

Toric available

Toric available

i. Bausch & Lomb, Rochester, NY

ii. Johnson and Johnson Vision, Jacksonville, FL

iii. Alcon, Fort Worth, TX

Which lens
to choose?



Which lens to choose?



Evaluate baseline ocular health and status



Understand lifestyle needs and visual expectations



Consider Cost



Select an IOL based on the benefits and limitations of that IOL as they relate to the above



Ocular health

Are there any other eye conditions?

Look out for abnormalities (like glaucoma or macular degeneration) that could limit visual acuity, contrast, color, or field of vision

Other abnormalities like ocular surface disease or dry eyes can make glare and halos worse

If an abnormality exists- need to decide if it is significant or potentially progressive



Lifestyle questions

- How important is sharp vision (with or without glasses)
- How important is spectacle independence



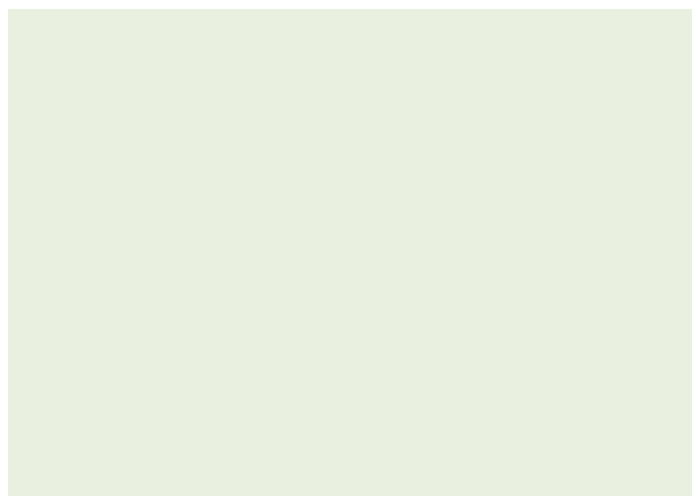
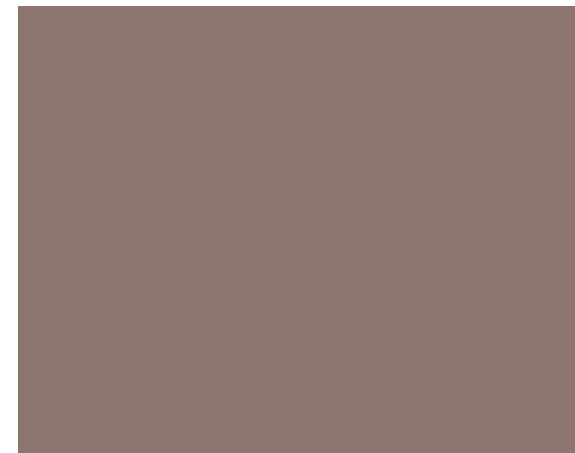
What activities do you like to do and would like to avoid glasses for?



Are you mostly outdoors?
Is depth perception important?

Driving

Do you frequently drive at night?





Does your lifestyle rely on near and/or intermediate vision?

- Reading
- Computer
- Phone





Cost

Medicare and most insurance companies cover the cost of monofocal lenses

Other lens options (i.e. toric, LAL, multifocal, EDOF, and accommodative IOLs) are not covered by insurance

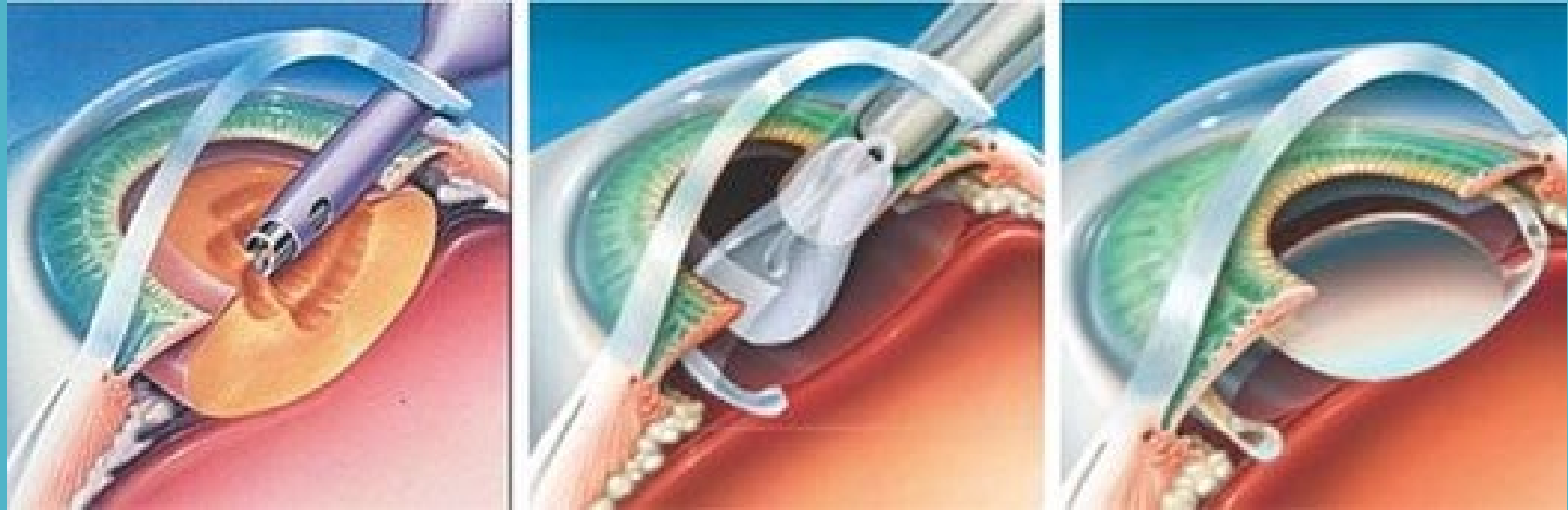
Some IOL manufacturing companies have a Resident and Fellow Training Program with academic institutions (including UCSF!) that can help cut out of pocket costs

IOI selection

Now we're ready to figure out the best lens for your eyes, lifestyle and budget!

Choosing an IOL- important points

- If your main concern is sharpest and clearest vision- consider monofocal
- Think about your lifestyle needs and visual expectations
- Consider monovision or premium IOLs if you are highly motivated for spectacle independence and willing to accept some tradeoffs
- Avoid premium IOLs if you have ocular pathology that may limit visual potential
- Have realistic expectations
- Consider cost
- Requires some time for discussion and thought- you may need a second preoperative visit



What to expect after surgery

What to expect after surgery

- You will go home that same day
- Expect to wear a patch or shield overnight
- You will be on drops (antibiotic and anti-inflammatory) for around 4 weeks
- Restrictions for 1 -2 weeks: weight bearing activities, bending/inversions, high impact activities, swimming, eye makeup
- Driving, TV, reading, computer, walking– all ok per your comfort!

What to expect after surgery: Post- operative visits

- 1 day after surgery
- 1 week (maybe skipped or by phone)
- 4-6 weeks: final post op check and glasses prescription



What to expect after surgery :

Should still get yearly eye exams

Cataracts do not come back

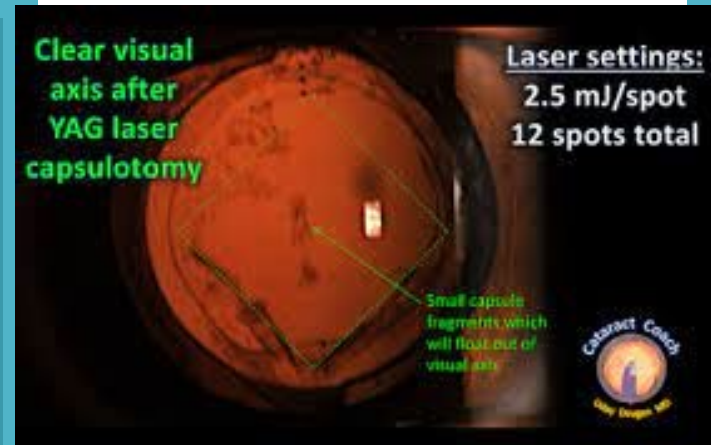
The IOL does not have an expiration date or need to be replaced

Posterior Capsular Opacification (PCO) can occur



Posterior Capsular Opacification (PCO)

<https://webeye.ophth.uiowa.edu/>



Treated with an in office laser procedure called a YAG Capsulotomy

<https://cataractcoach.com/>



Important points to remember...

Cataract = Opacification of Lens

Cataract surgery is warranted when you are unable to perform visual tasks and glasses no longer provide visual improvement

There are many lens implant options with various benefits and tradeoffs

The decision-making process around selecting an IOL involves several factors, including baseline ocular health, lifestyle needs, and visual expectations

Thank you!

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