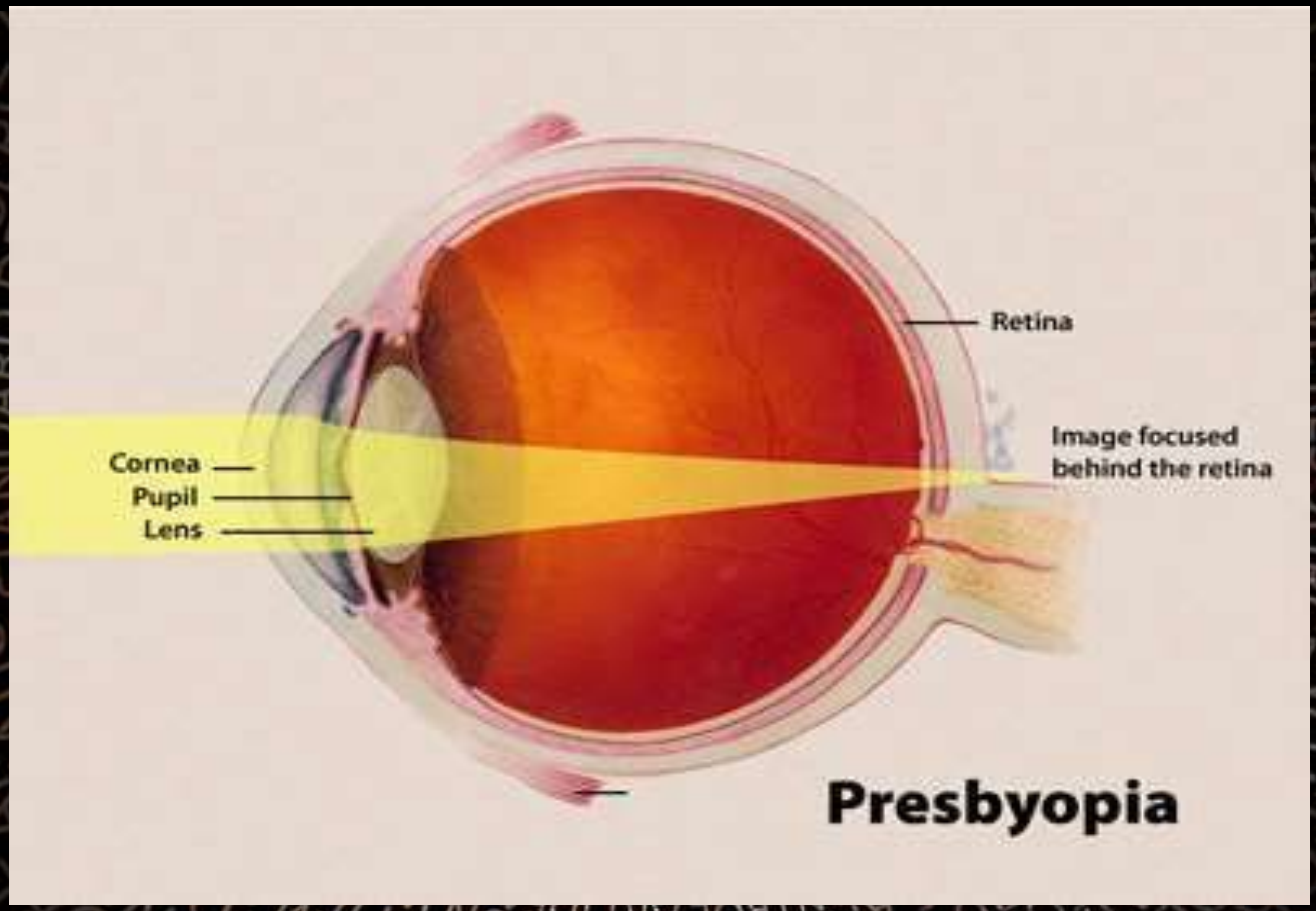
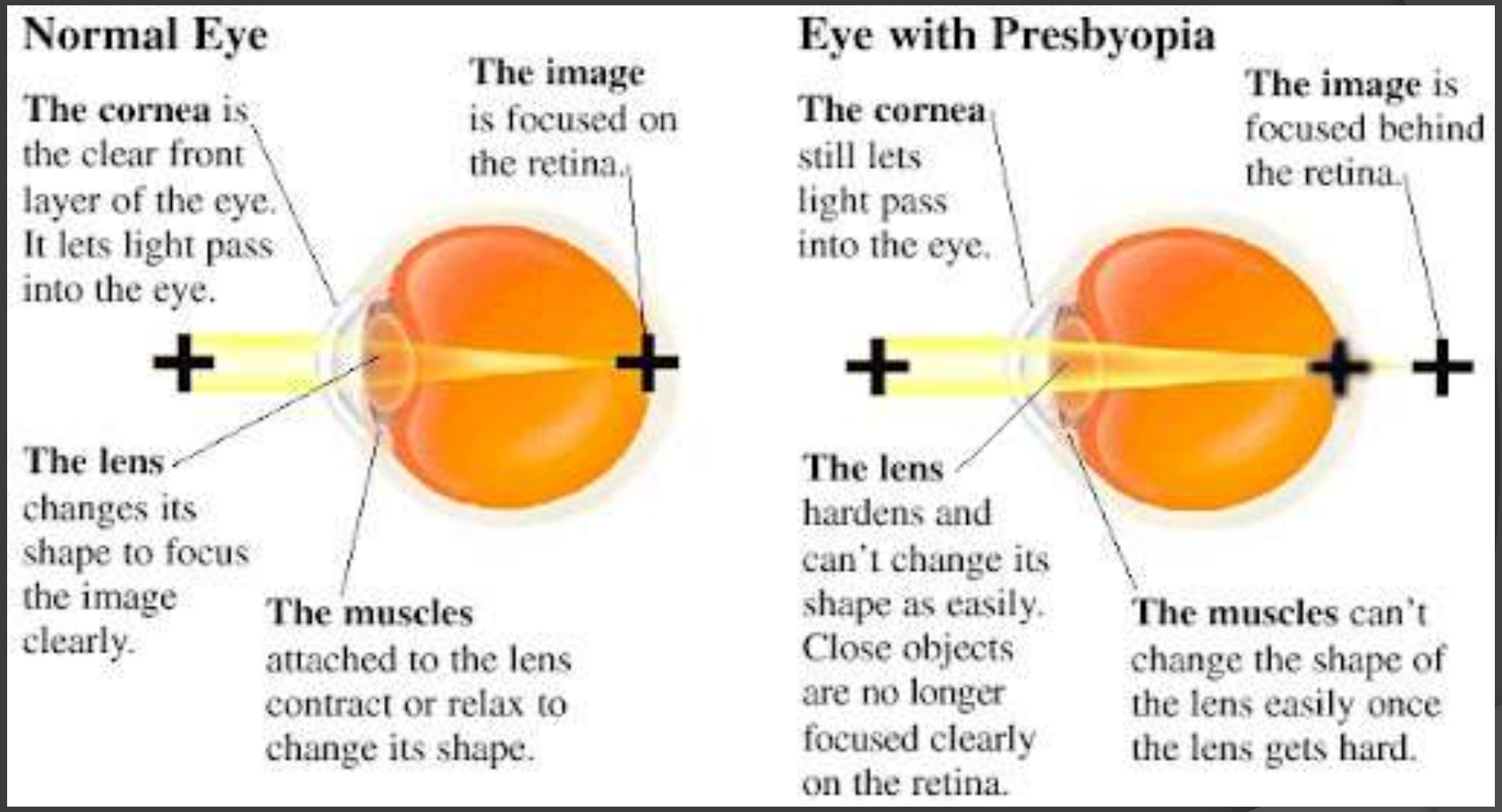
# PRESBYOPIA


Retina
Image focused
behind the retina
Cornea
Pupil
Lens
Presbyopia

# DEFINITION

- Greek presbys elderly; opos eye
- Presbyopia is the irreversible loss of the accommodative ability of the eye that occurs due to aging
- It is a normal physiological state due to the loss of the accomodative capacity with the passage of time.


Normal Eye
The cornea is the clear front layer of the eye. It lets light pass into the eye.
The image is focused on the retina.
The lens changes its shape to focus the image clearly.
The muscles attached to the lens contract or relax to change its shape.
Eye with Presbyopia
The cornea still lets light pass into the eye.
The image is focused behind the retina.
The lens hardens and can't change its shape as easily. Close objects are no longer focused clearly on the retina.
The muscles can't change the shape of the lens easily once the lens gets hard.

# PATHOPHYSIOLOGY

Lenticular and extralenticular theories

- **Lenticular**

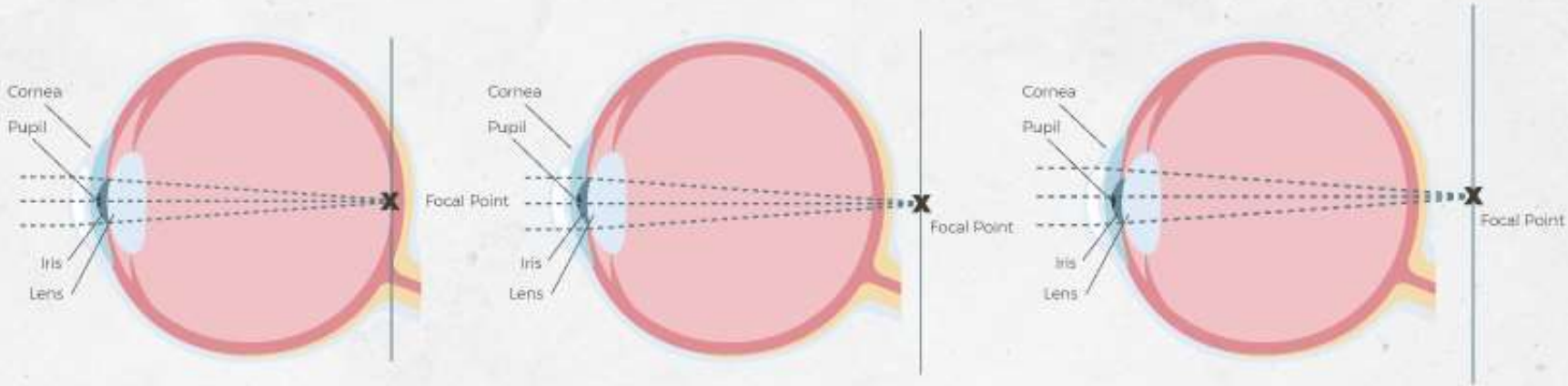
→sclerosis of the nuclear lens tissue,

→decreased distance between ciliary muscle and lens equator

→lens capsule with age becomes thicker,less extensible and brittle

STONEY CREEK EYE CARE & Eyewear Boutique
Dr. Louis P. Bahoshy & Associates

# NORMAL VISION VS. HYPEROPIA & PRESBYOPIA




## NORMAL VISION

With normal or 20/20 vision, light focuses directly on the retina's focal point.

## HYPEROPIA

Hyperopia is usually present at birth and occurs due to the shape of the eye, either a flat cornea or a short eyeball.

## PRESBYOPIA

As you age, the eye's lens loses its ability to focus on nearby objects, causing them to appear blurry.

**Extralenticular**

→age related hyalinization of ciliary processes and ciliary muscles

→loss of elasticity in the zonules

→even decreasing resistance of the vitreous humor against the accommodating lens capsule

- In emmteropic eye far point is infinity and near point varies with age

  7 cm at 10yrs age

  25-40,33-45

- At 10 yrs amplitude of accomodation

  A=100/7 =14D

  40 yrs A=100/25=4D

- Since we keep the book at 25 cm can read comfortably till 40 yrs
- After 40 yrs the NPA decrease beyond normal working range leading to presbyopia

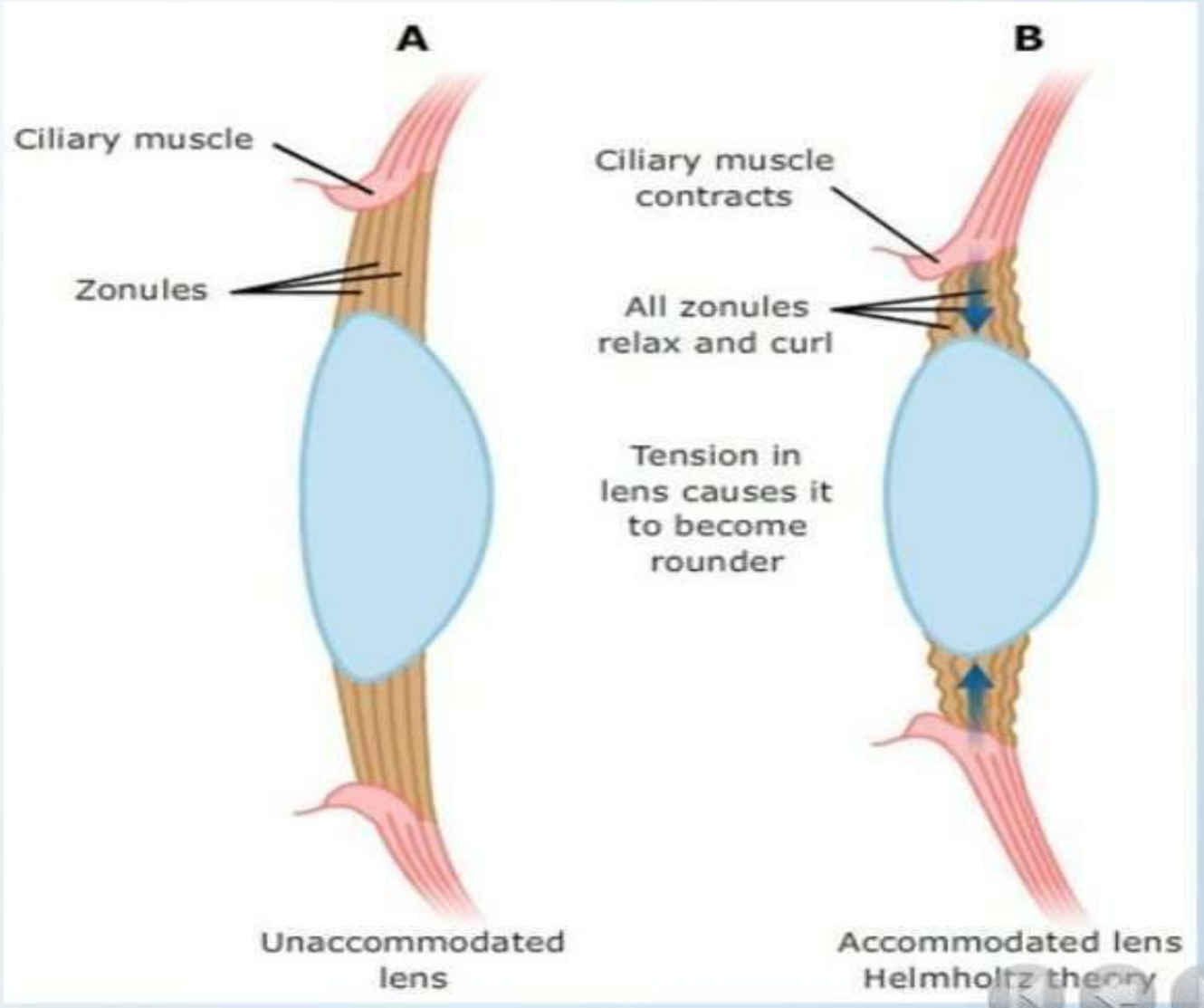
Some of the theroies include

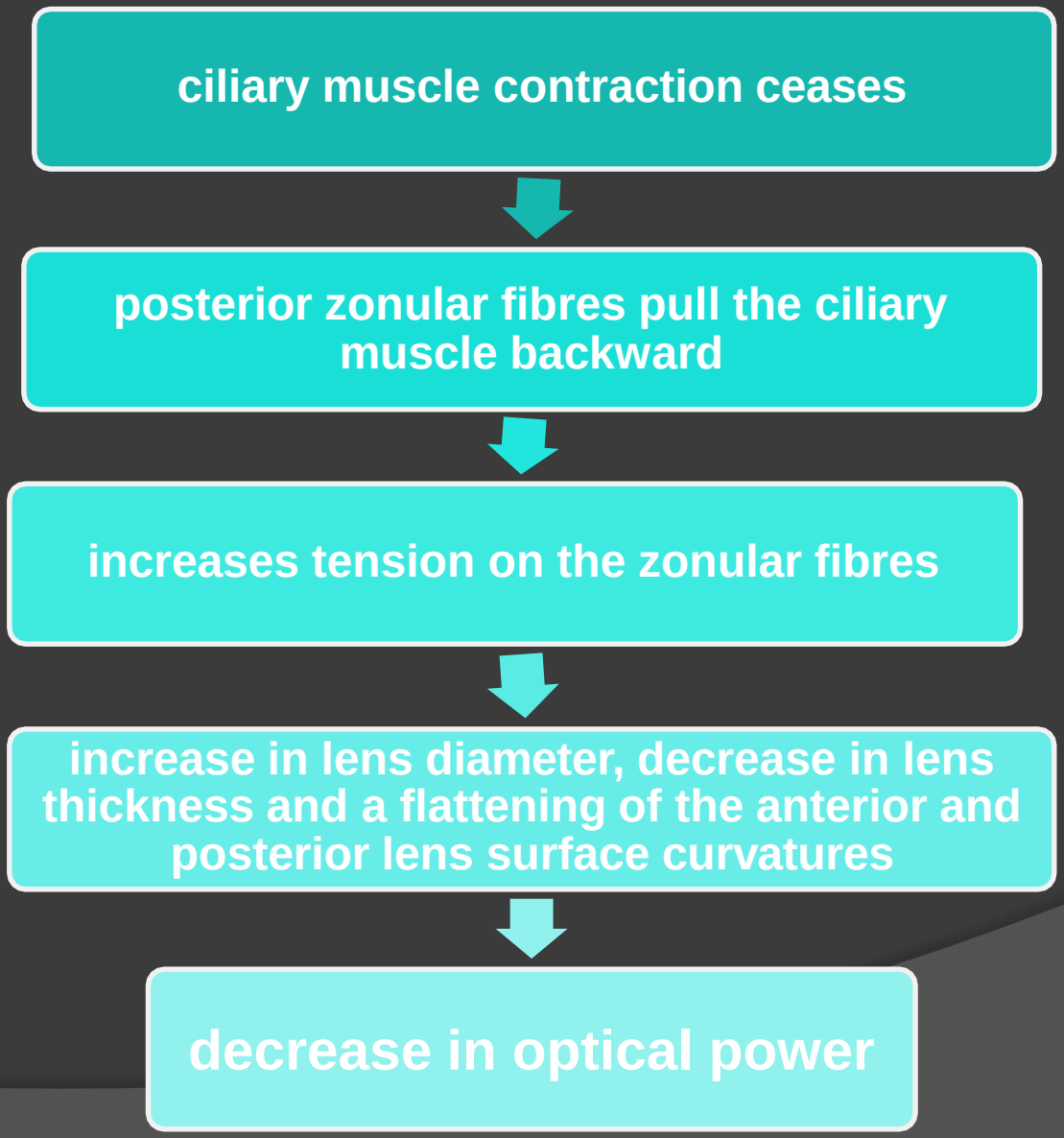
1.Helmholtz theory

2.Coleman theory

3. Schachar theory

# Helmholtz theory




ciliary muscle contraction ceases
posterior zonular fibres pull the ciliary muscle backward
increases tension on the zonular fibres
increase in lens diameter, decrease in lens thickness and a flattening of the anterior and posterior lens surface curvatures
decrease in optical power

# SCHACHAR'S THEORY

ciliary muscle contracts

↓

equatorial zonular tension is increased

↓

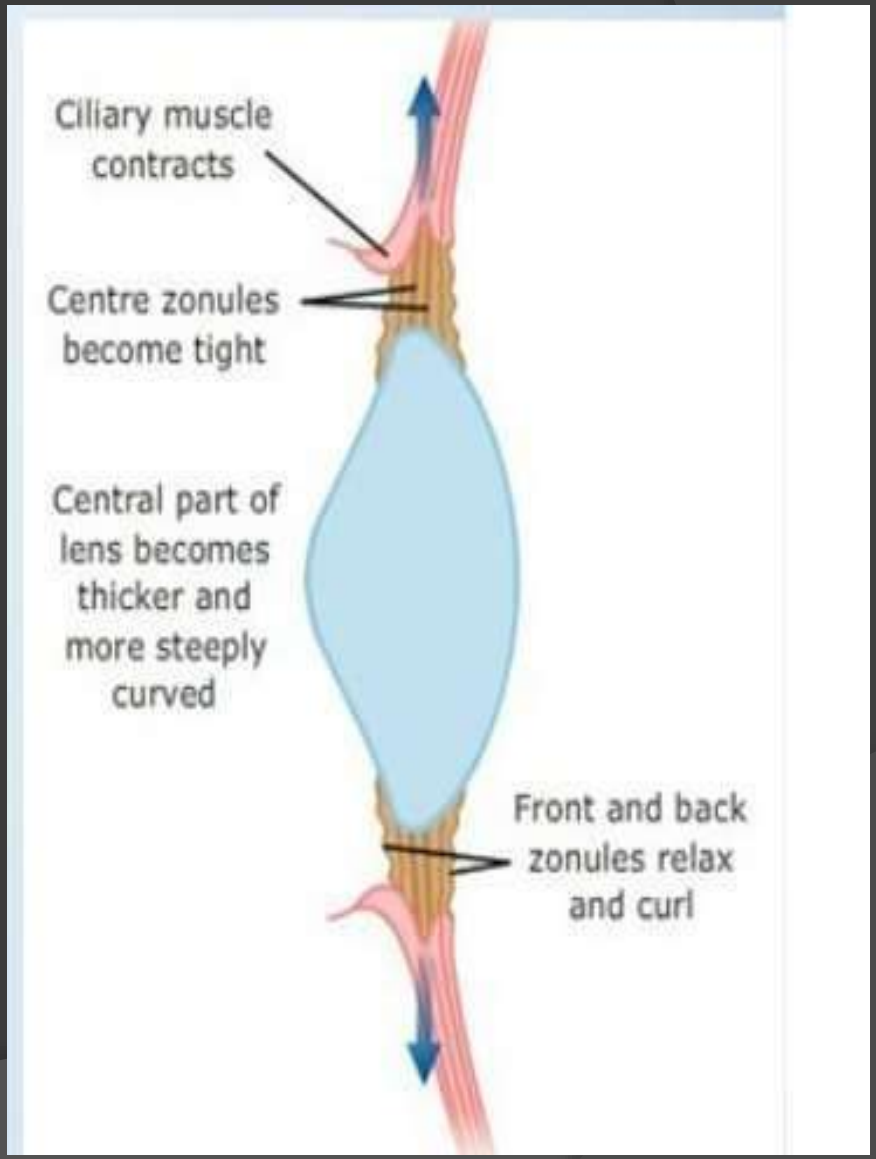
anterior and posterior zonules are simultaneously relaxed

↓

central surfaces of the lens steepen

↓

peripheral surfaces of the lens flatten

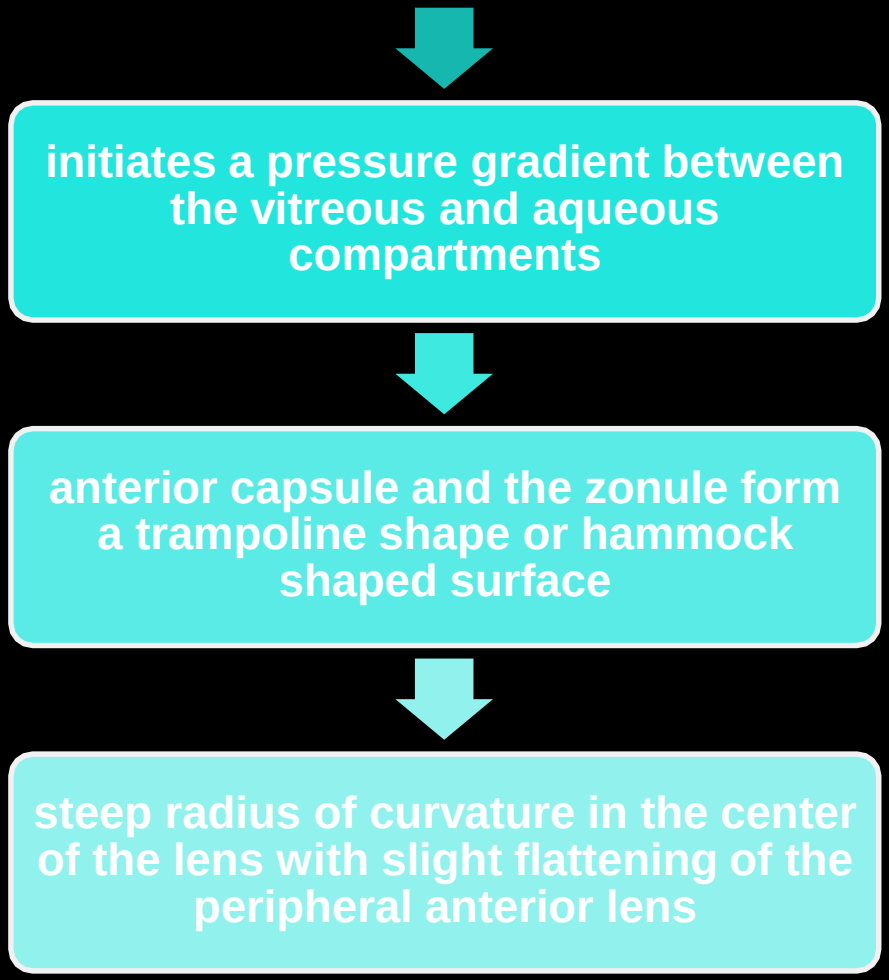


- Presbyopia results from growth of equatorial diameter of the lens
- with age,the perilenticular space is reduced and ciliary muscle contraction no longer tense the zonules and expand coronally
- Based on this theory introduded new sx for presbyopia scleral expansion bands

# CATENARY THEORY

- Proposed by coleman
- Says that lens zonules and anterior vitreous comprises of a diaphram b/w AC and vitreous

**ciliary muscle contracts**



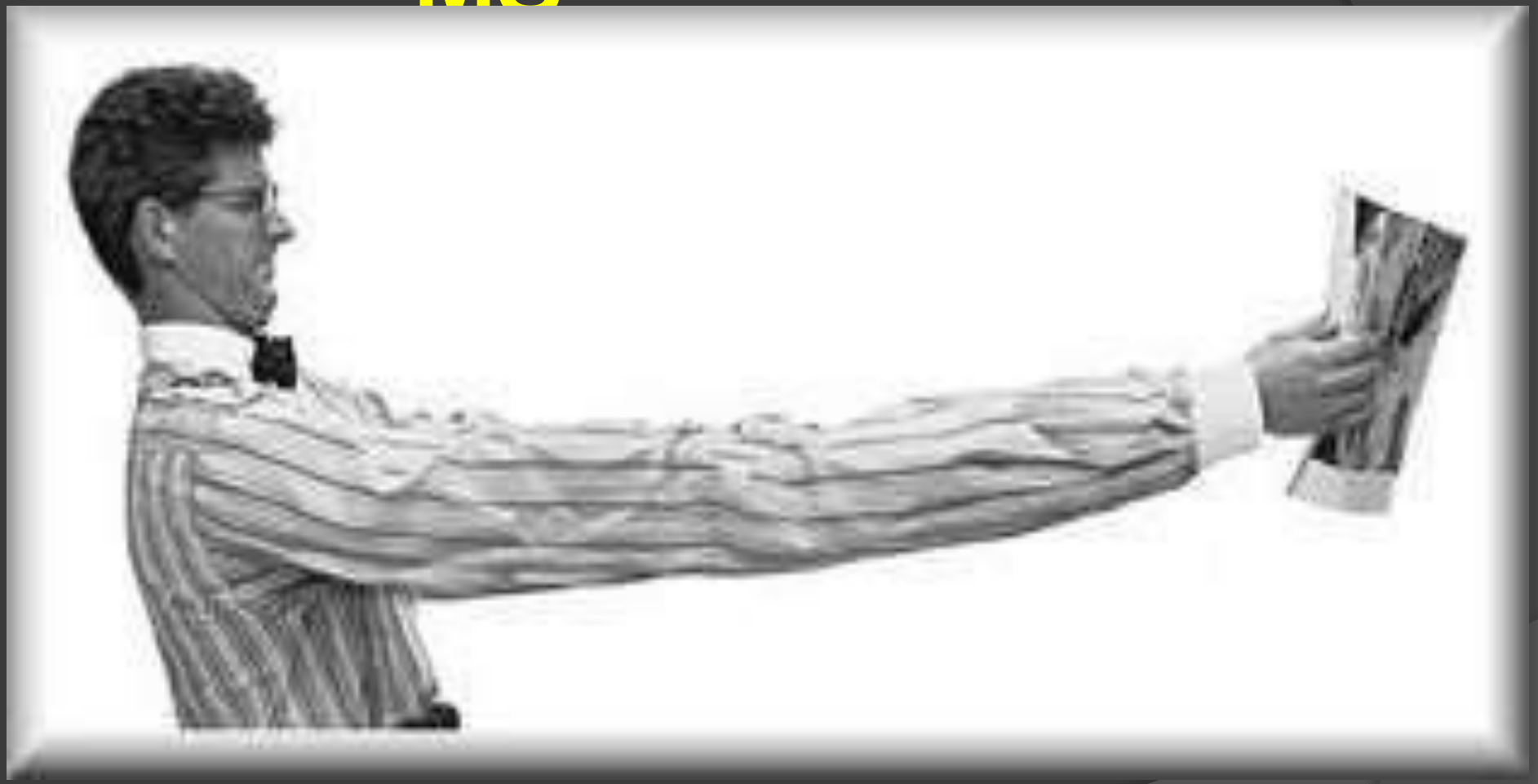

ACCORDIND TO THIS THEORY

presbyopia occurs d/t increase lens volume with age that results in a reduced response of anterior radius of curvature to the vitreous pressure gradient created by ciliary body contarction

# CAUSES FOR PREMATURE PRESBYOPIA

- Uncorrected hypermetropia
- Premature sclerosis of crystalline lens
- Presenile weakness of ciliary muscle
- Chronic simple glaucoma

# SYMPTOMS



“My arms are not long enough to see up close anymore”

# SYMPTOMS AND SIGNS

- Difficulty in near vision initially in evening and dim light and latter even in good light
- Asthenopic symptoms like headache d/t fatigue of ciliary muscles
- Intermittent diplopia due to associated disturbances of convergence

All symptoms aggravated by fatigue illness fever or other chronic conditions

**SIGNS→ reduced amplitude of accomodation**

Headaches

Eye strain

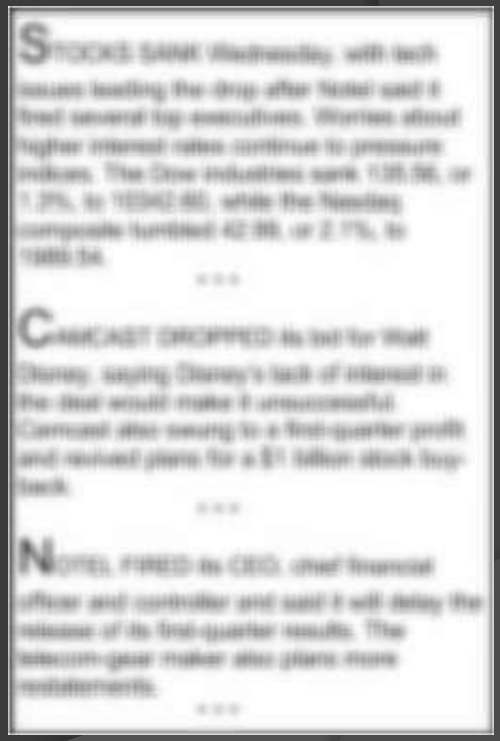
Redness and Watering of eyes

Neck and back aches

# THE VISION WITH PRESBYOPIA

***Distance***

***Intermediate***



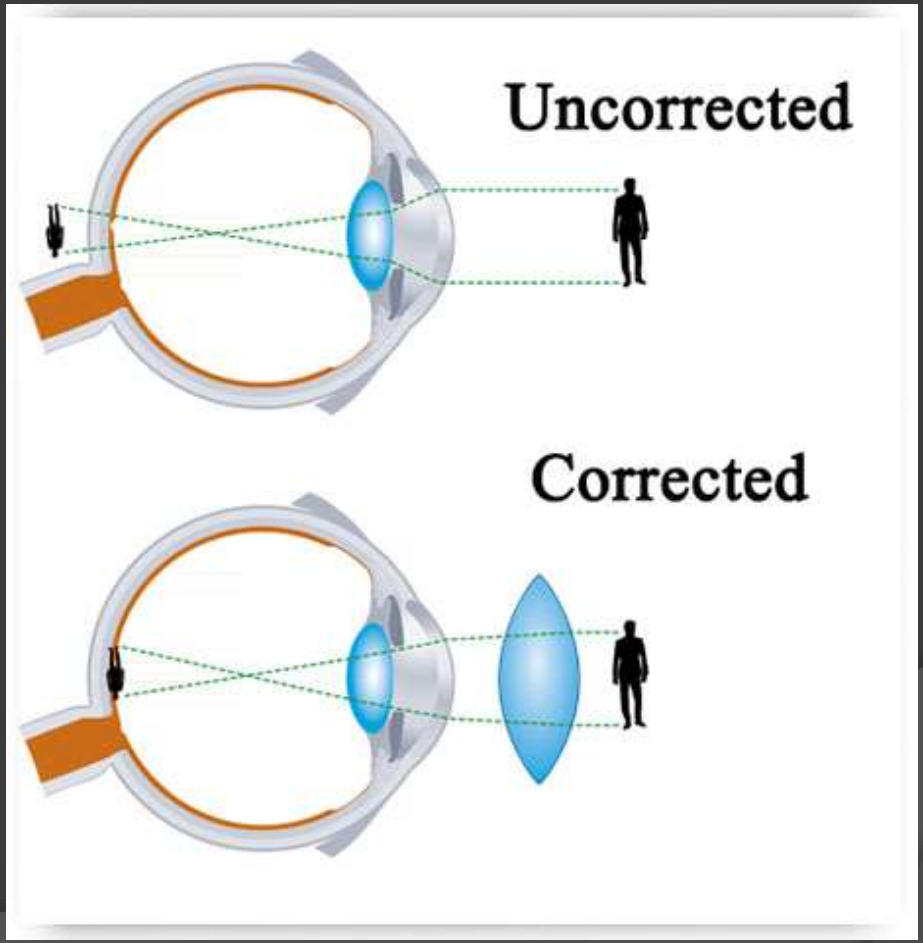
***Near***

# TREATMENT

OPTICAL CORRECTION OF PRESBYOPIA

Trial method

Age method



# Basic principles

- Find ref error for distance n correct it first
- Find presbyopic correction needed in each eye seperately and add it to distance correcction
- Presbyopic add should leave atleast 50% acomodation in reserve
- Near point should be taken consideration according to profession of patient
- Do not give over correction
- Additional correction for intermediate distance may be required

# Trial method

- Trial method
  - Patient with Rx in DV, test to 40 cm (or habitual distance of NV) well lit
  - Mono and/or binocularly
    - Cover LE and go on adding +0.25D in the RE until the patient sees clearly
    - The same for LE
    - Refine the result adding ± 0.25D binocularly

# Age method

- Empirical method based on clinical experience
- Patient with Rx for DV
- Reading test at a habitual distance in NV with convex lens of appropriate power
- There are approximated addition tables depending on age
- Refine the result adding ± 0.25D binocularly

- The difference b/w distance correction and the strength needed for near vision is called ADD
- BUT the add should be given considering the working distance of patient

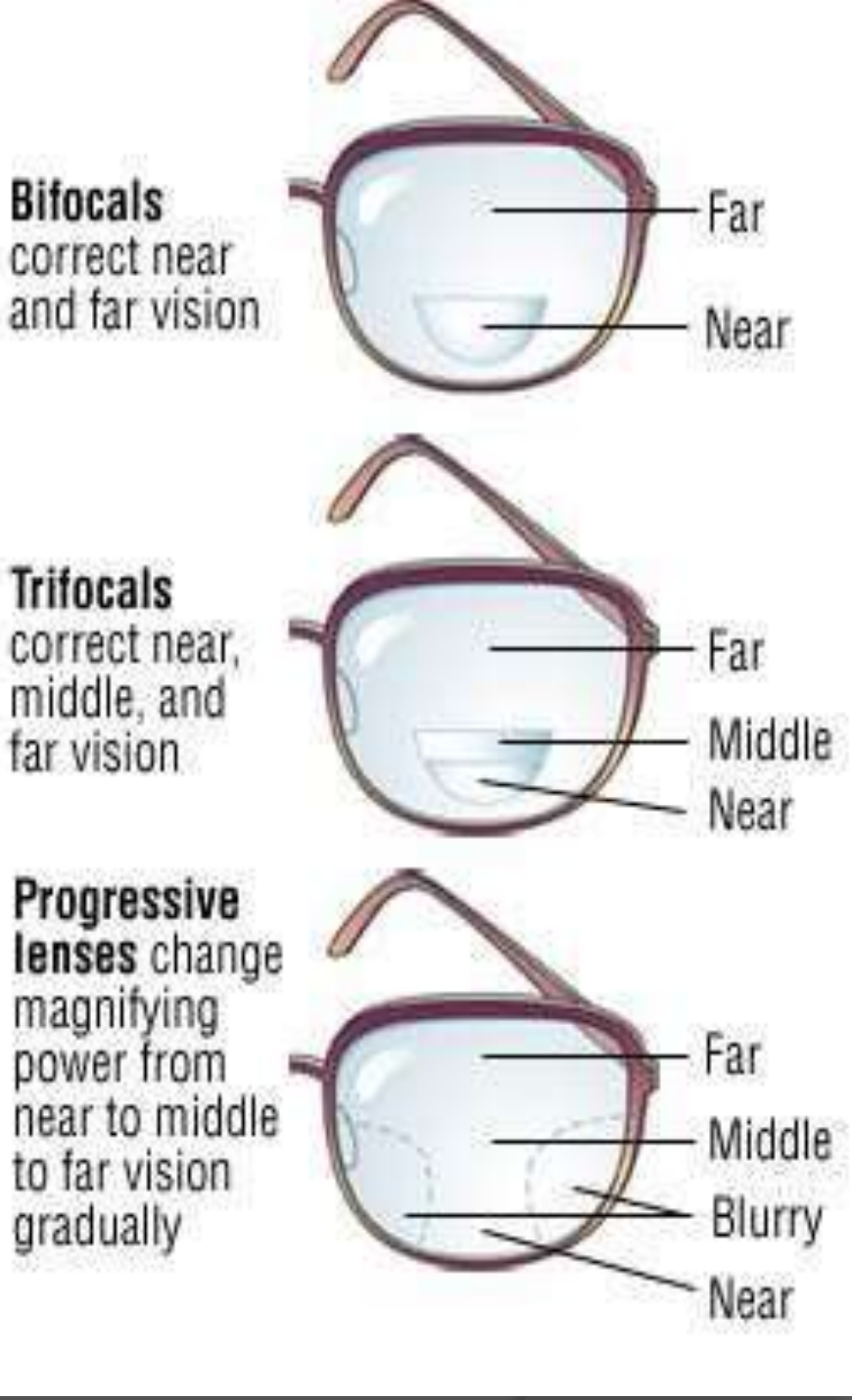
| Age | Predicted near add |
|---|---|
| 40 | 0 |
| 45 | +1.00 |
| 48 | +1.25 |
| 50 | +1.50 |
| 52 | +1.75 |
| 55 | +2.00 |
| 60 | +2.25 |
| 63 | +2.50 |

- Comfortable vision at near uses less than or equal to half of the available amplitude of accommodation
- Near work becomes difficult when the amplitude of accommodation is less than 5.00D

# Example

- Working distance at 40 cm requires 2.50D of accommodation
  - Patient A has 5.00D of accommodation
    - He can use up to 2.50D of accommodation comfortably
    - Therefore, he has just enough accommodative power for reading at 40 cm, and no reading glasses are required
  - Patient B has 3.00D of accommodation
    - He can use up to 1.50D of accommodation comfortably
    - Therefore, he needs an additional 1.00D of accommodative power for reading at 40 cm, and +1.00D reading glasses are required

- Monofocal lenses
  - Useful for static, long-term tasks
  - The glasses should be taken off to see from distances
- Bifocal lenses
  - For NV and DV
- Progressive lenses
  - For DV, NV and intermediate distances
  - There are peripheral areas with optical aberrations
  - Very precise adaptation



# CONTACT LENS

## Contact Lens Correction for Presbyopia

### Rigid Gas Permeable Lenses

- Smaller and harder
- Give more oxygen
- Less dry eye problems
- Good for high degrees
- Less deposits buildup
- Easy to handle
- Conventional lenses
- Must wash the lenses well
- Easily scratched
- Initial discomfort
- Not suitable for contact sports

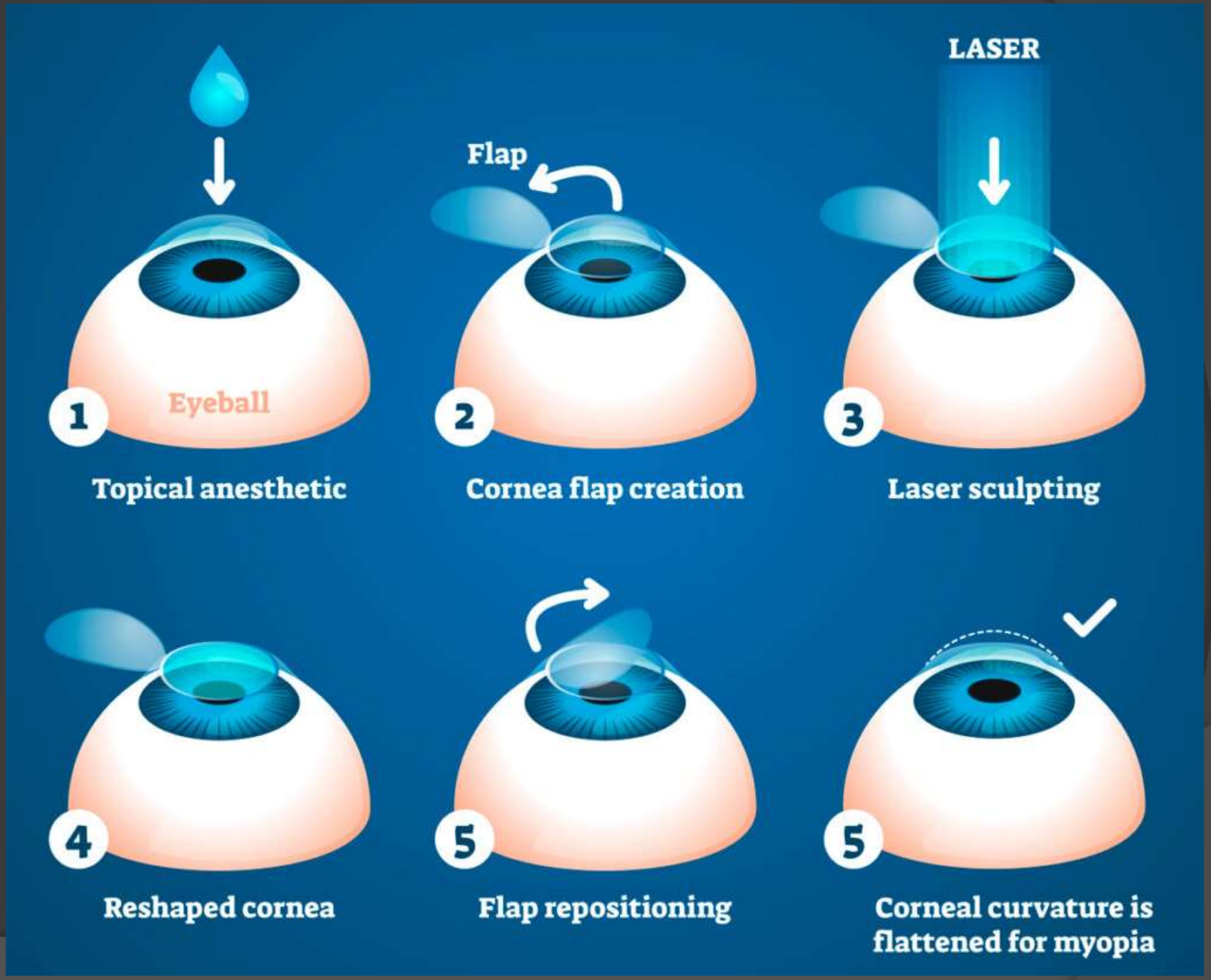
### Soft Contact Lenses

- Larger and softer
- Comfortable to wear
- Shorter adaptation period
- Good for occasional wear
- Need delicate handling
- Available in conventional and disposable types
- Daily, bi-weekly, monthly disposables
- Disposables are cleaner and more hygienic

Both are available in bifocal, multifocal and monovision corrections

# surgical treatment

- Surgery
  - Laser in-situ keratomileusis (LASIK)
    - More for presbyopic hyperopia than presbyopia myopia at the moment
  - Multifocal intraocular lens (IOL)
  - Conductive keratoplasty (monovision)
  - Scleral expansion


LASER
Flap
Eyeball
1
2
3
Topical anesthetic
Cornea flap creation
Laser sculpting
4
5
5
Reshaped cornea
Flap repositioning
Corneal curvature is flattened for myopia