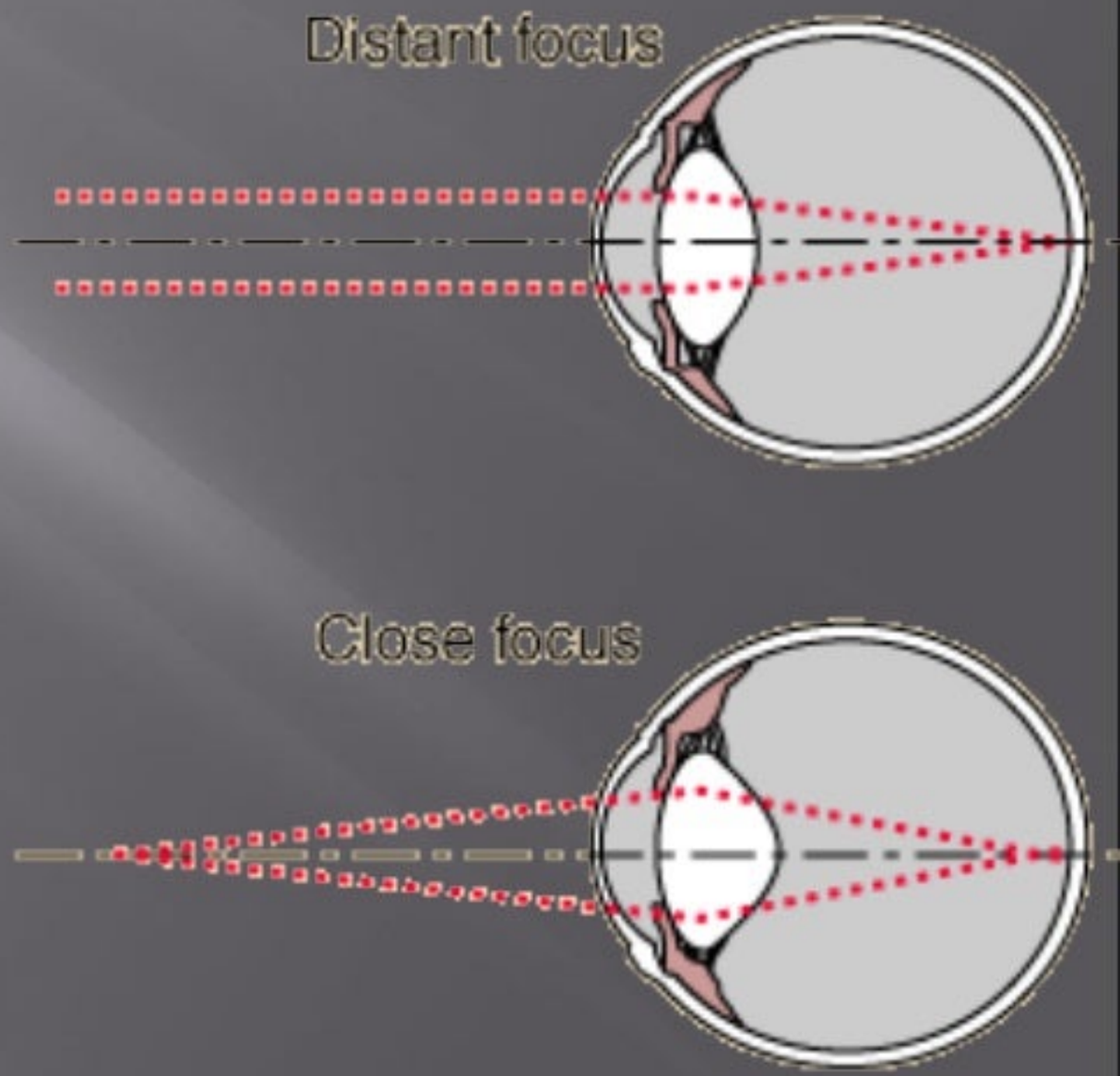
ACCOMMODATIVE ANOMALIES

REFERENCES

- Borish's clinical refraction
- Duke-Elder's practice of refraction
- Principal of optics and refraction by Lalit P. Agrawal
- Binocular vision and ocular motility-Gunter K Von noorden
- Clinical management of strabismus-Elizabeth
- Optics and refraction by A.K khurana
- Anatomy physiology by A.K khuran
- Internet

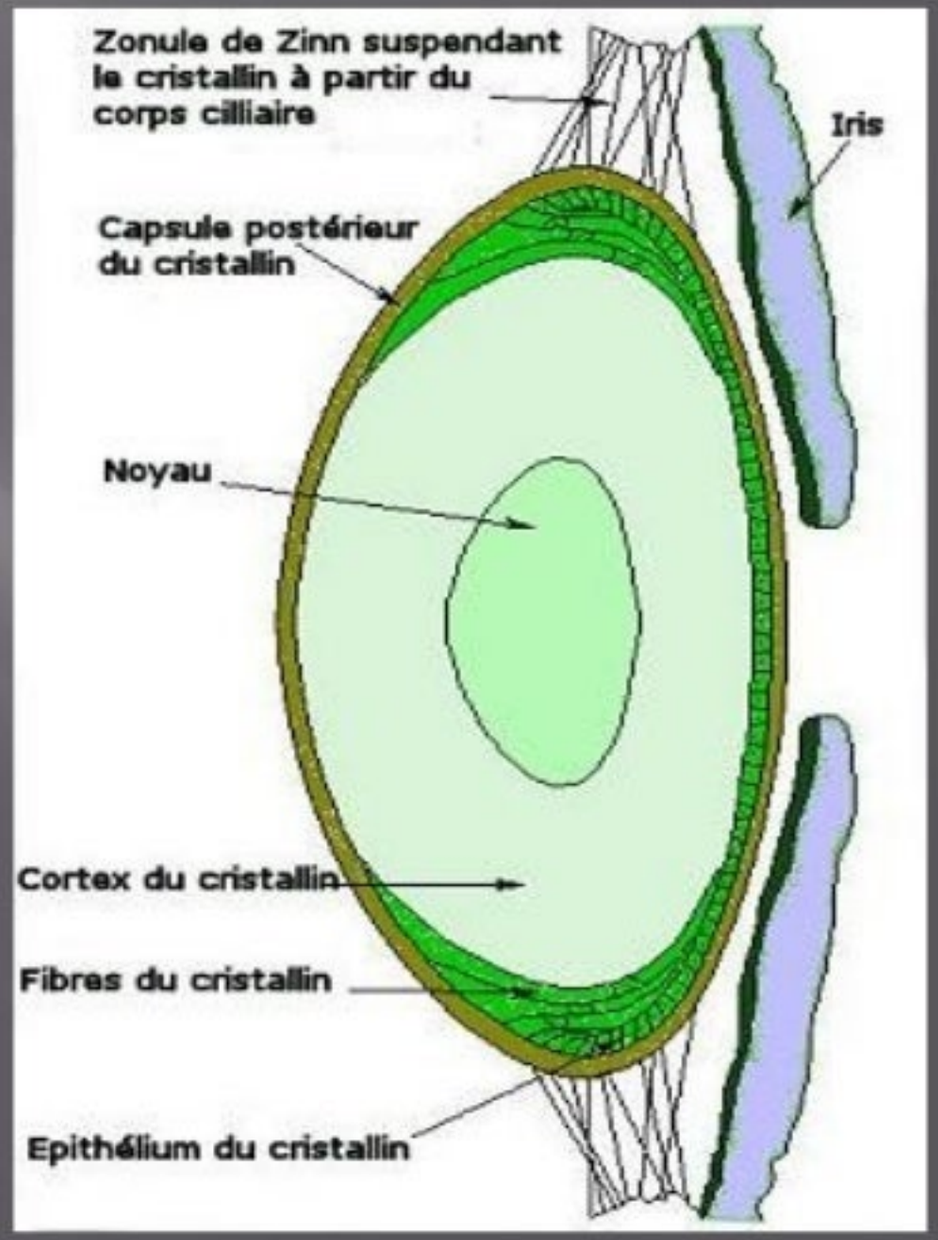
ACCOMMODATION

- The process by which the dioptric power of eye changes so that an infocus retinal image of an object of regard is obtained and maintained at high resolution at fovea.

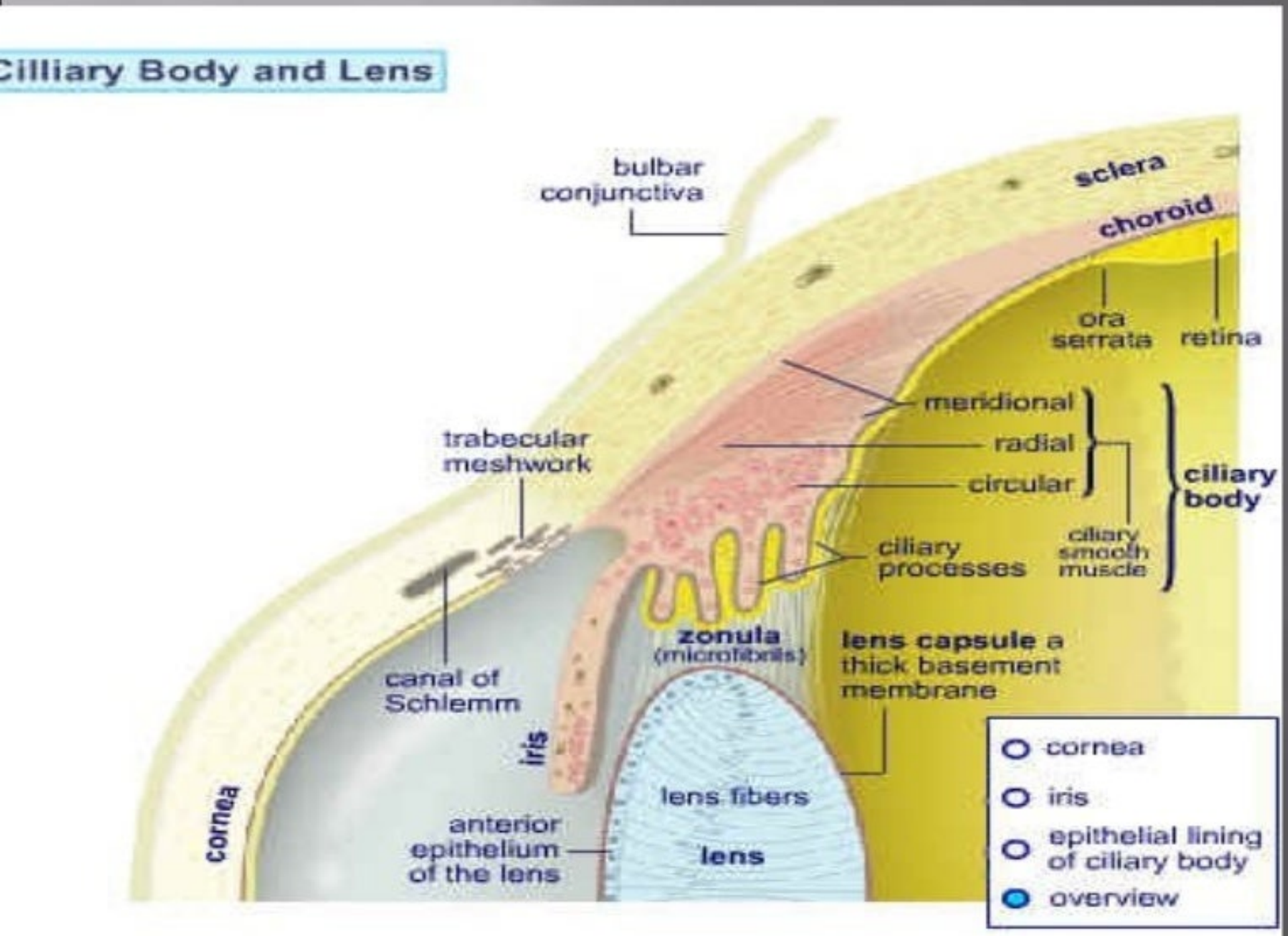


Accommodation ????

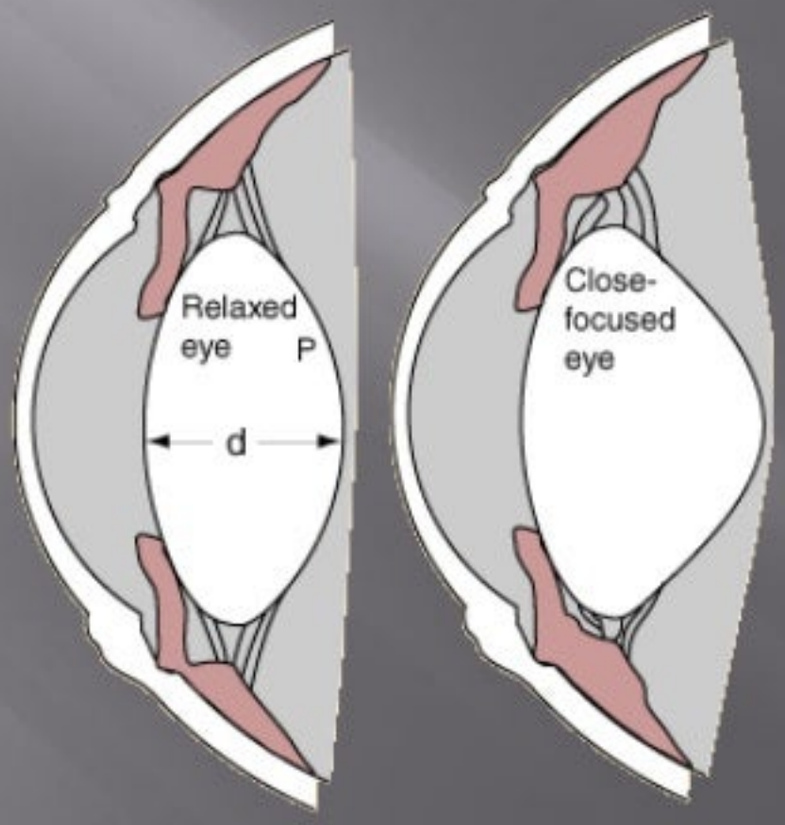
- Brief anatomy of lens
- Transparent,biconvex
- Anterior surface is is less convex(abt10mm)
- Posterior surface more curved(6mm)
- Refractive index=1.39



CILIARY MUSCLE AND ZONULES

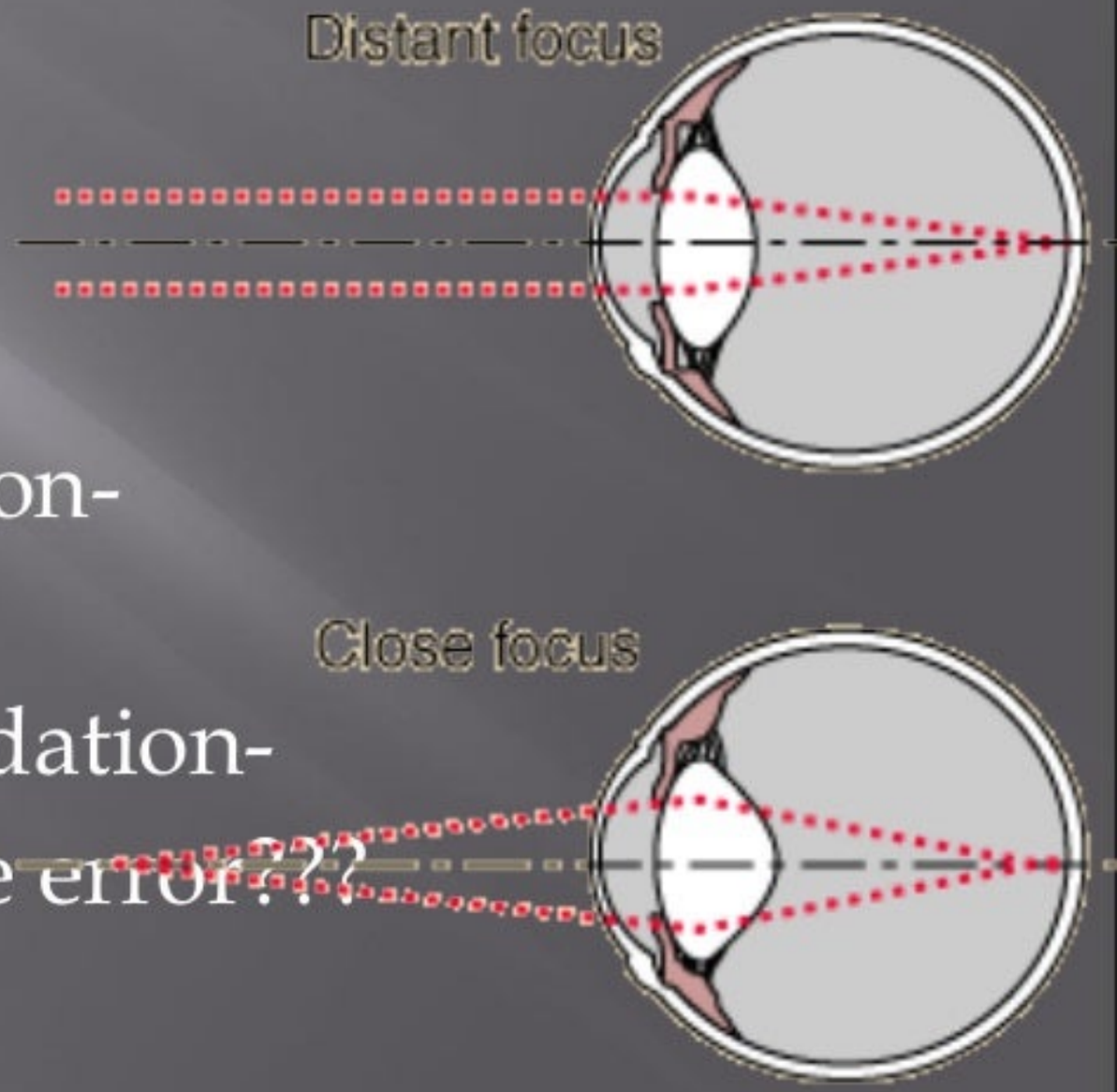


Changes in accommodation



Ranges and amplitude of accommodation

- Punctum proximum-
- Punctum remotum-
- Ranges of accommodation-
- Amplitude of accommodation-
- Variation with refractive error???



Variation of amplitude of accommodation with age

- DONDER'S TABLE

AGE(yrs)	AMP(Ds)	AGE(yrs)	AMP(Ds)
10	14	40	5.50
20	10	50	3.5
30	7	60	1

Hoffsteter's formula for amplitude of accommodation

- Minimum=15-0.25*age
- Average=18.5-0.3*age
- Maximum=25-0.4*age
- Eg for 40 yrs
  minimum=5Ds,intermediate=6.5Ds and maximum=9Ds.
- ????????

Anomalies of accommodation

- Insuffeciency of accommodation
- Excess or spasm of accommodation

Insuffeciency of accommodation

- Physiological anomaly
- Pharmacological anomaly
- Pathological anomaly

Physiological anomaly

- Presbyopia –not a disease
- Age of onset depends on sex,race and occupation.
- Why ?????
- Helmhotz –Hess Gullstrand theory
- Donder Duane fincham theory

Types of presbyopia

- Incipient presbyopia
- Functional presbyopia
- Absolute presbyopia
- Premature presbyopia
- Nocturnal presbyopia

- Symptoms –
- Small print become indistinct in dim illumination.
- Hand short for reading

Optical correction

- Glass..near glass,bifocal glass.progressive addition lens,monovision glasses
- Contact lens option
- Distance single vision CL and near glasses
- Monovision CL
- Bifocal /multifocal CL
- Non refractive bifocal
- Weakest glass which are compatible with good vision????

Methods determining addition

- A general rule an individual require 1D at 40 and in every 5 yrs ,increases by 1D until 55 then stabilizes.

- Considering amplitude of accommodation

-RAF ruler

-Donder's table

-hoffsteter's formula

-Dynamic retinoscopy

- Binocular cross cylinder test-

- Negative relative accommodation (NRA)and positive relative accommodation(PRA)-
- Addition-NRA+1/2 relative amplitude of accommodation
- Eg if PRA is –0.50 Ds and NRA is +2.00
- Amplitude of accommodation=+2.50
- Addition==2.00-1/2*2.50=+0.75Ds

Treatment ???

- Surgical procedure
- Made artificially anisometropic
- New advancement in surgical process

Pharmacological anomaly

- Ciliary body is supplied by both sympathetic and parasympathetic supply.
- Sympathetic receptor include alpha and beta
- Parasympathetic include muscarinic receptor M1,M2,M3

Group of drugs affecting accommodation

- Parasympatho mimetic
- Parasympatholytics
- Sympathomimetics
- sympatholytics

Some other causing accommodation insuffeciency

- Alcohol
- Phenothiazine
- Antihistamine
- Marijuana
- Digitalis

Pathological anomaly

- Insuffeciency of accommodation-
- Accommodative power is consistently poor than what may be considered as normal at that age.
- Etiology…..
- · General debility
- · Malnutrition
- · Anaemia
- Glaucoma (?)

Treatment

- Cause is treated
- If not treatable,symptom relieving majors…
- Optical treatment-1st choice
- Accommodation therapy…

Lag of accommodation

- Accommodative response is smaller than accommodative demand.
- Causes asthenopic symptoms.
- Can be found by dynamic retinoscopy ,jackson cross cyl method.
- Corrected by giving

Research report

- Normal accommodative lag in Nepalese population-Dhungana Purushottam
- 151 patient were examined out of which 88(58%) were female,63(42%)male.
- He found normal accommodative lag increase with age and ranges from 1.004-1.33(16-35yrs)in monocular fixation and 0.915-1.116(16-35yrs)in binocular condition.

Conclusions of the study

- Accommodation lag in entire Nepalese population found to be increase with age
- Myope showed lag towards higher side,hyperope towards lower side.
- Normal lag 1.174(+/-0.17) monocular fixation,0.998(+/-0.003)binocular condition.

Ill sustained accommodation/fatigue of accommodation

- Accommodation is normal initially but can not be maintained over length of time.
- Initial stage of true insufficiency
- Convalescent period from debilitating illness
- Tiredness

- · refractive status
- relationship with convergence

treatment

- Correct significant ametropia
- High astigmatism ? - check near cyl axes
- Advise on lighting and length of time accommodation

Inertia of accommodation accommodation facility

- Difficulty is experienced in altering the range of accommodation .
- Measurement of quality of the eye ability to smoothly and efficiently change the amount of accommodation
- Cycles per minute by flipper

Facility testing

Normal value

- Monocular distribution of monocular accommodative measurement using +/-2 Ds for 100 eyes,12-14 cycles constitute about 50 eyes.(asymptomatic)
- Binocular accommodative facility measurement using +/-2Ds,8-14 constitute about 50 percent total screened(asymptomatic)

Paralysis of accommodation

- Disease affecting cranium and oculomotor nerve
- Paralytical mydriasis
- If accommodation paralysis is isolated cause,-it is cortical in origin
- Other cause include encephalitis,anterior poliomyelitis,TB,syphilis etc

- May be partial or total, unilateral or bilateral
- ***Signs and symptoms***
- . Blurred vision
- Micropsia

Aetiology

- · Congenital defects e.g., no ciliary muscle
- · Cycloplegic drugs
- · topical eye drops intentional or unintentional
- Systemic drugs

- · Degenerative conditions e.g. Parkinson’s
- · Exogenous poisons e.g., snake bites, bee stings
- · III N lesion (tumour, aneurysm, haemorrhage)
- · Ocular disease (anterior uveitis, glaucoma)
- · Trauma to head or eye (temporary or permanent paralysis)

Management

- · If recent onset and not previously investigated then refer and, if of sudden onset, urgently
- Subsequent intervention will include spectacles and management of any diplopia

Excessive accommodation

- Tone of ciliary muscle is increased,inducing pseudomyopia.
- ***Symptoms***
- · Blurred vision depending on patient's refractive status
- · Macropsia
- · Asthenopia during close work
- · Pain (brows/headache)
- · Poor concentration
- Miosis
- Convergence anomalies (excess or insufficiency)

Investigation

- Cycloplegic refraction used to determine true refraction

aetiologies

- Functional cause
- Organic cause

Functional cause

-
- Functional spasm
- A response to over fatigue and "eye strain". Precipitated by 3 factors:
- · Bad visual hygiene e.g., poor lighting, glare unaccustomed work
- · Optical or ocular motor difficulties e.g., anisometropia, early presbyopia, convergence anomalies
- psychological factors

Organic cause

- Irritation of parasympathetic system
- ***Aetiology***
- · Ciliary spasm
- - drug induced e.g., physostigmine, pilocarpine, morphine, digitalis
- - lesions of brain stem
- · Inflammation
- e.g., anterior uveitis
- Trigeminal neuralgia

Treatment

- Reversible or irreversible….
- Reversible then + lens
- Irreversible than – lenses

Unequal accommodation

- Can be due to ciliary muscle weakness or decrease in elasticity of lens capsule..
- Other causes include amblyopia,unilateral sclerosis..

Accommodative esotropia

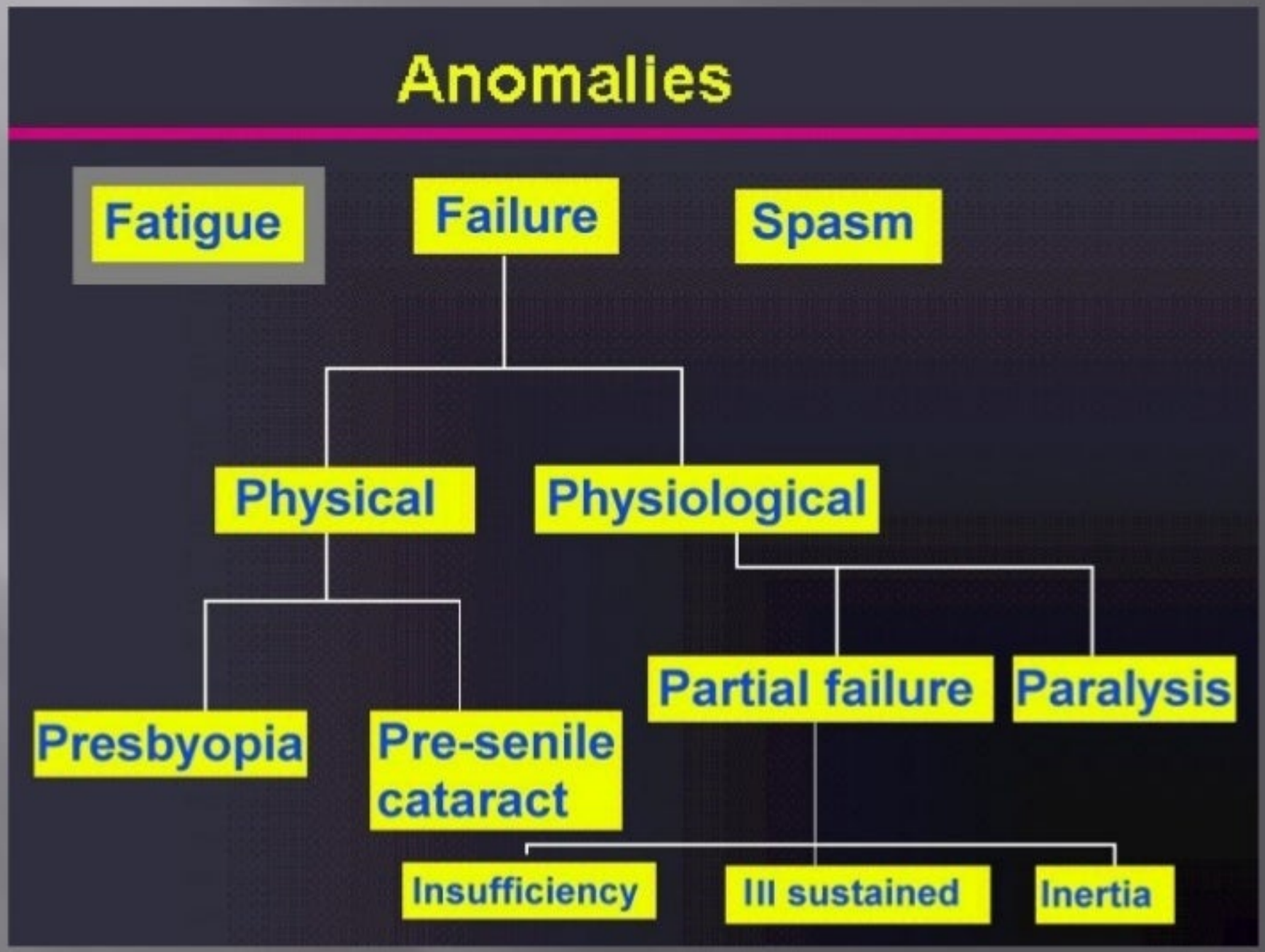
- Accommodative esotropia……
- Refractive accommodative esotropia..(AC/A normal)
- Non refractive accommodative esotropia(high AC/A ratio)
- Mixed
- AC/A=ipd+ N. phoria-D.phoria/D

Accommodative therapy

- To improve accommodative amplitude ,facility ..
- Principle is to alter the stimulus for accommodation by glasses or changing distance
- Initially therapy is performed monocularly so that vergence system does not influence.

- Hart chat push up(push up paddle)
- Hart chat distance near facility
- Lens flippers
- Loose minus lens rock
- Split pupil rock

Summary


Anomalies
Fatigue
Failure
Spasm
Physical
Physiological
Presbyopia
Pre-senile cataract
Partial failure
Paralysis
Insufficiency
Ill sustained
Inertia

conclusion

- Accommodative anomaly is one of the most common cause of asthenopic symptom presenting to optometrist.
- So all patient should undergo tests for refractive error,muscle imbalance and convergence and accommodation anomaly should not be forgotten.

Flow chart to approach Asthenopia

HEADACHE

Patch eye and do near work

Headache persists

Accommodative problem

Refractive error

Headache subsides

Binocular problem