Introduction

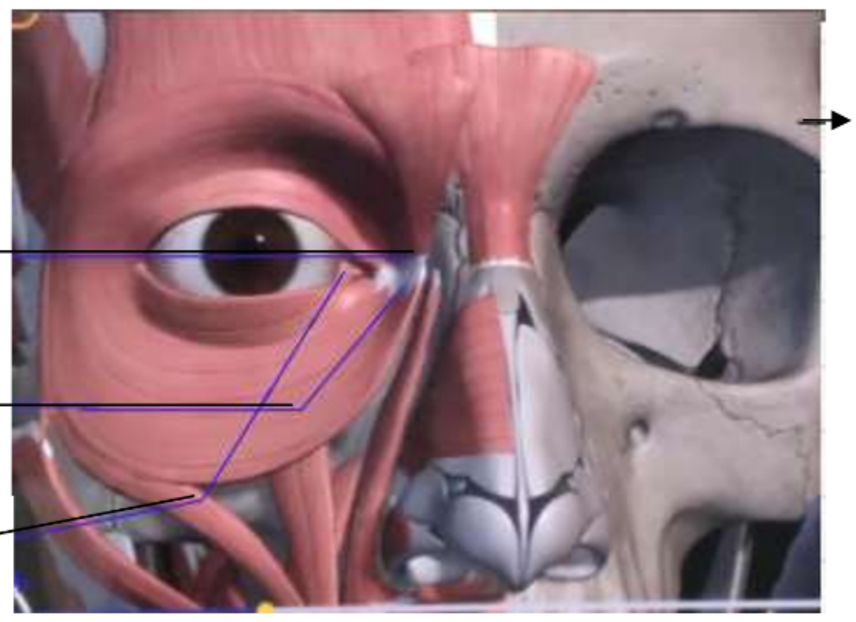
Topic Notes: 3

Introduction





If eyeball comes out ↓ Proptosis

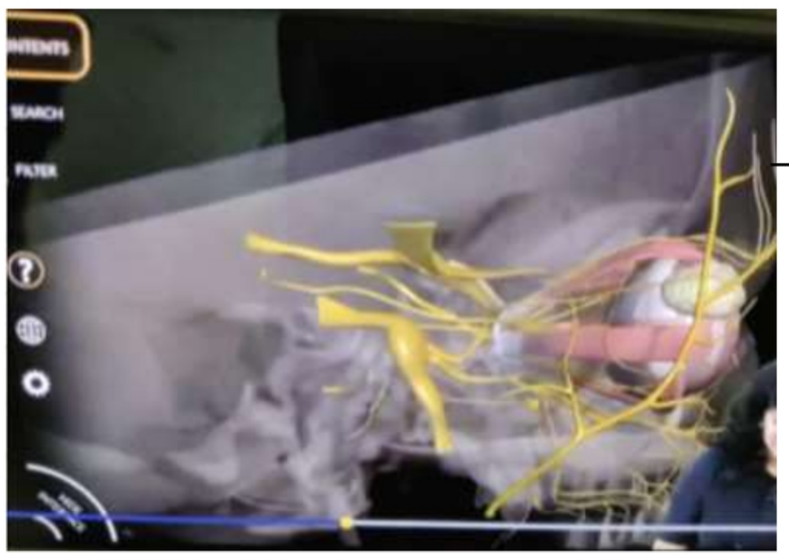


Calcle

Medial canthus

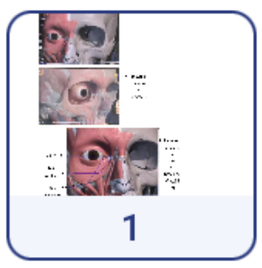
Plica semilunaris

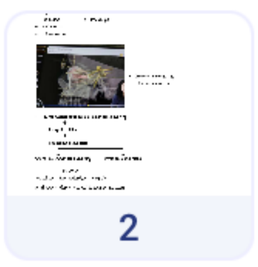
Palpebral aperture ↓ Less ↓ Drooping of eyelid (P)



Muscular support

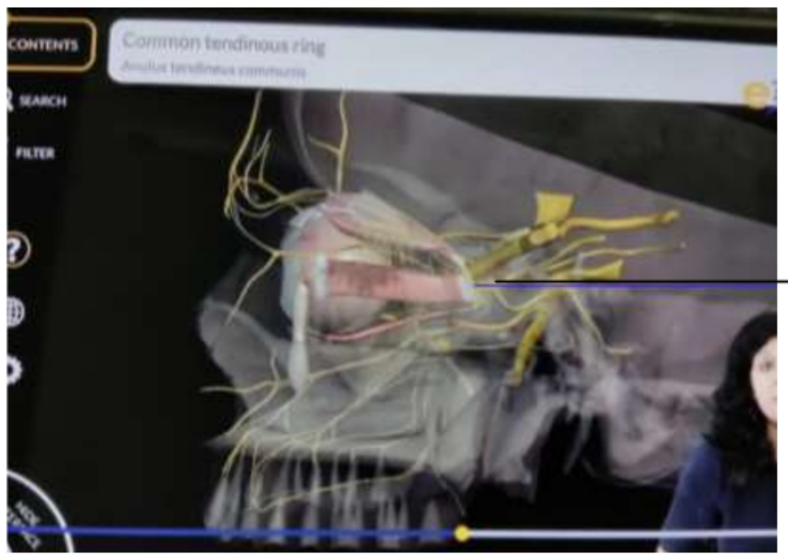
Pinch to zoom


1


2


3

4 rectus	2 oblique
• Sup rectus • Inf. rectus • Medial rectus • Lateral rectus	• Sup oblique • Inf. oblique



Common tendinous ring
(or) Annulus of zin
@ apex

- All the muscles arise from common tendinous ring

↓

Except inf oblique

↓

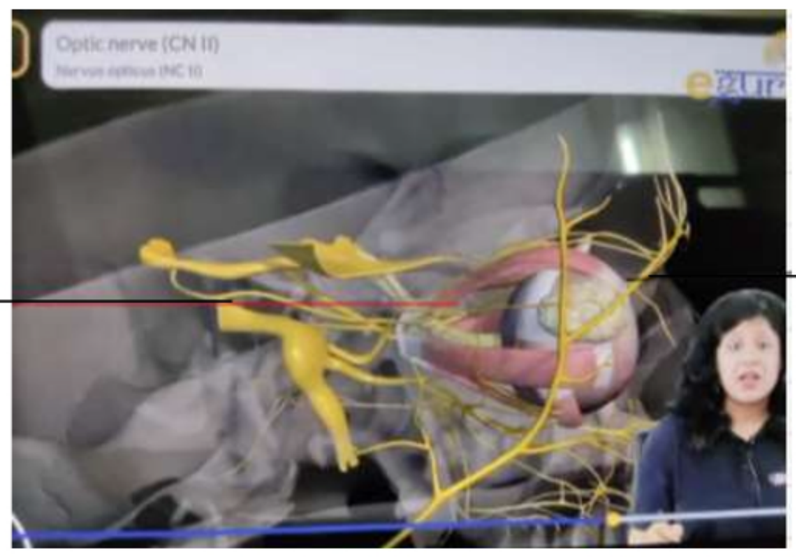
Sup oblique has 2 heads

One from common tendinous ring — Other from sup rectus

Insertion

Sub oblique = Superolateral,post to equator

Inf oblique = Inferolateral,post to equator into sclera



Post pole ← → Ant pole

- Dis between ant and post pole = Separated in mid by equator

Pinch to zoom


1


2

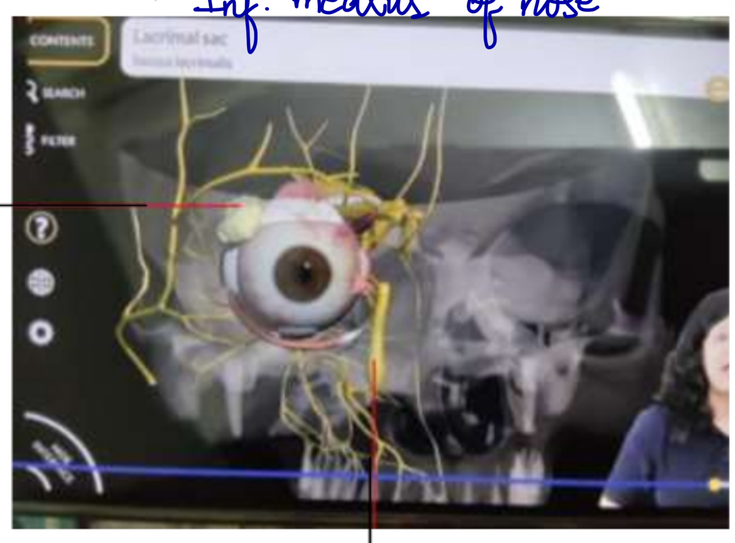

3

Introduction

Topic Notes: 3

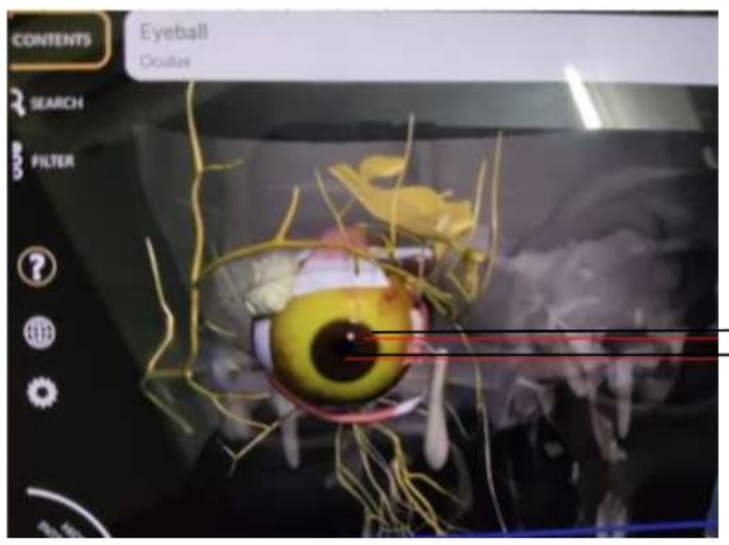
Lacrimal app

Lacrimal gland
↓
Lacrimal caruncle
↓
Canaliculi
↓
Lacrimal Sac
↓ Inf. meatus of nose



Lacrimal gland ←

Lacrimal Sac ↓



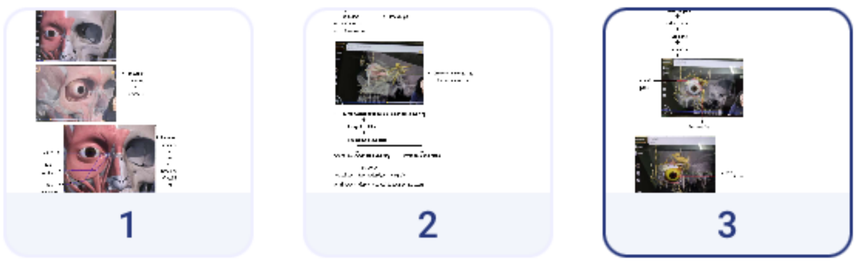
Iris →

Pupil →

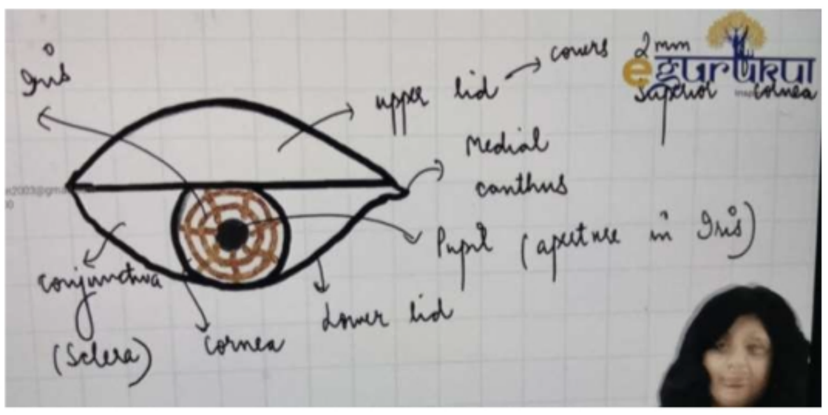
Iris = Pigmented, colourful part

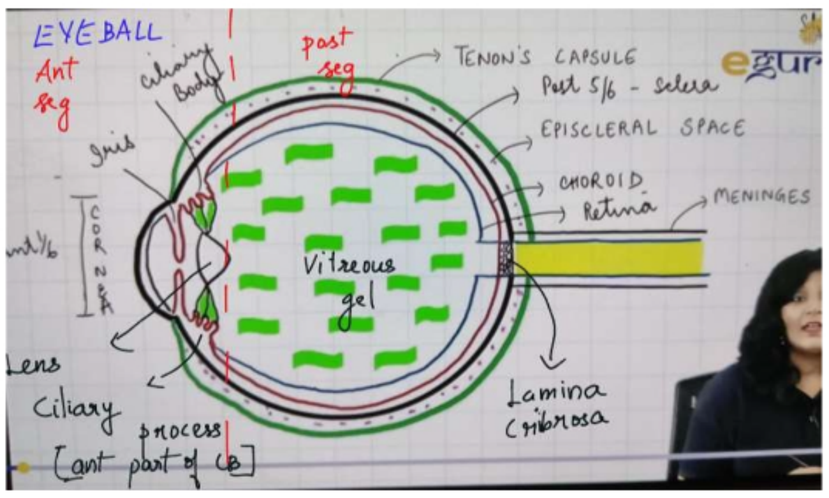
Eyeball
↓
Covered by conjunctiva, sclera posteriorly
↓
Inferiorly capsule condense to form suspensory ligament

Pinch to zoom



Anatomy Development and Visual Acuity

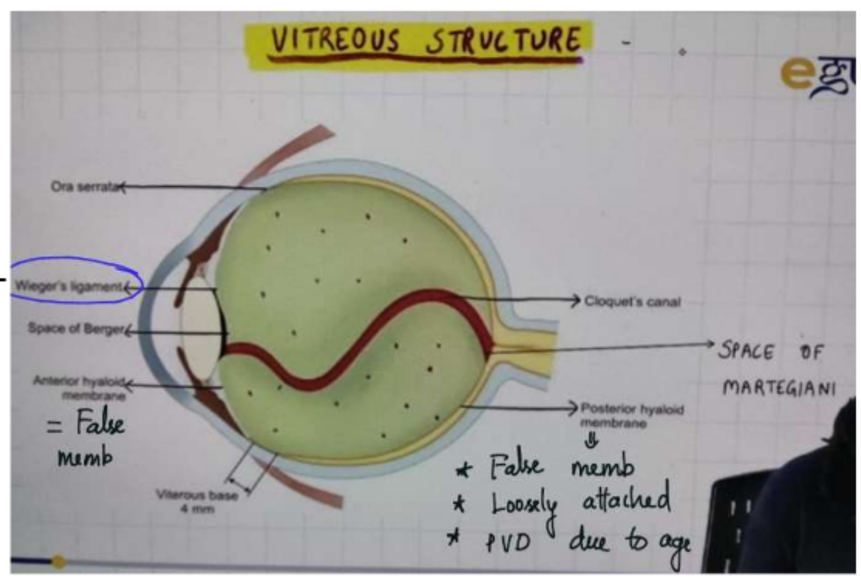




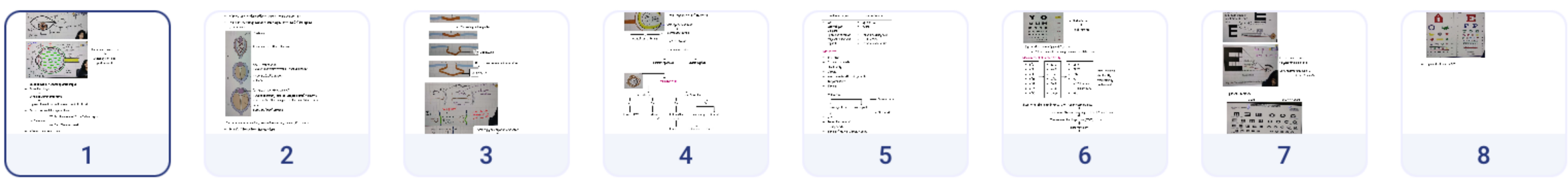
Line passing through lens
↓
Divides eye into ant, post segment

- Shape of eyeball = Ablate spheroid shaped
- Retina has 10layers
  ↓
  Of this one layer optic nerve
  ↓
  It passes through Lamina Cribrosa (Part of sclera)
- Ant segment contains aqueous humor Q
  Has 2 chambers → Ant chamber = 0.25mL = 2-3mm depth *
  Has 2 chambers → Post. Chamber = 0.06mL Q
- Vitreous humor (gel) = 4mL Q

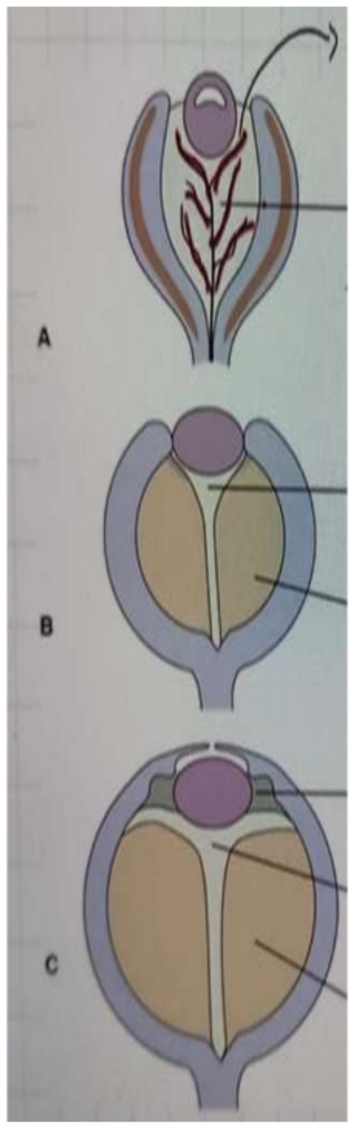
Hyaloido capsular ligament
↓
Connects AHM with post. capsule of lens
↓
Circular



Pinch to zoom



- 1° vitreous = present before birth
- 2° vitreous = present after birth
- Vitreous humor contains collagen (Type-II), Hyaluronic crystals
- Hyaloid artery through cloquet's canal = supplies vitreous (1°) through IUL (Mesodermal)



1° vitreous

Primary vitreous (Hyaloid artery)

At 3-4th month of IUL
Remains of primary vitreous (Croquet's canal)

Secondary (adult) vitreous
At birth

Tertiary vitreous (Lens zonules)

Remains of primary vitreous (Cloquet's canal) = Doubtful existence → If this canal persists, known as PHPV = Leuco coria

Secondary (adult) vitreous

2° vitreous condenses in ciliary area → forms ciliary zonules (3° vitreous)

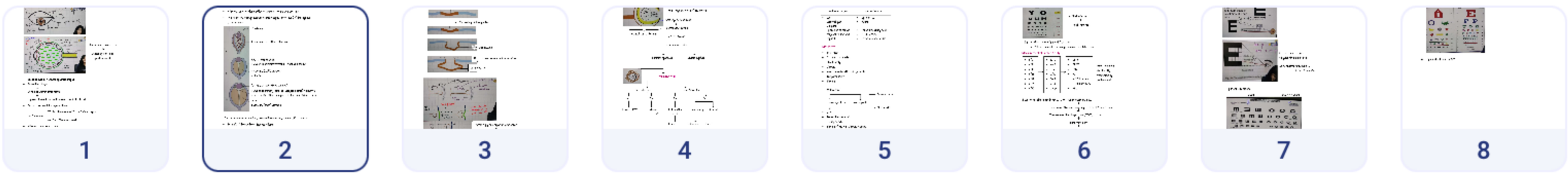
- Both 2°, 3° derived from Neuroectoderm

DEVELOPMENT OF EYE *18:30*

1) Optic vesicle = Neuroectoderm
2) Lens vesicle = Surface ecto
3) Mesenchyme
4) Visceral mesoderm

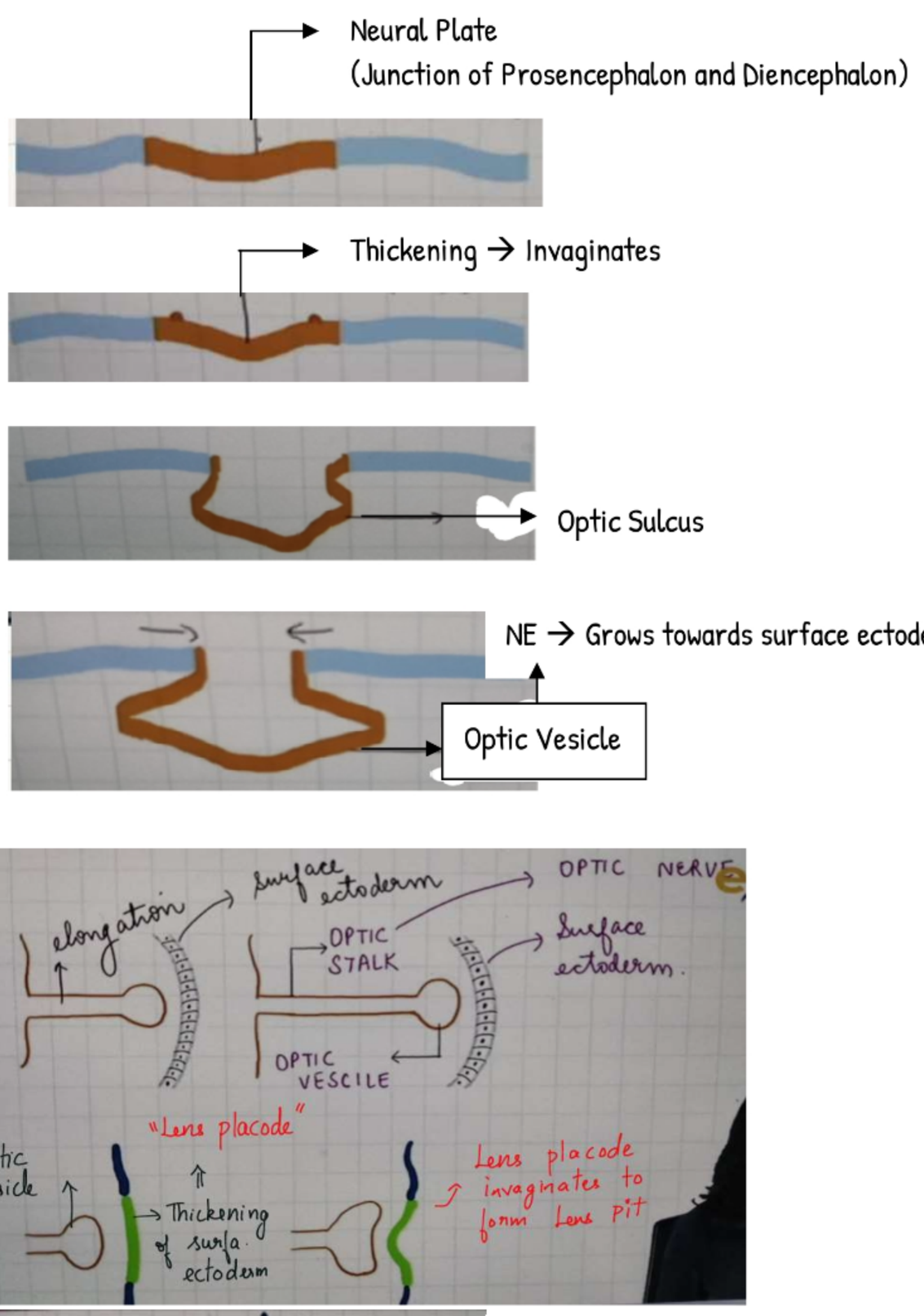
- Starts at 3rd month of IUL till 9-10 weeks

Pinch to zoom



Anatomy & Development, Visual Acuity

Topic Notes: 8

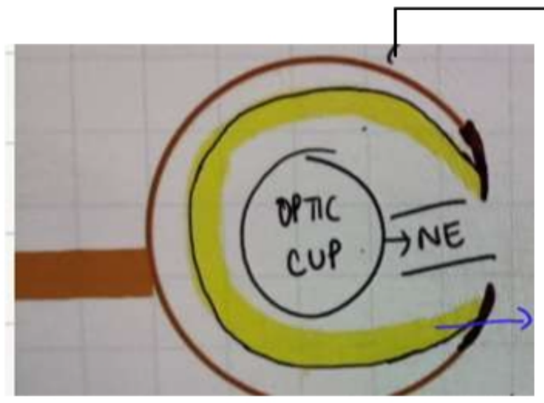


Optic cup grows superiorly, laterally
↓
Def. present infero laterally
↓
"Choroidal (or) embryonic fissure"
↓
Closes at day 33-35
↓
Fails to close
↓
Coloboma
↓
Typically present inferonasally

Pinch to zoom

Anatomy & Development, Visual Acuity

Topic Notes: 8



Optical part of Retina

Outer pigmented layer
↓
RPE + Pigment epith of iris and CB

Inner layer of optic cup
↓
Neurosensory retina
+
2°, 3° vitreous
+
Smooth muscle of iris
- Sphincter pupillae
- Dilator pupillae

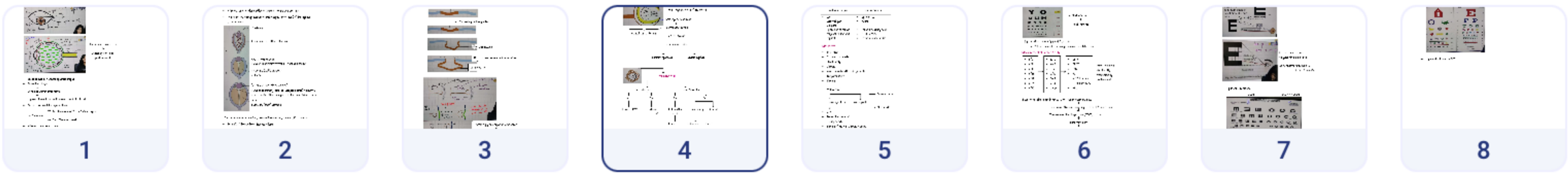


Mesenchyme

- Outer/Fibrous
  - Ant → Cornea (1/6th)
  - Post → Sclera (post 5/6th)
- Inner/Vascular (Uveal Tract)
  - Ant → Iridopupillary memb → Iris stroma
  - Post
    - Ciliary body → Ciliary stroma, Muscle
    - Chroroid

Inner vascular layer
↓
Forms vessels which passes through choroidal fissure inside optic cup
↓
Hyaloid sys of vessels
↓
Fissure obliterates

Pinch to zoom



Anatomy & Development, Visual Acuity

Topic Notes: 8

Q.

Development of eye = PAX6 gene ***

Ectoderm

Surface ectoderm	Neuroectoderm
• Lens • Lacrimal gland • Lid gland	• Optic nerve • Retina
• Epithelium of cornea, conjunctiva, lacrimal apparatus	• Epi of iris, ciliary body • 2°, 3° vitreous • Smooth muscle of iris

Mesoderm

- 1° vitreous
- Extra ocular muscles
- Blood supply
- Choroid
- Vascular endothelium of eye, orbit
- Temporal sclera
- Stroma

Neural crest

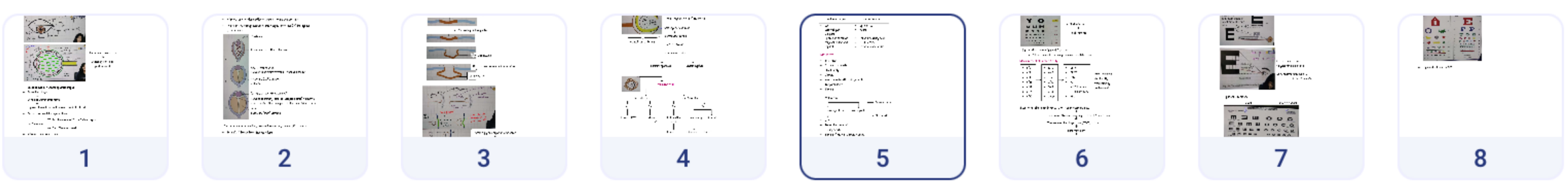
- Mesenchymal part → Orbit
- Neural part → Schwann cells
- Neural part → Melanocytes

- Trabecular meshwork
- Ciliary muscle
- Stroma of iris, CB, Choroid, Cornea
- Corneal endothelium
- Sclera (except temporal part)

VISUAL ACUITY 43:52

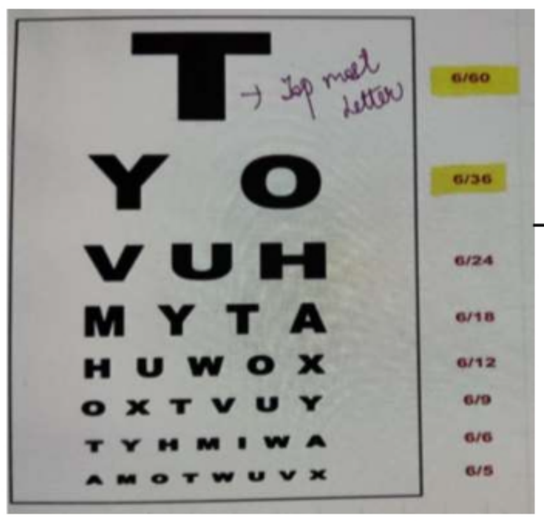
- By snellen's chart
- At distance of 6m

Pinch to zoom



Anatomy & Development, Visual Acuity

Topic Notes: 8



→ Snellen's chart
↓
Read from top

Eg : 6 → Distance of patient from chart
60 → Dist from which normal person can read this letter

Measurement of Snellen Acuity :

- 6/6
- 6/9
- 6/12
- 6/18
- 6/24
- 6/36
- 6/60

→

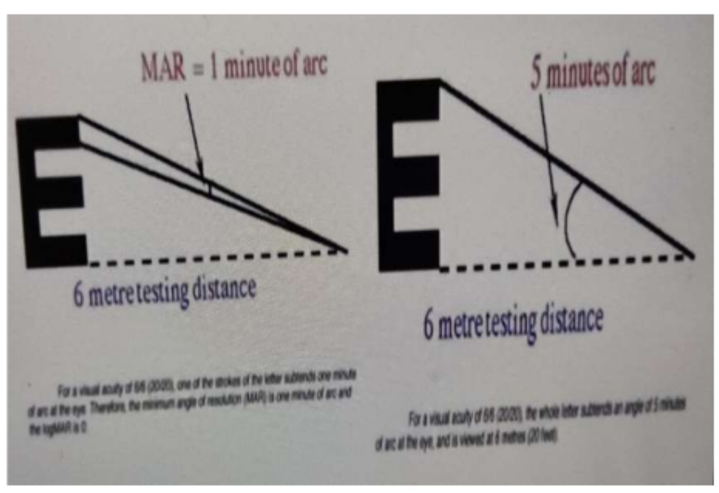
- 5/60
- 4/60
- 3/60
- 2/60
- 1/60
- CF 3F
- CF 2F

→

- CF 1F
- CF CF
- HM+
- PL+
  = PR Accurate
  = PR Inaccurate
- NPL

1/60 = Minimum visual acuity measurable by snellen chart

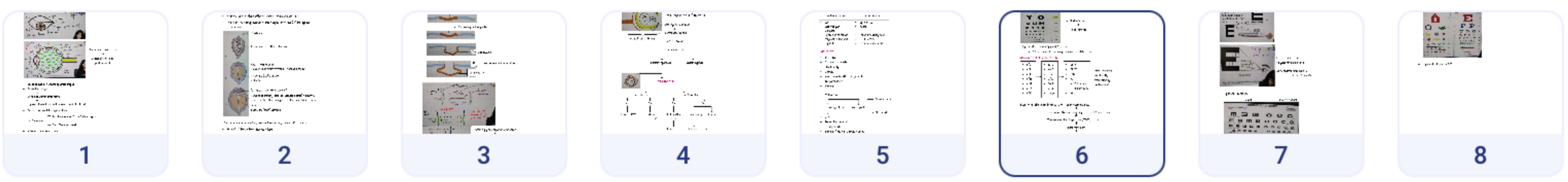
If person not able to read even 6/60 → Then decrease distance
↓
Then see whether counting finger (CF) is 1,2 (or) 3 finger
↓
Then see counting finger close (CF CF) to face
↓
Hand movement
↓
Perception of light → Projection of rays

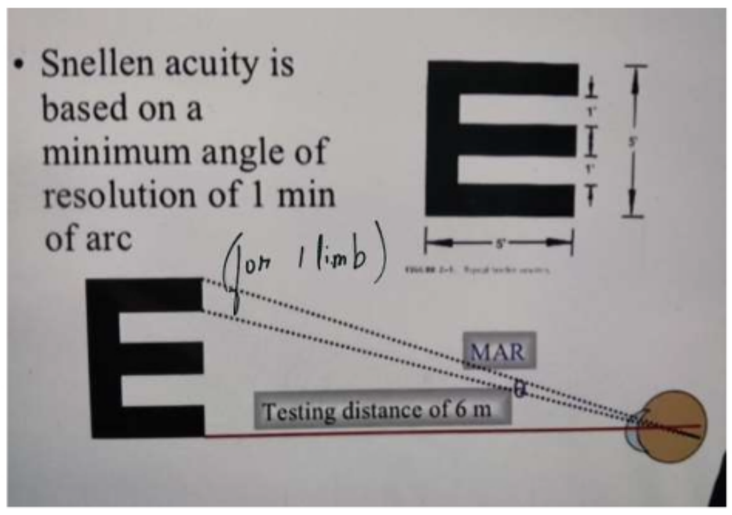


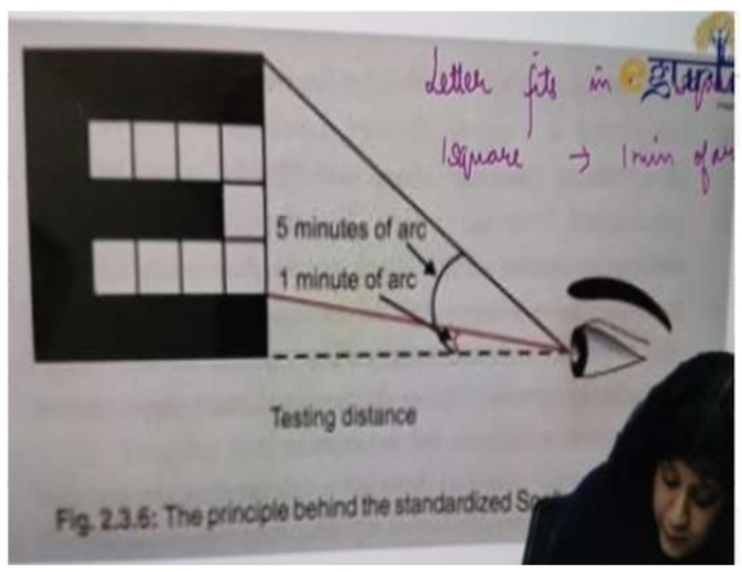
MAR = Minimum angel of resolution
↓

- Each letter makes angle of 5min of arc at resp. distance
- Angle substended by topmost letter

Pinch to zoom







Letter fits in a square

1 square → 1 min of arc

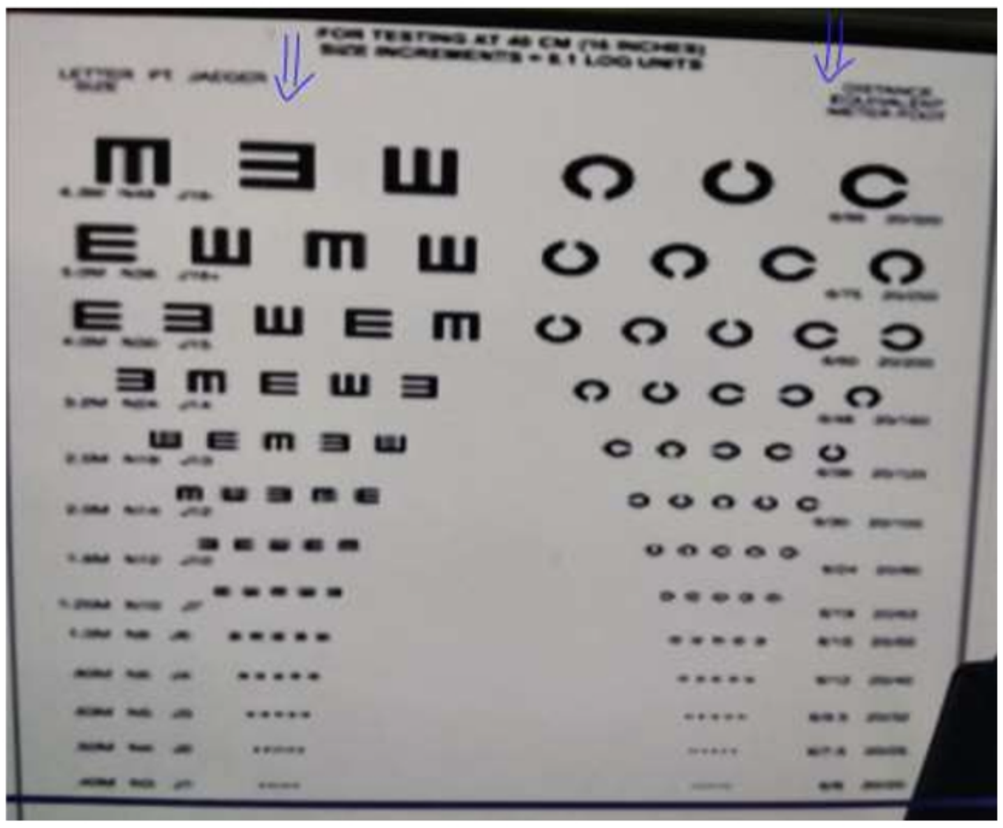
So, total letter will make →

1 x 5 = 5 min of arc

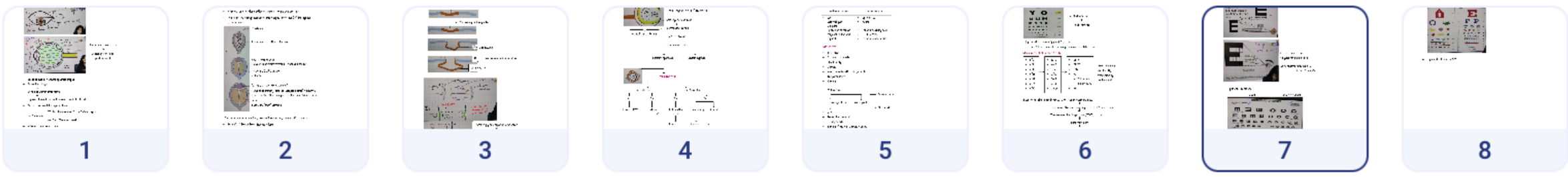
- If patient is illiterate

E-chart

Landolt's c-chart



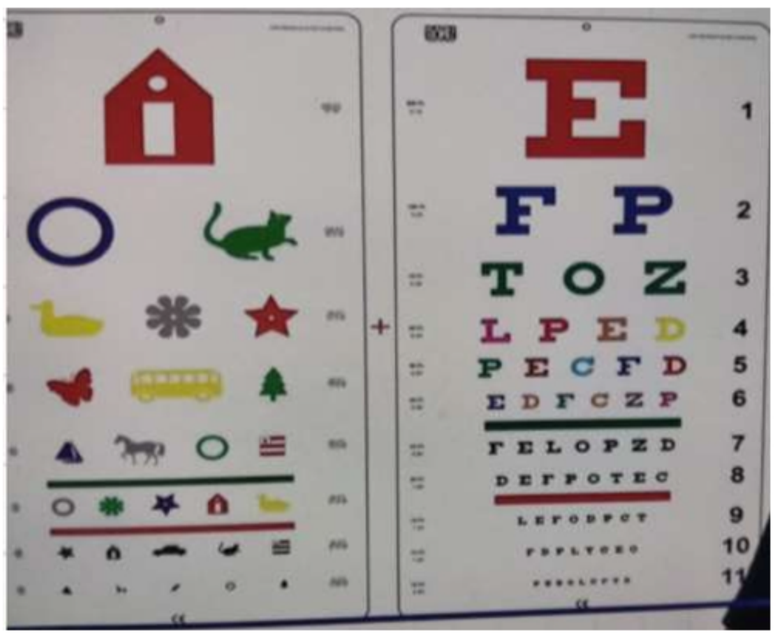
Pinch to zoom



Anatomy & Development, Visual Acuity

Topic Notes: 8

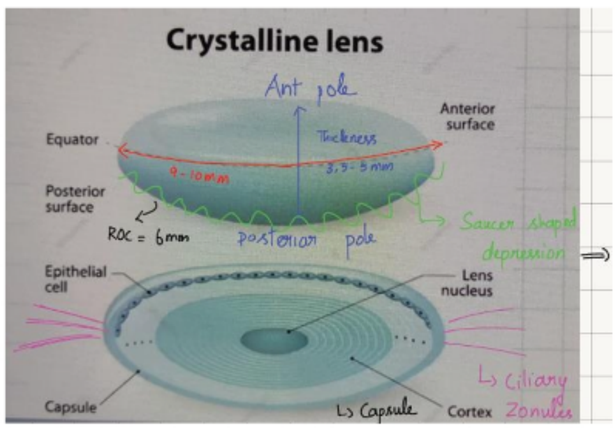
- If patient is children, (2-5yrs) → Simple picture chart



- If patient is infant → ERG

Pinch to zoom

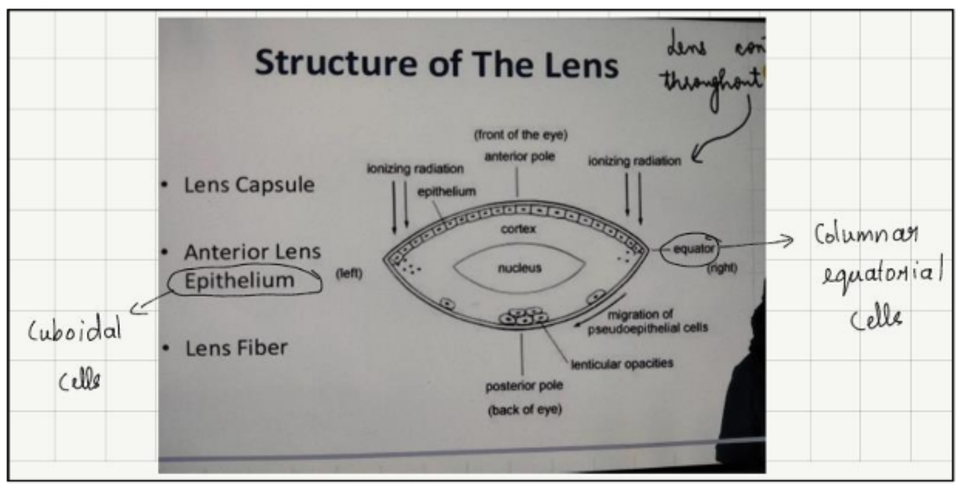
Lens - Part 1



Lens lies here which is called as patellar fossa

- Avascular = Nutrition from aqueous humor
- Biconvex
- Crystalline nature
- ROC $\propto \frac{1}{\text{Curvature}}$

- Lens lies at its position by ciliary zonules
- Lens continue to divide throughout year. Most sensitive to radiation

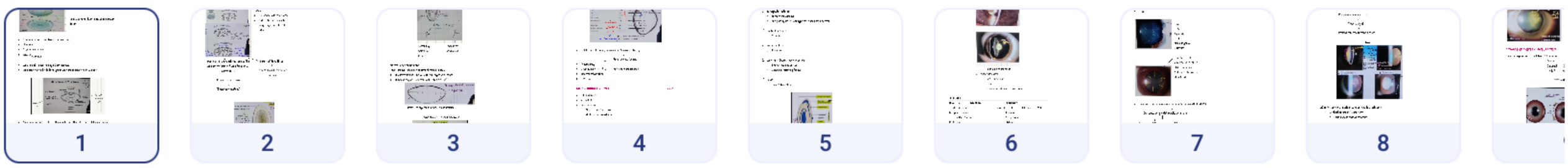


- Columnar epithelial cells at the equator are the cells which divide continuously
- Single layer of cuboidal cells at anterior epithelium

↓

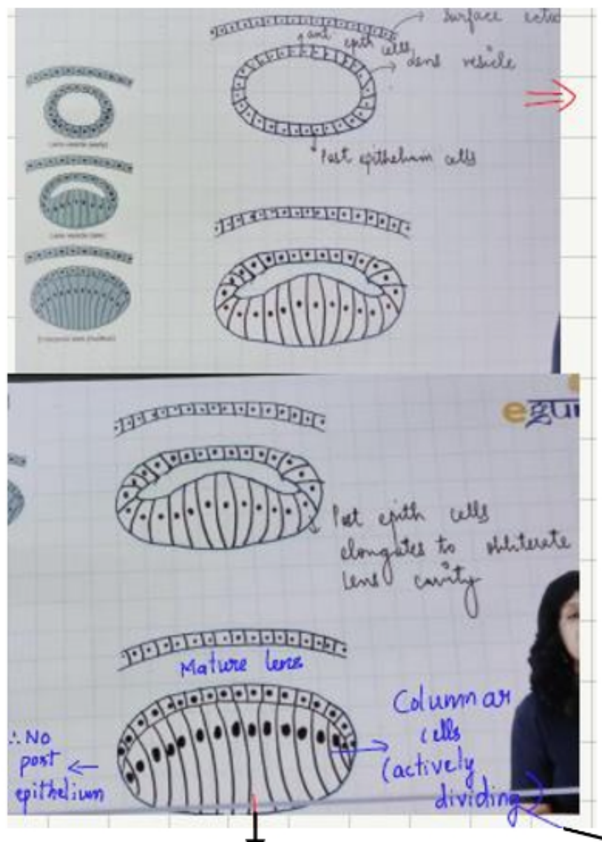
Occurs due to development of lens

Pinch to zoom



Lens (Part- 1)

Topic Notes: 14



Only post epithelial cells grows

↓

Hence

- Columnar cells at equator
- Ant epithelium has only single layer of cuboidal cells

Post epithelium which obliterates the lens cavity forms 1° lens fibres by 3rd month of IUL

↓

Oldest fibres of lens

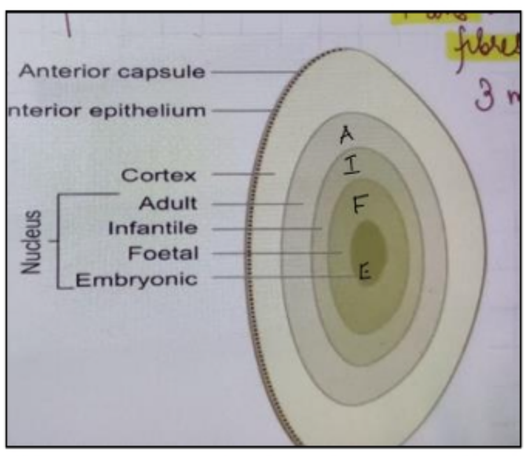
↓

"Embryonic nucleus"

Forms 2° lens fibres

↓

Present around embryonic nucleus



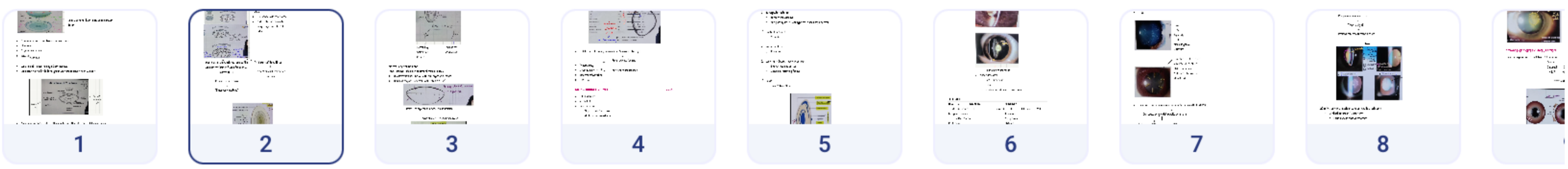
Embryonic = 0-3 months

Fetal = 3 month - Birth

Infantile = Birth - Puberty

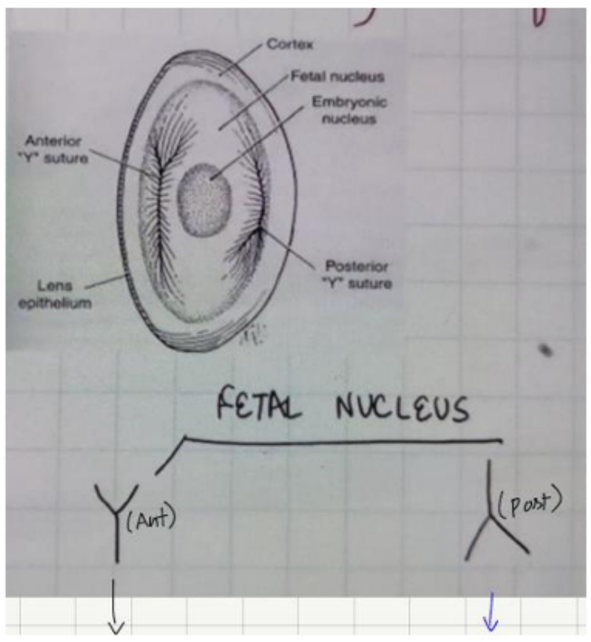
Adult = After Puberty

Pinch to zoom



Lens (Part- 1)

Topic Notes: 14



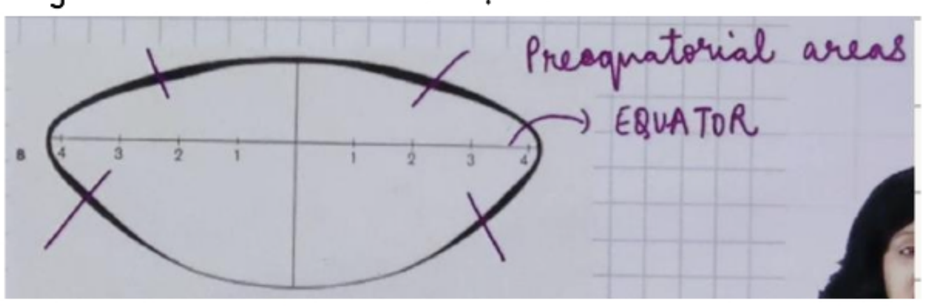
Formed by Apical cell Process

Formed by basal cells

Normal Crystalline Lens

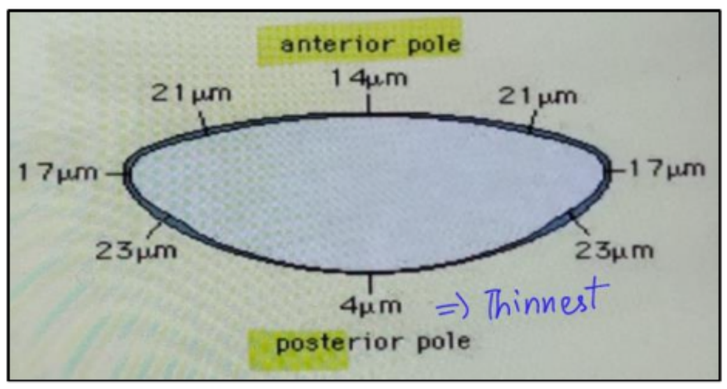
Lens Capsule - Thickest Basement memb in body

- Thickest regions: Ant. & Post. Pre-equatorial zones
- Thinnest regions: Central Post. Pole (2-4μ m)

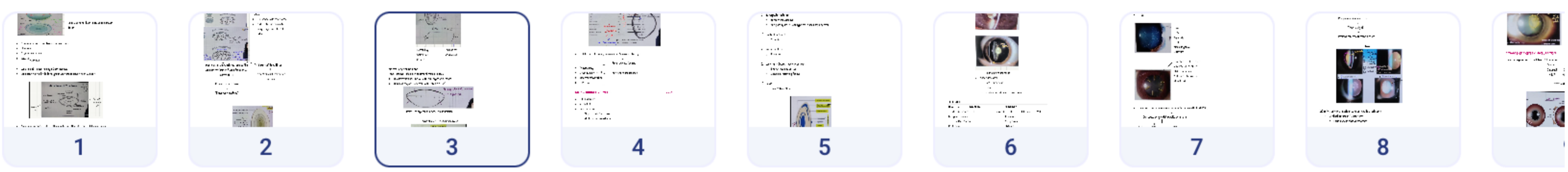


Post. Pre equitorial > Ant. Pre equitorial

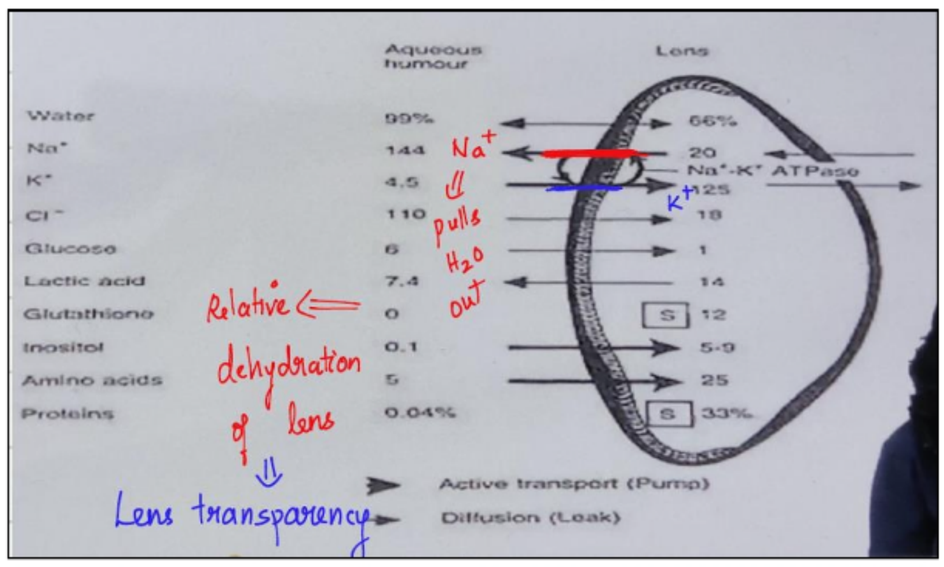
THICKNESS OF THE LENS CAPSULE



Pinch to zoom



Biochemistry and Physiology of Lens



- Metabolism → Mainly anaerobic = Anaerobic glycolysis

↓

Free radicals formed

- Avascularity
- Crystalline = α, β, γ
- Relative dehydration
- MIP – 26

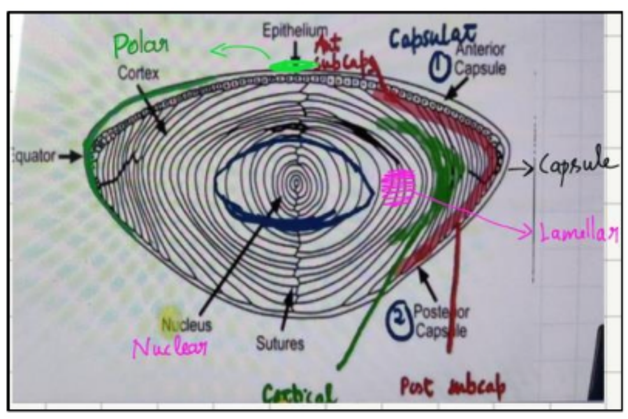
} For lens transparency

ANTI – OXIDATIVE MECH 22:48

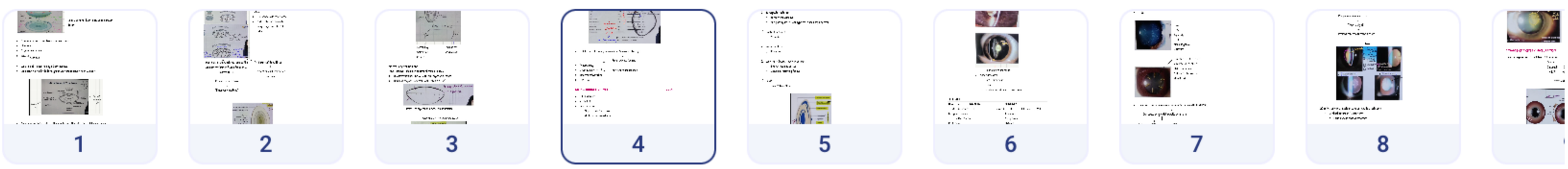
- β Carotenoids
- Vit B, C, E
- Enz: Catalase
  Super oxide dismutase
  Glutathione peroxidase

CATARACT 24:12

- Lens opacification
- Due to overhydration of cortex [Most metabolically active part]
- Morphological classification



Pinch to zoom



1) Capsular cataract
   - At the capsule

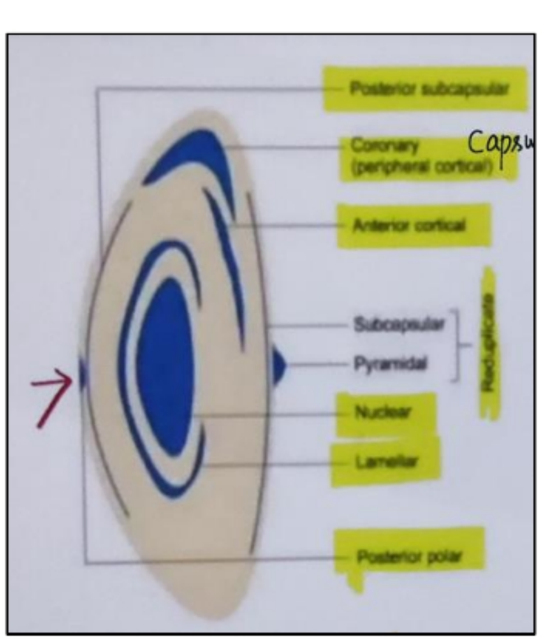
2) Subcapsular cataract
   - Beneath the capsule
   - Ant, post types = Post type most handicapping type

3) Cortical cataract
   - At cortex

4) Nuclear cataract
   - At nucleus

5) Lamellar / Supra - nuclear cataract
   - Btw nucleus and cortex
   - Occurs in radiating forms

6) Polar
   - Only at the poles



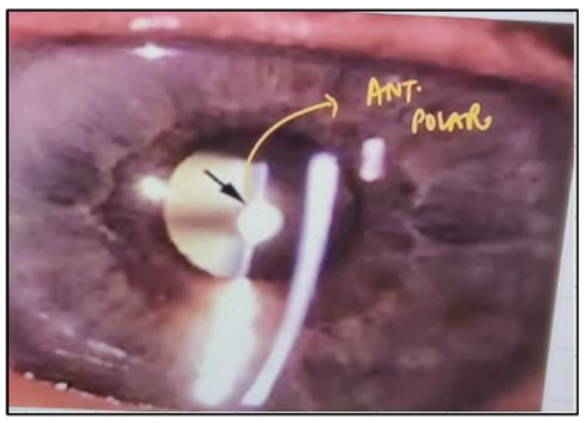
Sometimes ant capsular cataract → cataract in ant cortex (identical) & separating from each other.

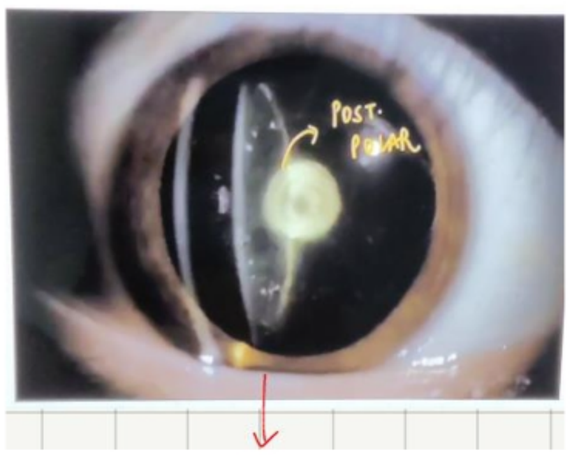
↓

Reduplicate cataract

Lens (Part- 1)

Topic Notes: 14





Onion ring appearance

- Associated with
  - Post, Lenticonus
  - PHPV
  - Persistence of hyaloid remnants

CATARACT

Hereditary **CONGENITAL**	**ACQUIRED**
TORCH infections ↓	**CAUSES** ↓ M/C Senile (M/C)
Drugs - Steroids	Traumatic
- Thalidomide	Complicated
Radiations	Metabolic
Malnutrition	Electric
Anoxia	Radiational
Birth trauma	Toxic
Cong anomalies	Dermatogenic
	Osseous
	Dystrophica myotonica

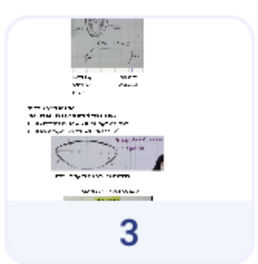
TYPES OF CONGENITAL CATARACT *38:15*

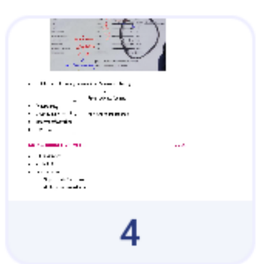
Genes associated with congenital cataract

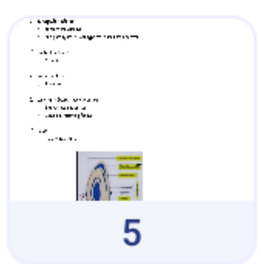
- CRY AA

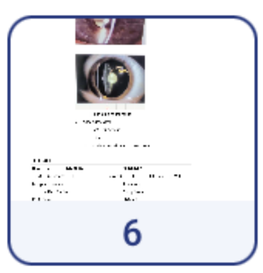
Pinch to zoom


2

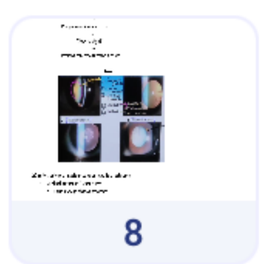

3

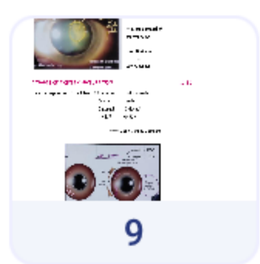

4


5


6

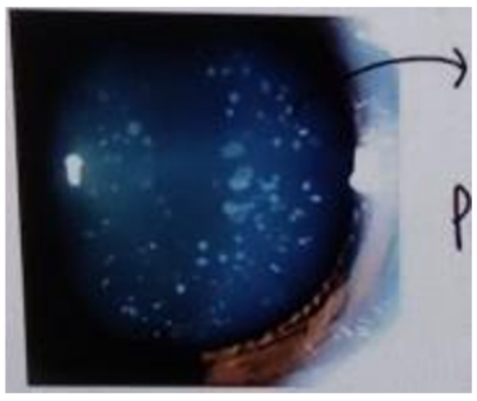

7


8


9


10

- AB
- CD
- GC
- GS



Blue dot
Or
Punctate
↓
M/c cong/dev.
Cataract



Lamellar cataract or
RIDER'S CATARACT[Q]
M/C cong / dev
Cataract is usually
significant.

- Lamellar cataract associated with maternal rubella (7-8 POG)

↓

Can cause congenital rubella syndrome

Eye — Ear — Heart

↓

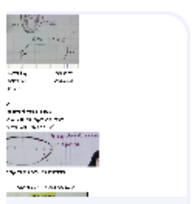
- Nuclear - Pearly cataract
- Salt - pepper retinitis

SENILE CATARACT

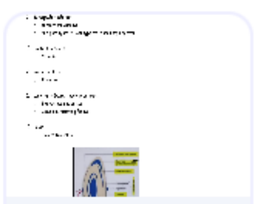
39:06

- MC acquired
- >60 yrs
- M = F
- Heriditary
- UV rays, Smoking

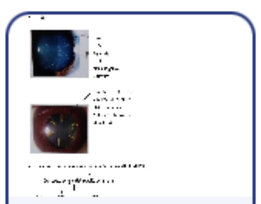
Pinch to zoom

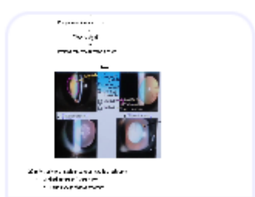

3


4


5

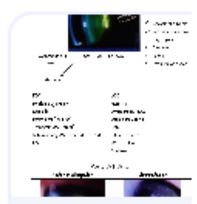

6


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- Dehydration Crisis = Nuclear cataract / sclerosis

↓

Deposition of urochrome pigment

↓

Progressive index myopia

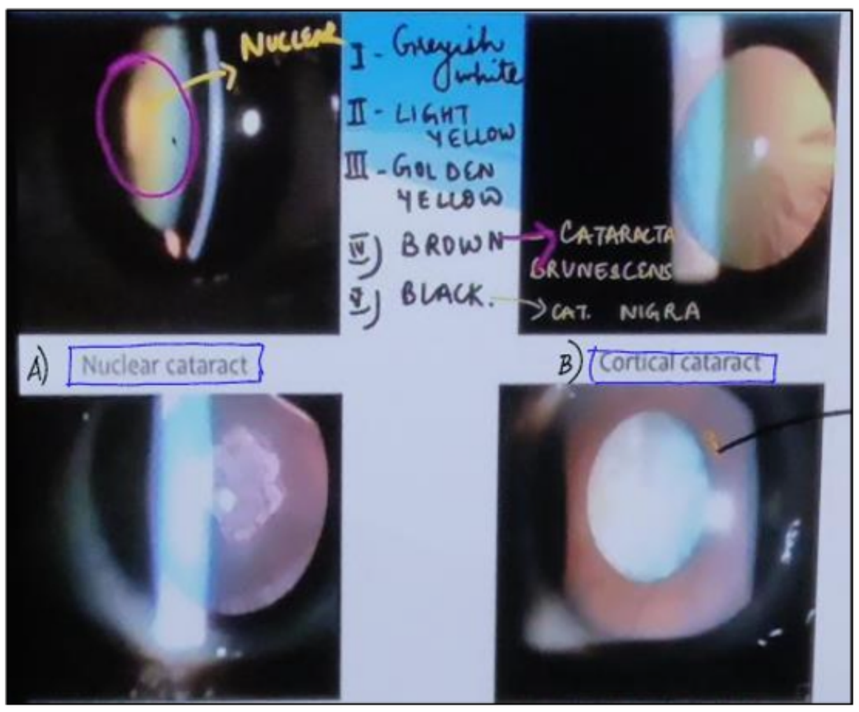
↓

"Second sight"

↓

Patient can read without glasses

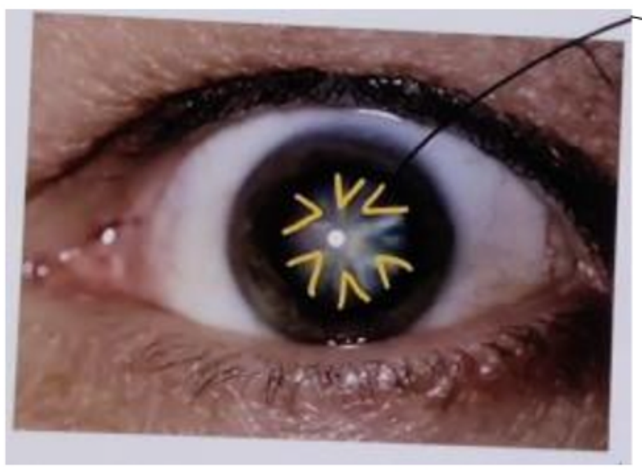
GRABES



Q) Yellow colour of nuclear cataract due to urochrome

- Cortical cataract / Cuneiform
  - Forms wedge shaped cataract

1) CUNEIFORM



Wedge

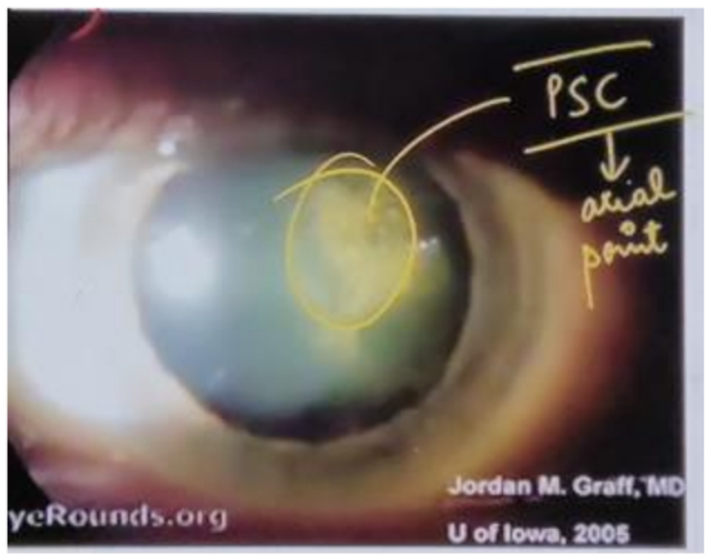
↓

Peripheral

↓

Clumpsy vision in dim light

2) CUPULIFORM / PSC

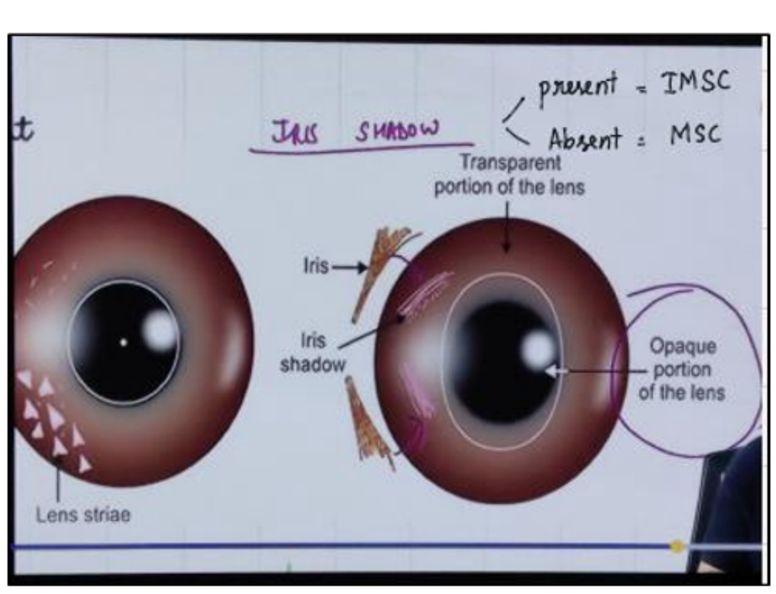


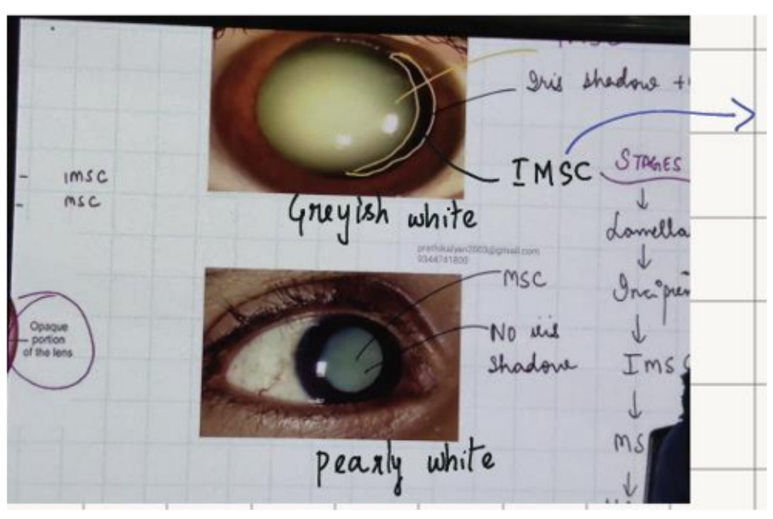
→ Since cataract at central point
↓
Max blindness
↓
Day blindness

STAGES OF CORTEX MATURATION

45:16

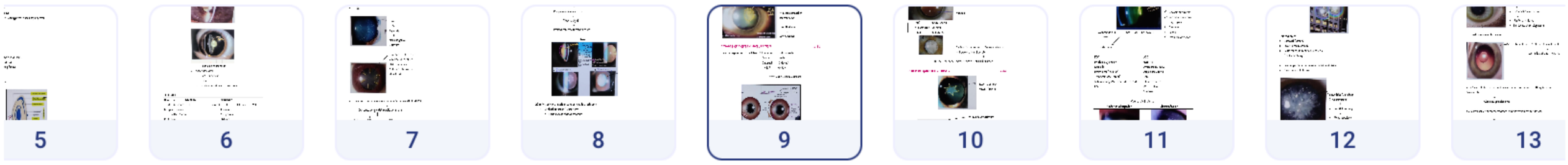
Lamellar separation → Incipient → Immature Senile Cataract (IMSC) → Mature senile Cataract (MSC)
↓
Hyper mature senile cataract





Swollen lens → PHACOMORPHIC GLAUCOMA

Pinch to zoom

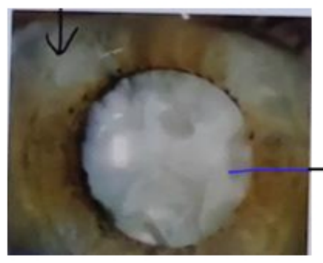




Chalky white cortex proteins →
PHACOLYTIC GLAUCOMA

Nucleus

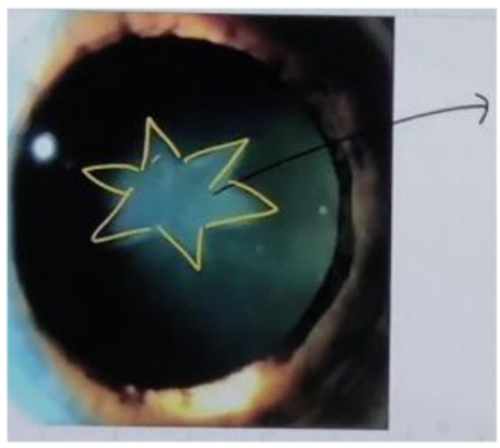
→ (i) MORGAGNIAN
HYPERMATURE CATARACT
→ (ii) SCLEROTIC



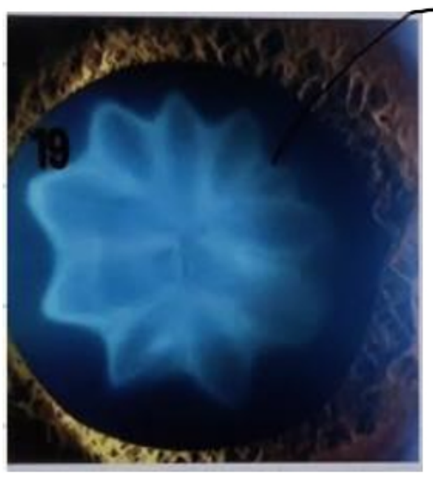
→ Cortex disintegration → Capsule wrinkling
→ Degeneration of zonules
↓
PHACOTOPIC GLAUCOMA ← Ant ← Lens subluxation

OTHER ACQUIRED CATARACT

51:44



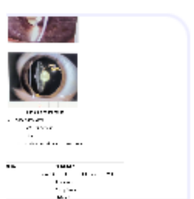
Rosette cataract
(Blunt Trauma)

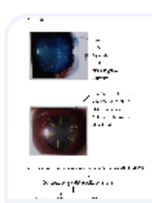


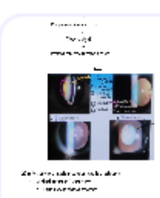
Sunflower cataract
(Penetrating trauma)

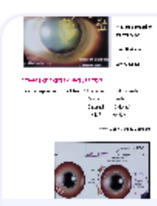
Q3) sunflower
a) Galactosalmia
b) Chalcosis

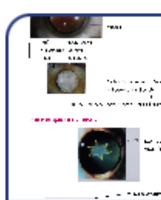
Pinch to zoom

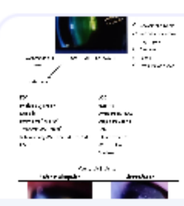

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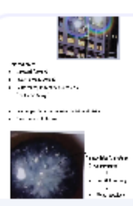

7

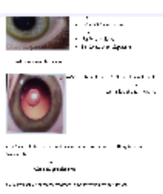

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14

Q) Sunflower cataract seen in chalcosis = due to Cu deposition



Complicated cataract

M/C -

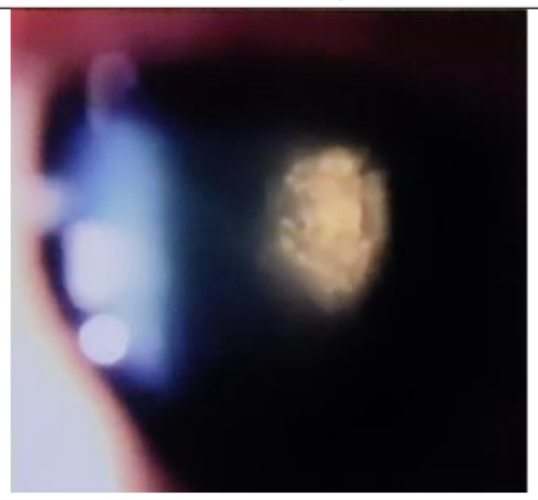
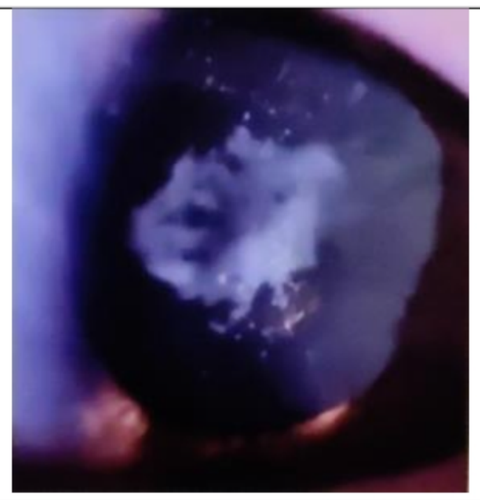
↓

1) Chronic ant uveitis
2) Retinitis pigmentosa
3) High myopia
4) Glaucoma
5) Long RD
6) Intra ocular tumor

Polychromatic Lustre ← COMPLICATED CATARACT → Bread crumb

PSC	ASC
Myotonic Dystrophy	Electric
Steroids	Amiodarone, ACES
Radiational (Ionizing)	Atopic dermatitis
Traumatic (M/C blunt)	Gold
Inflammatory (M/C Chr ant. Uveitis)	Chlorpromazine
MSC)	ACG → glauc
	Sunflower

Complicated cataract

Posterior subcapsular	Glaukomflecken
	
• Chronic anterior uveitis • High myopia • Hereditary fundus dystrophies	• Follows acute angle – closure • Glaucoma • Central, anterior subcapsular

Lens (Part- 1)

Topic Notes: 14



Colored halos

- Cataract (Water)
- ACG (Corneal edema)
- Acute mucopurulent conjunctivitis
  (Sticky discharge)

- Gradual painless progressive dimision of vision
- Freq change of glasses

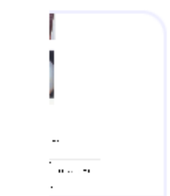
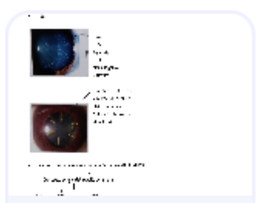
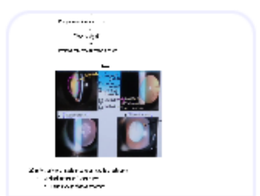


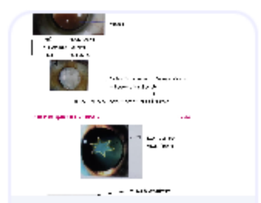
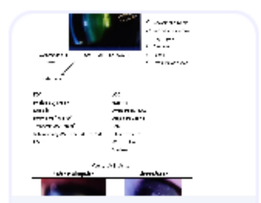
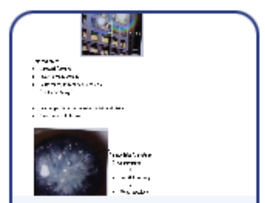
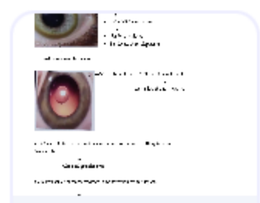
Snow flake (Diabetes)
(True Metabolic)
↓

- Sorbitol pathway
  ↓
- Aldol reductase
  ↓
- Fluctuation of refrae
  Errors
  ↓

Due to changes in glycemic index

Pinch to zoom

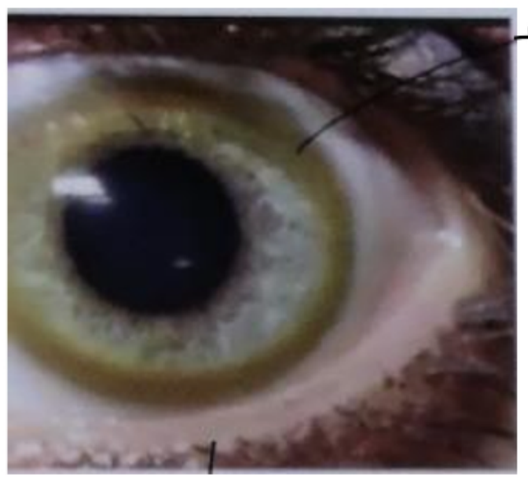





7 8 9 10 11 12 13 14

Lens (Part- 1)

Topic Notes: 14



→ K Fring (Wilson's disease)

↓

- Cu deposition (Impious oxide)

↓

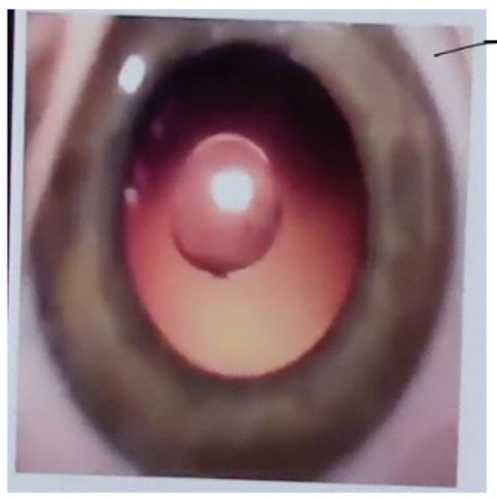
- Descement's of cornea

↓

- Sunflower cataract
- Low levels of ceruloplasmin

↓

Most common ocular finding



→ Oil droplet cataract → Classical galactosemia

↓

Due to def. of Gal-1-PO_4 - UT

Q. 15 day child with whitish pupillary reflex and recurrent vomiting, hepatos plenomegaly

↓

Classical galactosemia

Q. 6 month baby $\overline{c}$ bilateral cataract, urine test required to suspect.

↓

Galactosemia

Q. Only reversible cataract

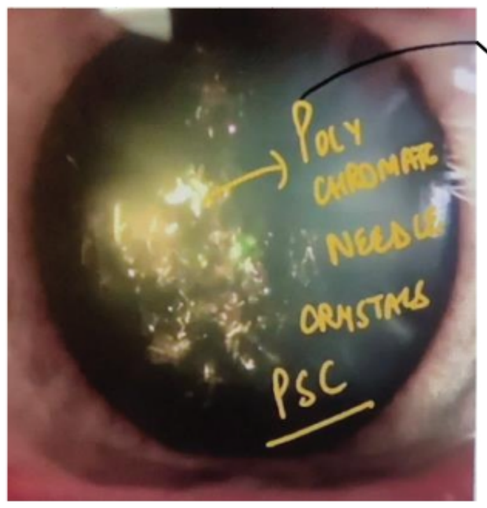
↓

Galactosemia

Pinch to zoom

Lens (Part- 1)

Topic Notes: 14



Christmas tree cataract

↓

Dystrophica myotonic

Next MCQ

A male presents with cardiac arrhythmias in medicine OPD. O/E frontal baldness & Hatchet face , ptosis is present. What type of cataract is expected in this patient ?

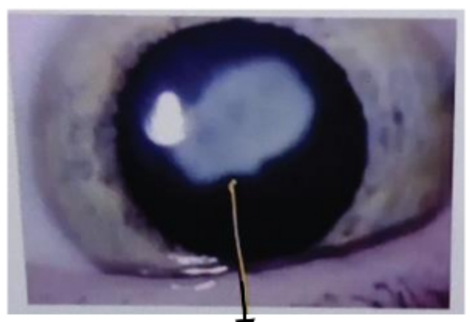
Myotonic dyst.

A) Christmas Tree ✓

B) Shield

C) Rainbow

D) Snowflake



Shield cataract Q

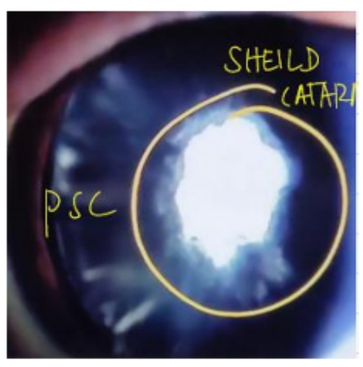
(atopic dermatitis)



Cataract develops in 10% of cases between 15-30 years

Bilateral in 70%

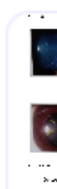
Frequently becomes mature

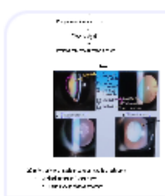


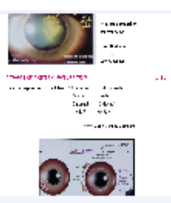
Anterior subcapsular plaque (shield cataract)

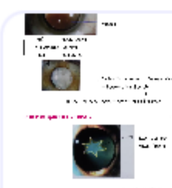
Wrinkles in anterior capsule

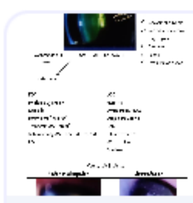
Pinch to zoom

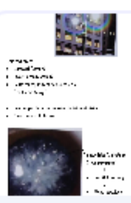

7

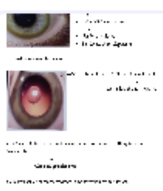

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12

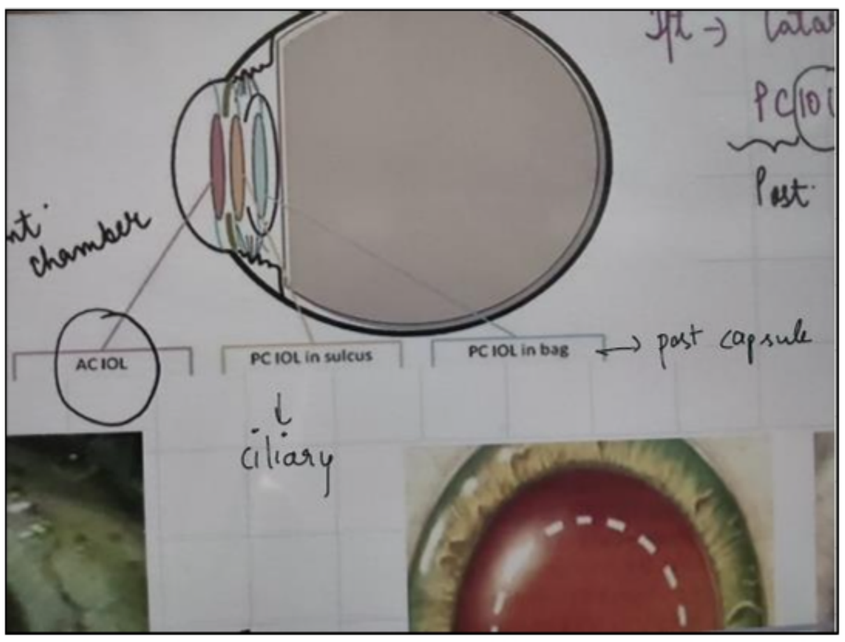

13


14

Lens - Part 2

Treatment

Cataract extraction with PCIOL implantation



= Post chamber ideal site

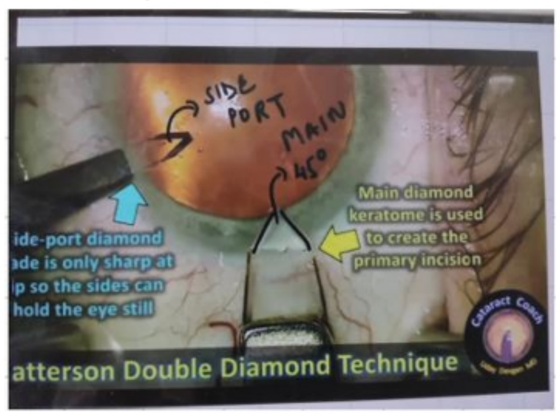
Techniques

- Incision
  - ICCE = obslete = 10-12 mm
  - ECCE = 7-8 mm
  - SICS = 5.5 - 7mm
  - Phacoemulsifiction = 3-3.5 mm ⟶
  - Micro incision = < 2 mm
  - Phaco NIT = < 1 mm

  → Rigid one piece IOL ↓ PMMA

  → Foldable (Acrylic) IOL ↓ Rollable = Hydrogel

Phacoemulsification – Techniques

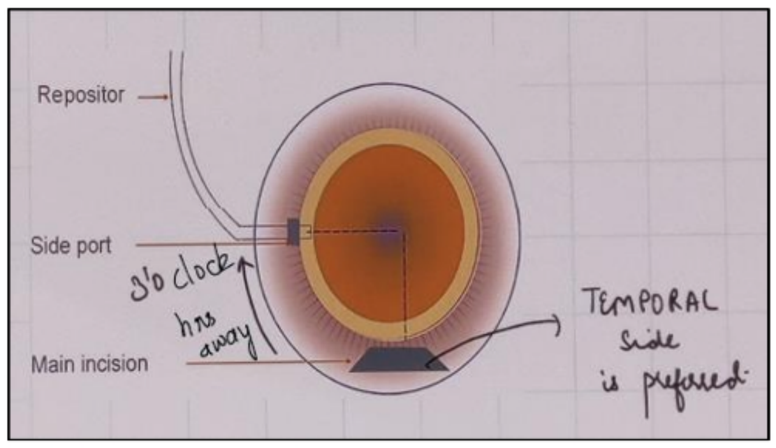


Step 1

Incision
- Main = Crescent
- Side port = 15° Blade

Lens (Part- 2)

Topic Notes: 9



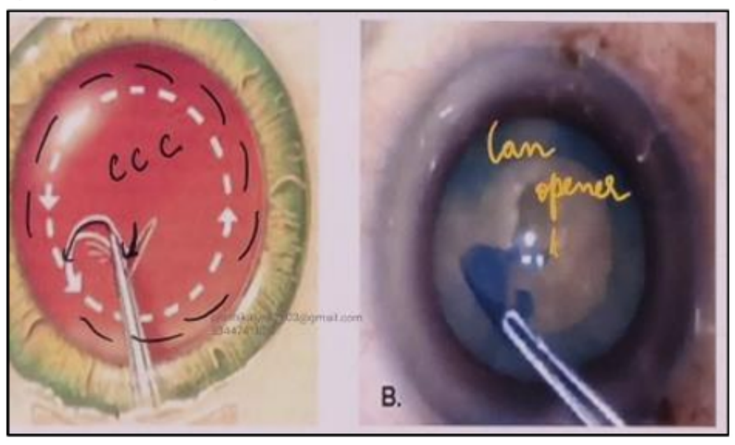
Step 2

Ant Capsulotomy

↓

Trypan blue dye

CCC Can opener technique ↴



Step 3

↓

Hydro dissection = Best is Basal soln with glutathione

Step 4

↓

Hydrodelineation = Epinucleus and Endonucleus separated

Step 5

↓

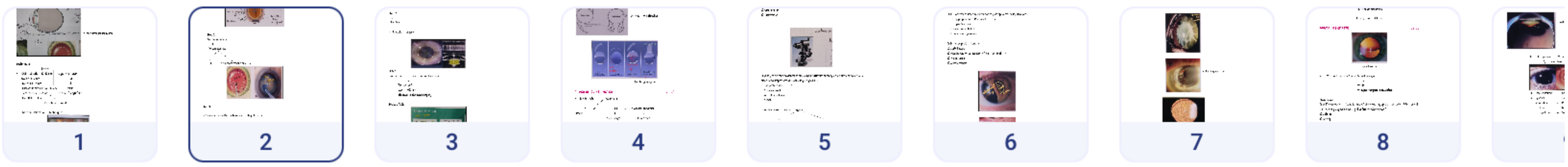
Phaco emulsification = by Titanium needle

Rate = 40,000 - 60,000 times/s by

↓ Piezo electric crystal

Electrical energy → Mech energy (ultra sonic waves)

Pinch to zoom



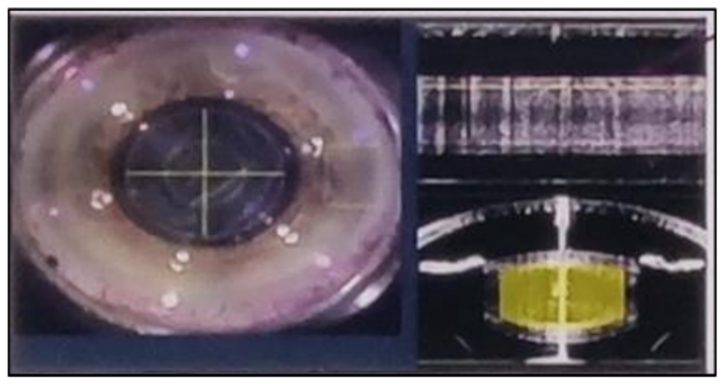
Lens (Part- 2)

Topic Notes: 9

Step 6
↓
Aspiration of cortical matter

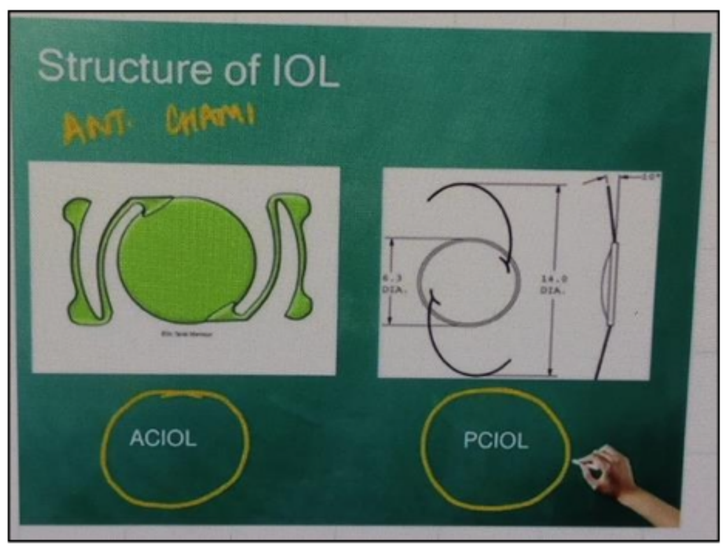
Step 7
↓
IOL entry

→ Sutureless surgery

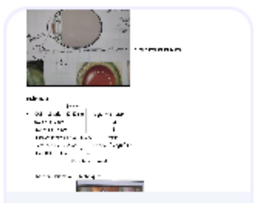


FLACS
Fentosecond Laser assisted cataract surgery
↓
Fentosecond
Laser : 1053 nm
Bladeless, Sutureless surgery

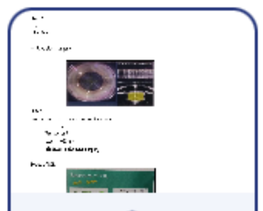
Types of IOL

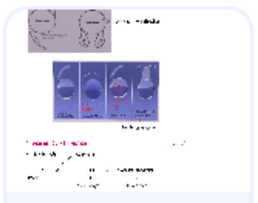


Pinch to zoom


1

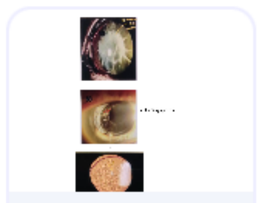

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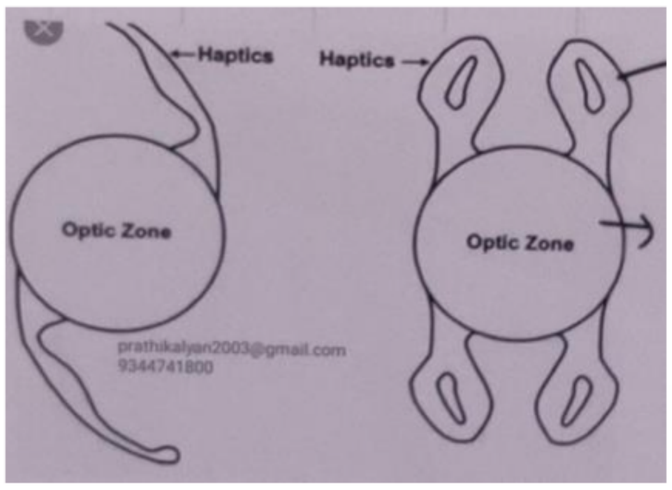

7


8

Lens (Part- 2)

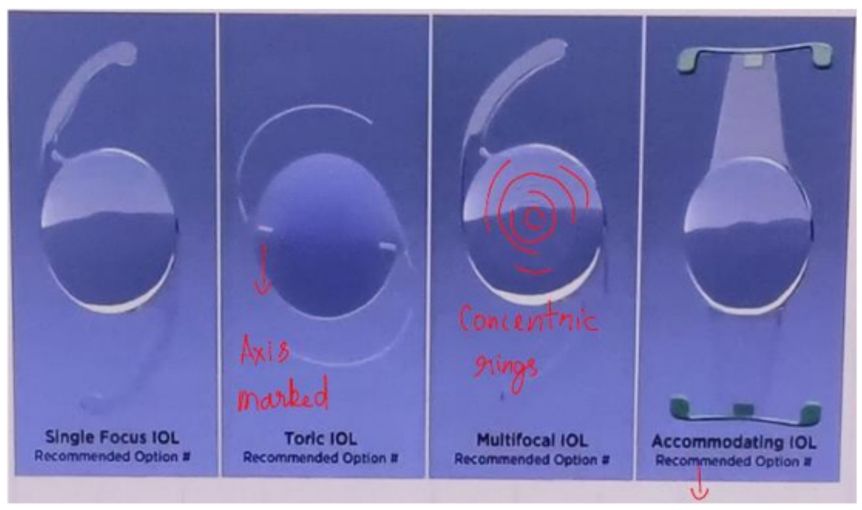
Topic Notes: 9

PARTS OF IOL



Hooks → Placement

Central → Refraction



For Accommodation

POWER OF IOL = BIOMETER

14:40

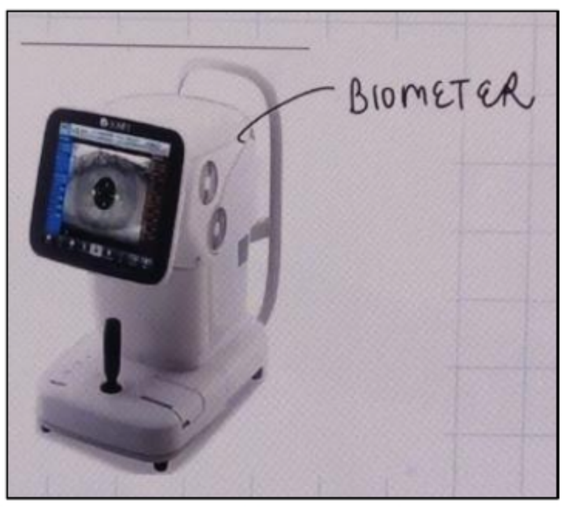
- SRK formula → IOL constant

P = A − 2.5 L − 0.9 K → Corneal curvature

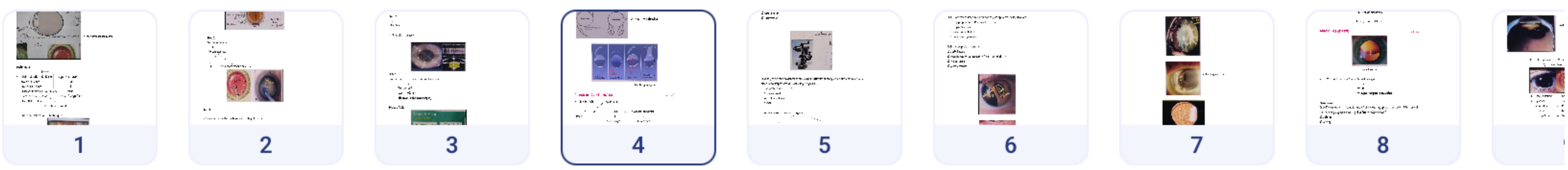
Power

↓ Axial length (A scan)

↓ By keratometer



Pinch to zoom



Lens (Part- 2)

Topic Notes: 9

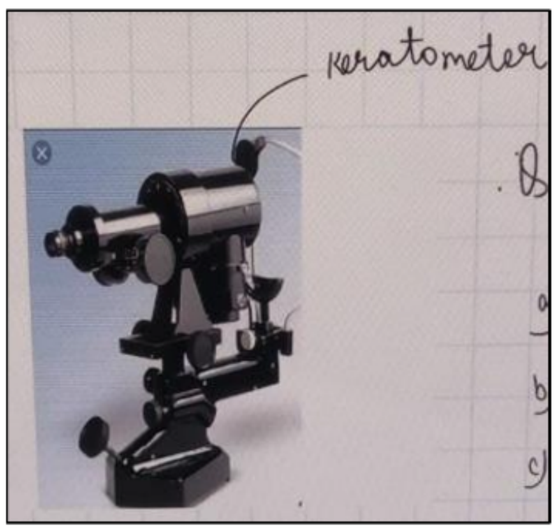
Q. For calculation of power of IOL all are required except

a) Biometer

b) SRK formula

c) Keratometer

d) Pachymeter ✓



Q. A 56 yrs old man presented after 3 days of cataract surgery with history of pain & DOV after initial improvement. Most likely diagnosis is:-

a) Endophthalmitis ✓

b) After cataract

c) Retinal detachment

d) CRVO

Complications of cataract surgery

Intra - OP

- Desc, memb detachment
- Iridodialysis / D shape pupil
- Post capsular rupture
  - Vitreous loss
  - IOL / Nucleus drop
  - No PCOL
  - Phacotoxic glaucoma

Post OP

Early (< 7 days) 48 - 72 hrs

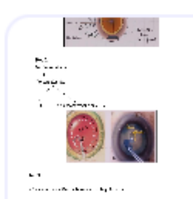
- M/C Hyphema
- Iris prolapse
- Striate keratitis
- Flat AC
- Early onset Endophthalmitis

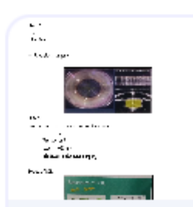
Late

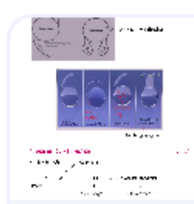
- M/c PCO/Aft or 2 cataract
- Irwine Gass Syn. (CME)
- Vitreous touch syn (Bullous Keratopathy)

Pinch to zoom


1

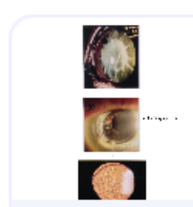

2


3

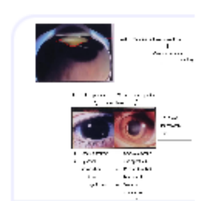

4


5


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8


9

- Expulsive choroidal hemorrhage

↓

- Most severe
- Staph epidermidis

Q. M, Important factor in prevention of post operative endophthalmitis

a) Pre op preparation ē Povidone I_2 ✓

b) Pre op antibiotics

c) Intra vitreal antibiotics

d) Trimming of eyelashes.

Q. D shaped pupil is found in

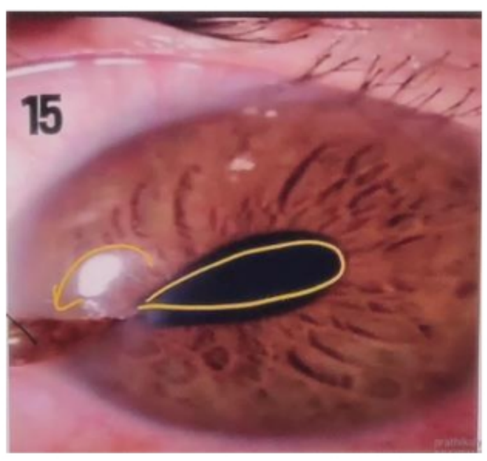
a) Cyclodialysis

b) Iridodialysis → Detachment of iris from root ✓

c) Iris prolapse

d) Ciliary trauma





↓

Iris prolapse

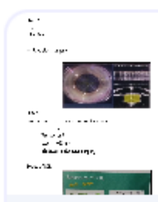
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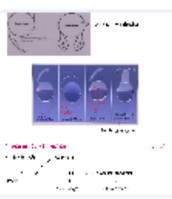
Due to ↑ IOP

↓

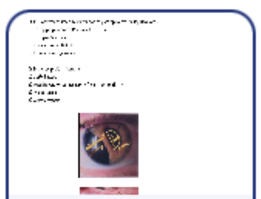
Pinch to zoom

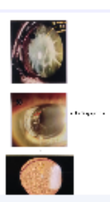

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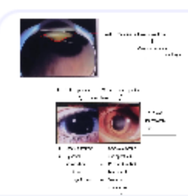

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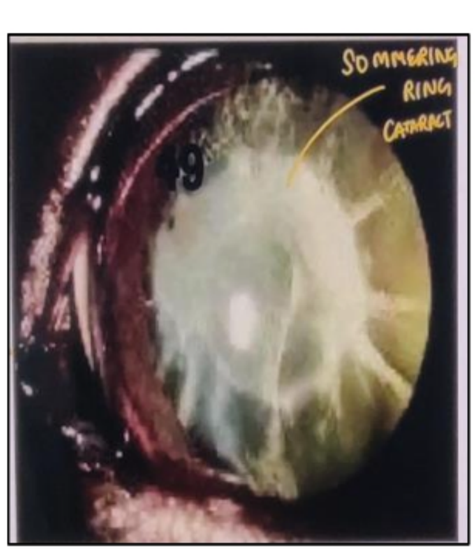

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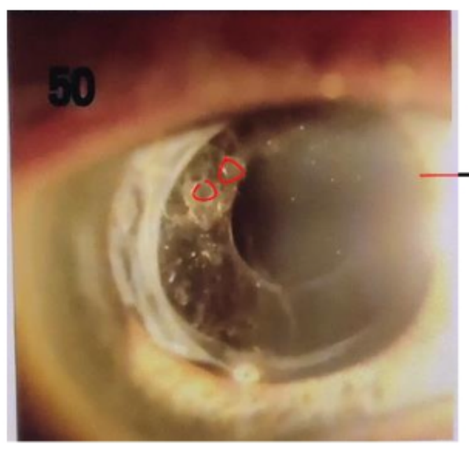

9

Pre op give

Acetazolamide 500 mg x 2 HS

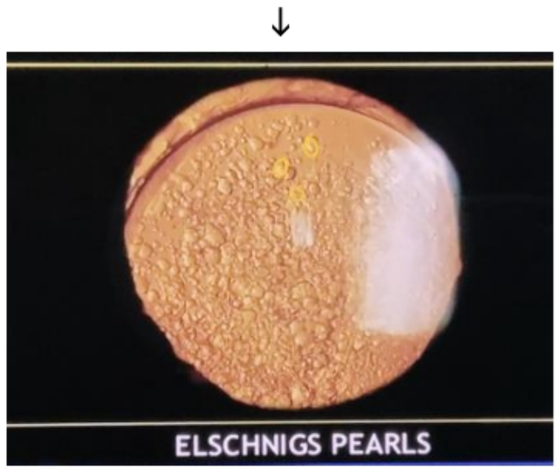
500mg x 2 (Morning)





→ Elschnig's pearls

↓



TREATMENT

27:03

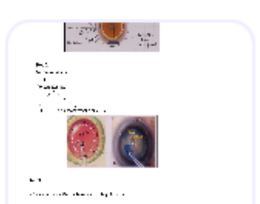
T/t of after cataract

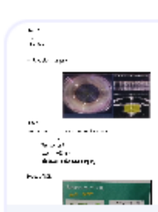
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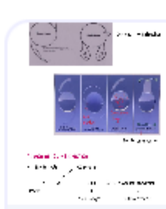


Pinch to zoom


2

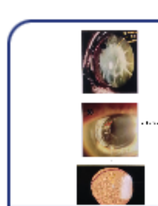

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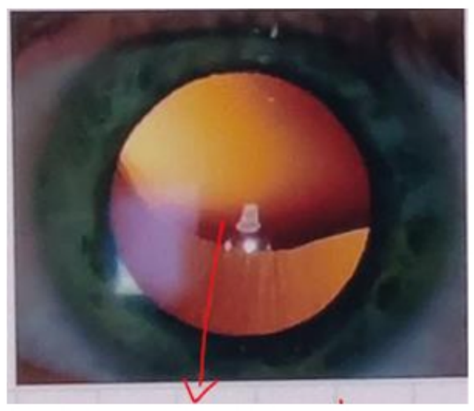

8


9

ND YAG laser
↓
1064 nm
MOA: photo disruption
↓
Mostly done in children

ANOMALIES OF LENS

28:40



Sup subluxation

- M/C Ectopia lentis = Ass. With Marfan's syn.
  ↓
  → AD
  → Superotemporal subluxation.

Next Pattern

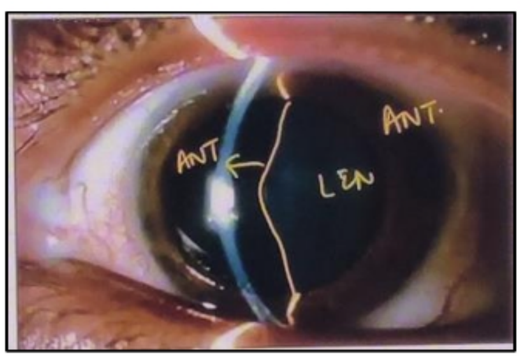
Q. A 35 year women is found to have AR she is wearing aphakic spectacles. Which one of the following diagnosis sheds light on her volvular disease?

a) Cataract
b) KF ring
c) Ectopia lentis ✓
d) Glaucoma

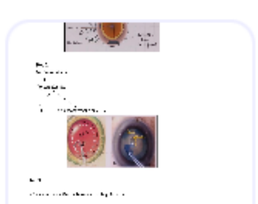
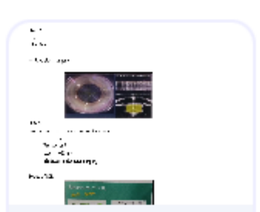
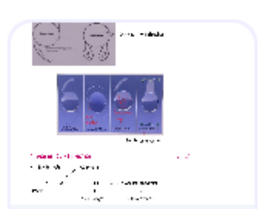
LENTICONUS

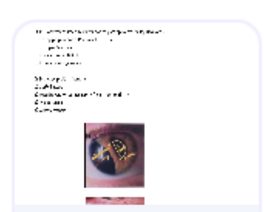
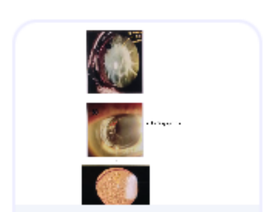
30:49

II) Lenticonus



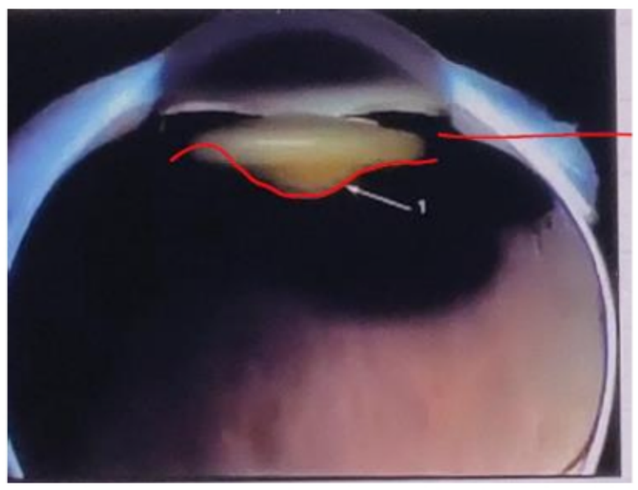
Pinch to zoom


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9

- Alport syn (Ant > Post lenticonus)
  ↓ ↓
  Khurana Parson's



Post lenticonus → Lowe's syndrome
↓
Oculo - cerebral renal syn

III → Microphakia IV Microspherophakia
Small lens

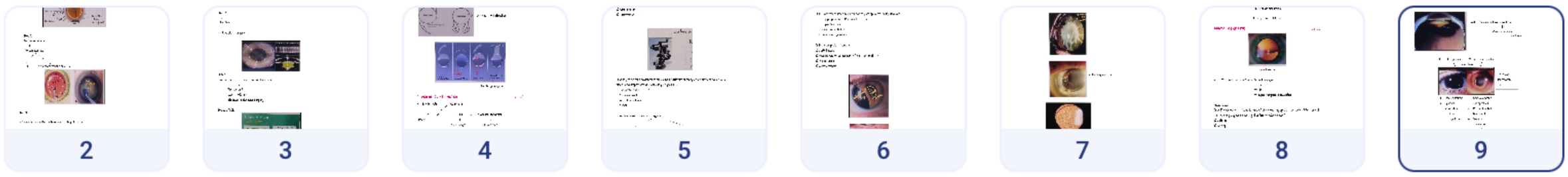


→ In weil Merchesani syn.

- Small diameter
- Systemic association
  - Lowe syndrome

- Small diameter and spherical
- May be familial (dominant)
- Systemic association
  - Weill - Marchesani syndrome

Pinch to zoom



Eyelids

Lid → Hidden

Blepharophimosis Syndrome

- Telecanthus + Epicanthus + Poorly developed nasal bridge + Ptosis + Horizontal shortening of palpaberal fissure

↓

Dis between UL and LL

↓

Normal = 10-12mm

Eg : If dis between UL and LL = 6mm

Then ptosis = 4-6mm

- Sx for epicanthus -
- Sx for ptosis - (levator function poor)



- Telecanthus

↓

↑ in intercanthal distance

↓

Epicanthus —> Vertical semiluminar folds over medial canthus

PTOSIS

03:03

- Dropping of upper lid

Mild → 2mm → Fasanelle / Servat / Opn

Moderate → 3mm → LPS Resection

Severe → 4mm → Levator function

Levator function → Good → LPS Resection

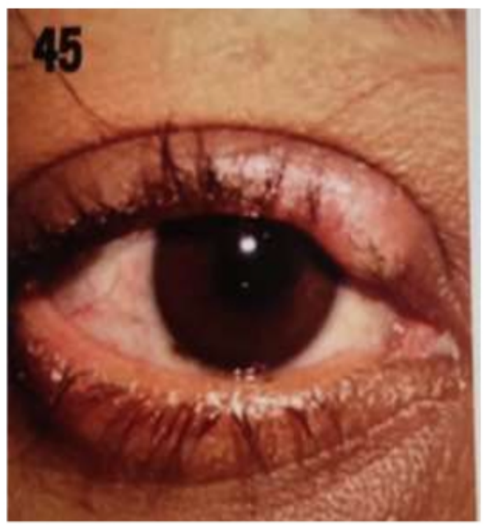
Levator function → Poor → Frontalis sling operation

Eyelids

Topic Notes: 4

EYELIDS INJECTION

05:08



- Stye (or) Ext hordeolum
- Acute
- Suppurative
- Painful swelling of gland
  - Zeis (rebaceous)
  - Moll (sweat)
- Pus pointing towards lid margin

Treat :

1) Warm = Compresses
2) Next = NSAIDS
3) Antibiotics

Internal Hordeolum



- Acute
- Pus in meibomian gland
- Painful
- Pus pointing away from Lid margin
- Treat : Same as stye

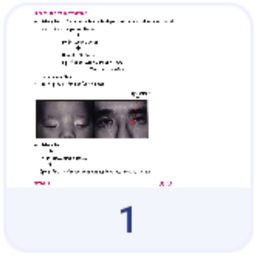
Chalazion

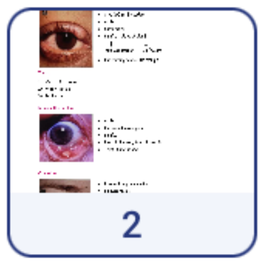


- Chronic Lipogranulomatous
- Painless nodule
- Meibomian gland
- Treat : Insertion and Drainage

- Recurrent chalazion = Prone to sebaceous cell Ca
  Treat intra - lesional = Steroids

Pinch to zoom









Eyelids

Topic Notes: 4

Basal Cell Carcinoma



- M/C Malignant Tumor

Frothy/Foamy Secretions

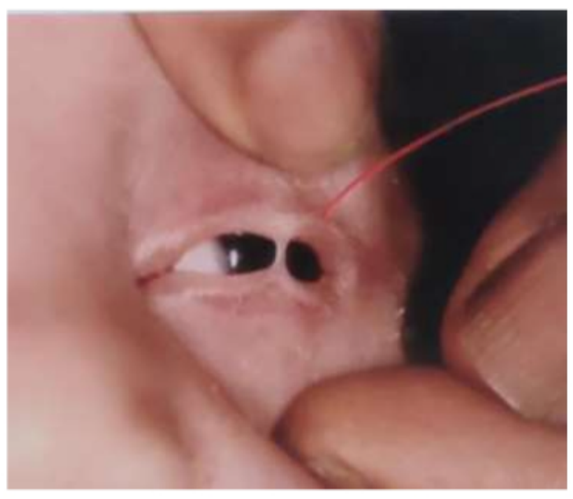


- Due to chronic meibomitis
- Expression of meibomian glands and noting the quality of the secretions is a key to diagnosis

Chalazion Clamp



Ankyloblepharon



- Adhesion between UL and LL known as Ankyloblepharon

Symblepharon



- Adhesion between palpebral and bulbar conjunctiva
  ↓
  Symble pharon

TRICHIASIS *13:17*

- Rubbing of eyelashes over cornea

Distichiasis

- 2 rows of eyelashes

Poliosis

- Greying of eyelashes

Madarosis

- Absence of eyelashes

Entropion

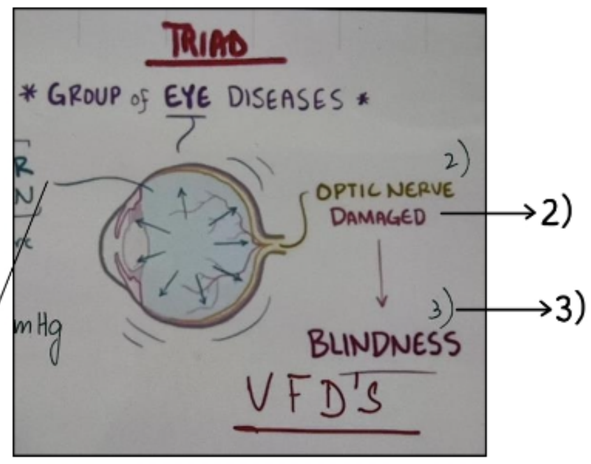
- Inward turning of lid margin

Ectropion

- Outward turning of lid

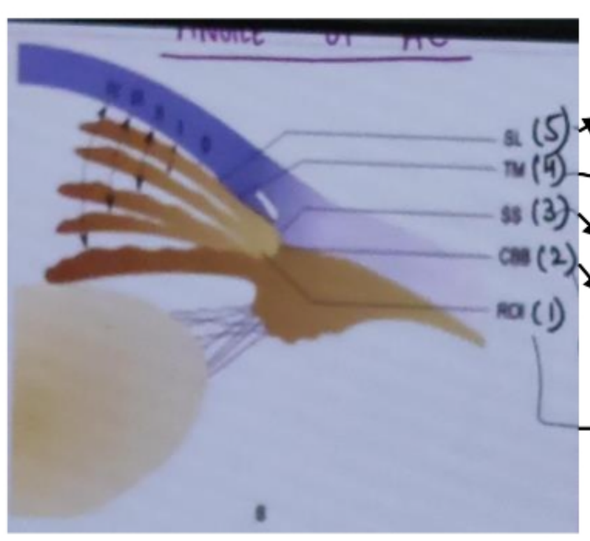
Glaucoma – Part 1

- Multifactorial optic neuropathy characterized by retinal ganglionic cell apoptosis.



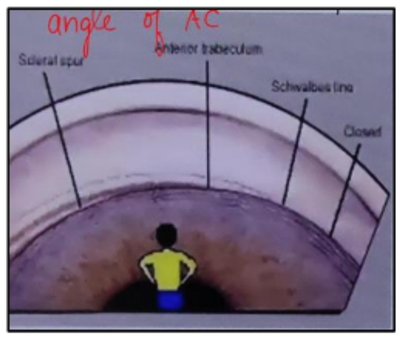
1) Inside the eye
INTRAOCULAR
HYPERTENSION
Increased pressure
↓
IOP > 21 mmHg

2), 3) Present at normal IOP
↓
Normal tension glaucoma

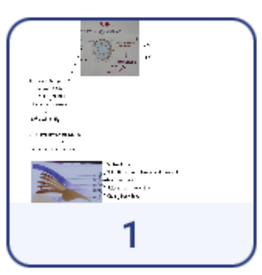


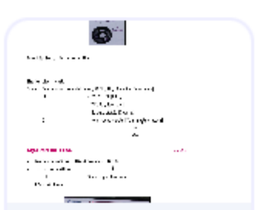
5 Structures
Schwalbe's line of Descement memb of
Trab.meshwork
Scleral spur (projection)
Ciliary Body Band
Root of iris

Visualization of angle of AC = Gonoscopy



Pinch to zoom

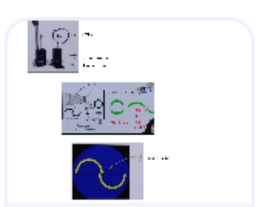

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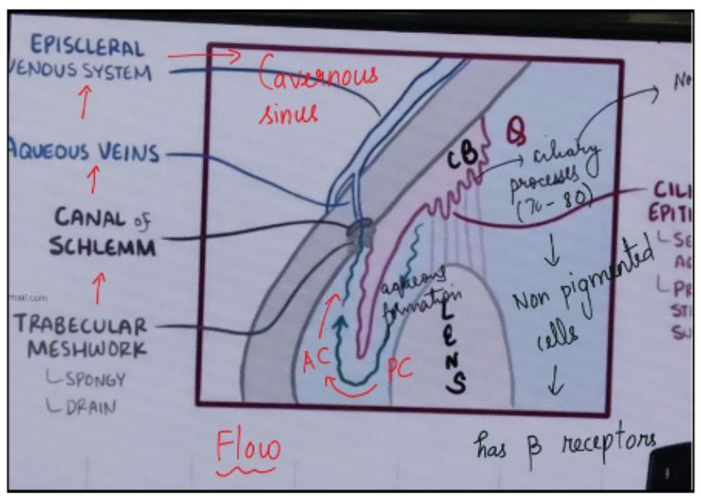
Principle: Total internal reflection

Shaffer classification

Grades IV = 4 structures visible = (BB, SS, TM, SL visible [Wide open]
III = SS, TM, SL [Mild]
II = TM, SL [Moderate]
I = SL only visible [Severe]
0 = No struc is visible [Total angle closure]
↓
ACG

AQUEOUS OUTFLOW 11:47

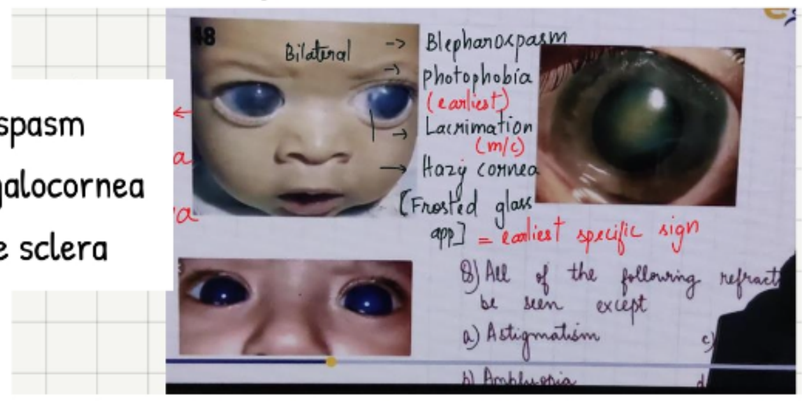
- Trabecular outflow = 90% of drainage = Block
- Uveoscleral outflow ↓
  || Open angle glaucoma
  10% of drainage



Ciliary process (70-80)
↓
Located at pars plicata
[ant part of ciliary body]

Pinch to zoom

Congenital Glaucoma



- Lid spasm
  Megalocornea
  Blue sclera

Lens flattened
↓
Subluxation

Congenital glaucoma

- Genes ass GLC 3 — A
  B
  C
- ↑ IOP < 3 yrs of age → ↑ size of eyeball
  ↓
  BUPTHALMOS, Bilateral,
  M/C in boys, AR

Q. All refractive changes in blepharospasm can be seen except

a) Astigmatism = seen due to HAAB's striae
b) Myopia = seen due to ↑ axial length
c) Ambylopia = Anisometropia can be seen
d) Hypermetropia = Not seen

Ans: d) Hypermetropia = Not seen

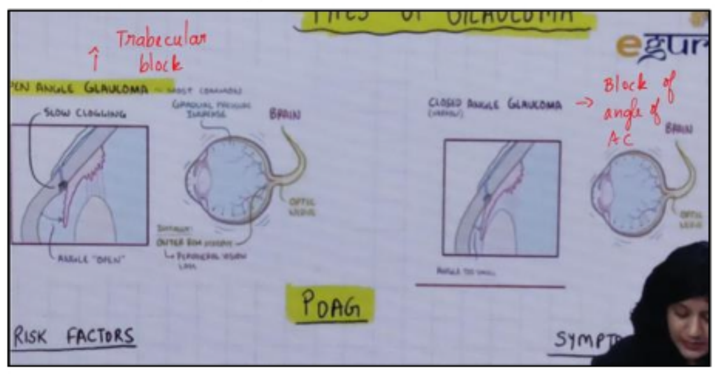
Treatment

Clear cornea → Goniotomy

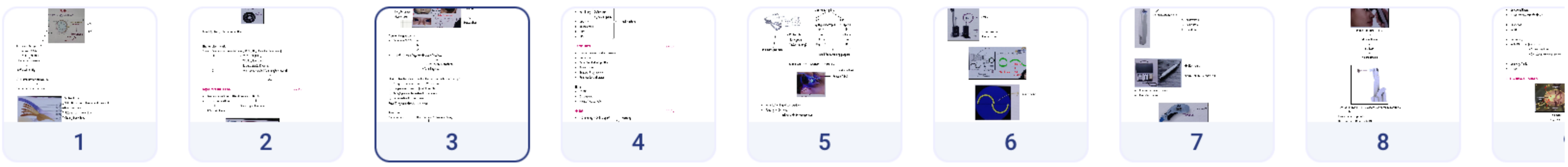
Hazy Cornea → Trabeculotomy
↓
Trabeculectomy

TYPES OF GLAUCOMA 23:50

Types of Glaucoma



Pinch to zoom



Glaucoma (Part -1)

Topic Notes: 11

PRIMARY OPEN ANGLE GLAUCOMA (POAG) 26:08

- MC type
- M = F, > 60 yrs
- Heriditary = Optineurin
  Myocillin genes
- DM, HTN
- Thyroxicosis
- CRVO
- BRVO

→ Risk factors

SYMPTOMS 27:09

- Freq. change of reading glasses
- Eye strain
- Defective dark adaptation
- Tunnel vision
- Gradual, Progressive
- Painless loss of vision

Signs

- ↑ IOP
- OD changes
- Visual field defects

↑ IOP 30:04

- > 21 mm Hg = 24 hrs apart → Morning, Evening
- IOP_{mor} > IOP_{eve}

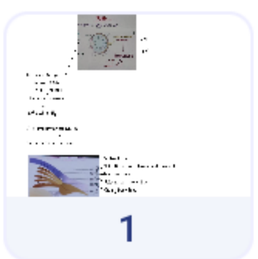
  Diff upto 5mmHg → Normal

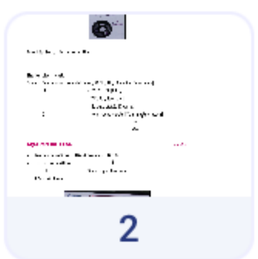
  5-8 → Glaucoma suspicious

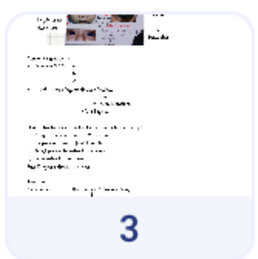
  >8mmHg → Diagnostic of glaucoma

- By tonometer

Pinch to zoom

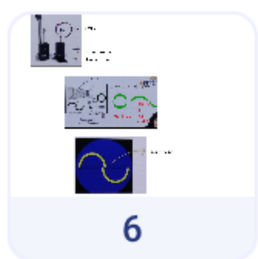

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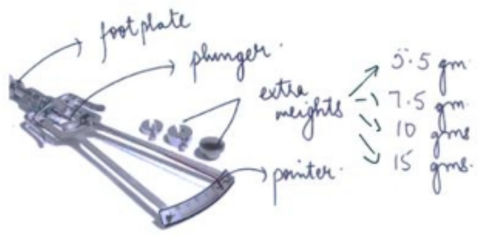

8

Glaucoma (Part -1)

Topic Notes: 11

TONOMETER

1) SCHIOTZ INDENTATION TONOMETER → Depends on corneal identation



In supine position

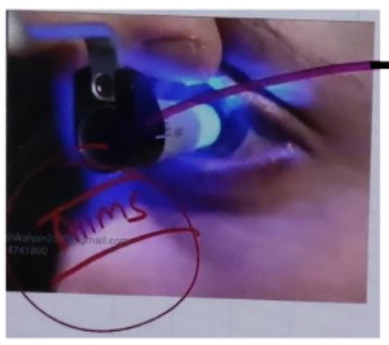
∝ corneal rigidity

	High	Less
	Eg: Hypermetropia	Eg: Myopia
	ARMD	↓
↳ Fridenwald	↓	falsely
Nomogram	Falsely	low
Tables (mmHg)	High IOP	IOP

Used for screening purpose

GOLDMANN'S APPLANATION TONOMETER

→ Gold standard



- Here flattening of cornea done
- Reading ∝ Corneal

  Thickness → By Pachymeter

- Principle: Imbert fick law

  Pressure = Force / Area → fixed = (3.06 mm dia of cornea)

Pinch to zoom



Glaucoma (Part -1)

Topic Notes: 11

FIXED AREA TONOMETER

36:00

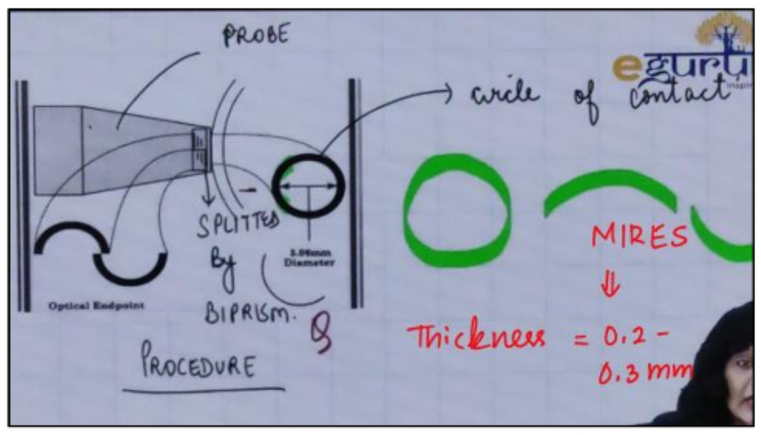
P ∝ F (gms)

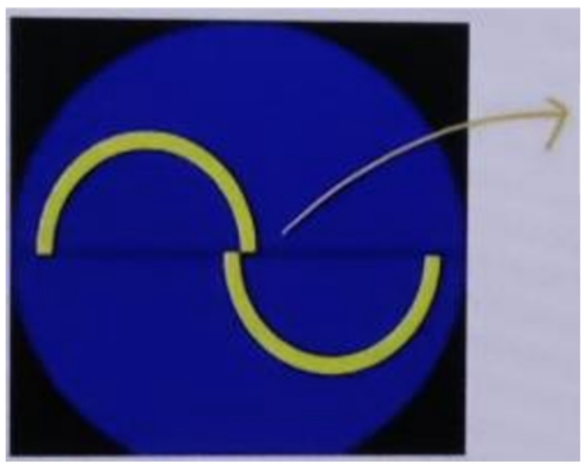


Probe

Sitting position

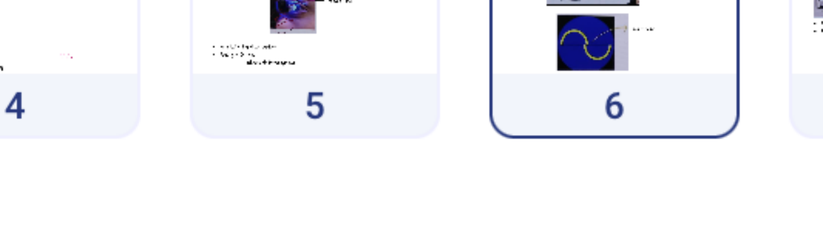
Fluorocein dye





Final reading

- The knob of the tonometer is adjusted so that the inner margins of both the semi-circles meet and start pulsating.
- This is the end point where reading is taken.



Pinch to zoom

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Glaucoma (Part -1)

Topic Notes: 11

- Cobalt blue filter = used in split lamp



PORTABLE form of GAT

PERKIN'S TONOMETER

A - Anaesthesia

B - Bed ridden

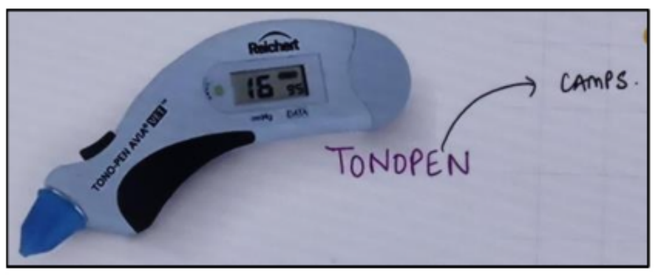
C - Children



→ Electronic

MACKAYMARG TONOMETER

- Corneal scarring, edema
- Irregular cornea

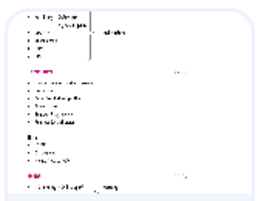




PNEUMATO TONOMETER
↓
Applanation Tonometer
↓
Jet of air

Pinch to zoom

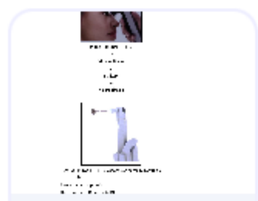

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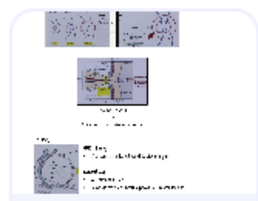

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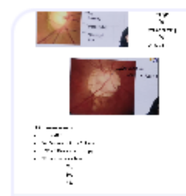

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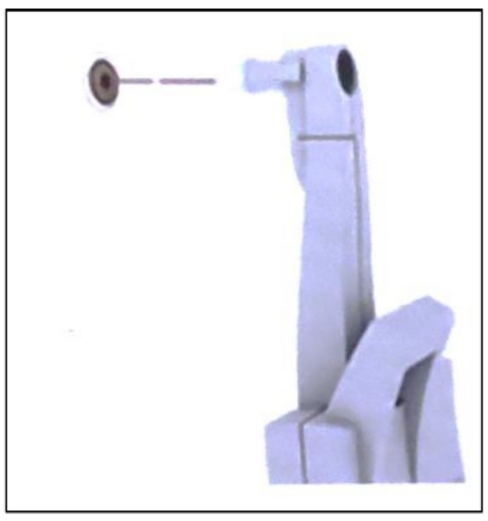

11

Glaucoma (Part -1)

Topic Notes: 11



REBOUND TONOMETER
↓
Self monitoring
↓
In children
↓
No anesthesia



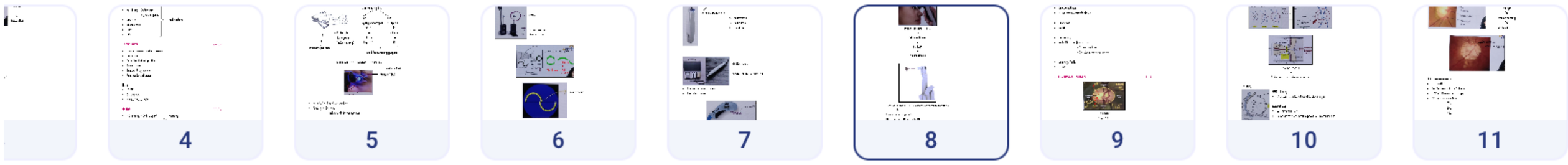
PASCAL TONOMETER → depends on corneal curvature
↓
Ocular pulse amplitude
[Diff b/w max IOP and min IOP]
↓
Ocular blood flow

FACTORS FOR IOP

46:23

- Axial length
- IOP ∝ AL
- Myopes have higher IOP — Eumetropes, Hypermetropes
- Diurnal variation ∝ Cortisol levels
- $IOP_{mor} > IOP_{eve}$

Pinch to zoom



Glaucoma (Part -1)

Topic Notes: 11

- Supine
- ↑ IOP

- Gen. Anesthesia
- ↑ IOP → few min → ↓IOP

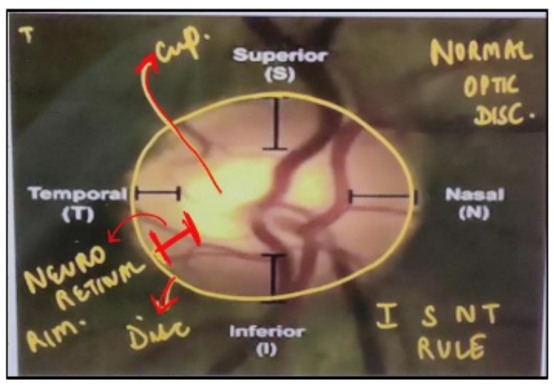
- Exercises
- ↓ IOP

- Pregnancy
- ↓ in IOP = ↑ aq utflow
  ↓ Scleral outflow
  ↓ Episcleral venous pressure

- Drinking fluids
- ↑ IOP

OPTIC DISC CHANGES

48:13

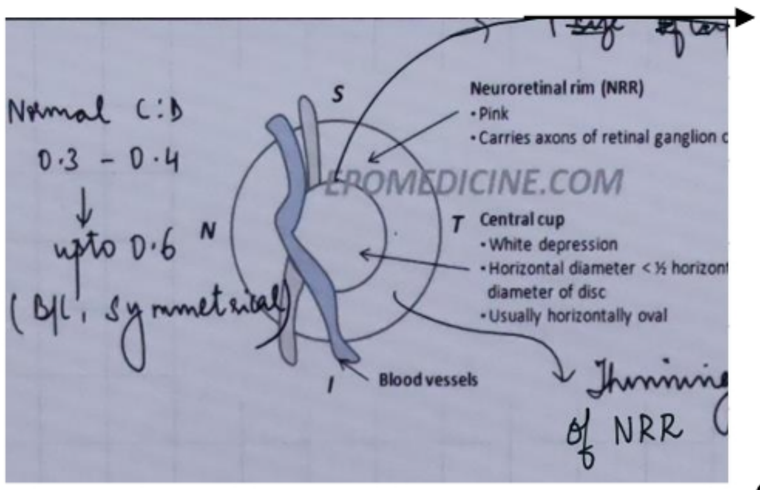


Thickness

I > S > N > T

↓

Violated in glaucoma



↑ size of cup

↓

Cupping

↓

Asymmetrical

↓

Vertically oval

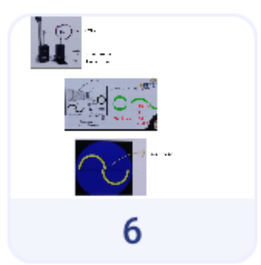
↓

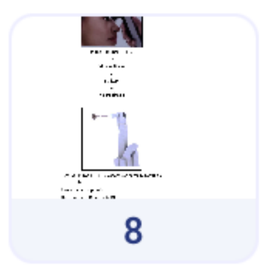
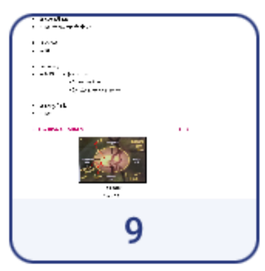
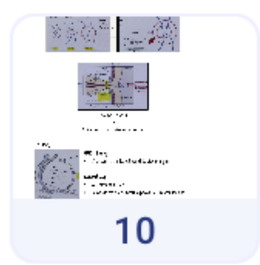
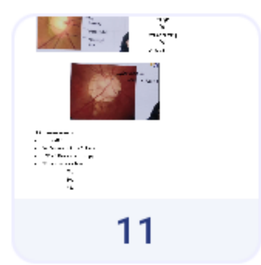
As S and I fibres affected first

Pinch to zoom



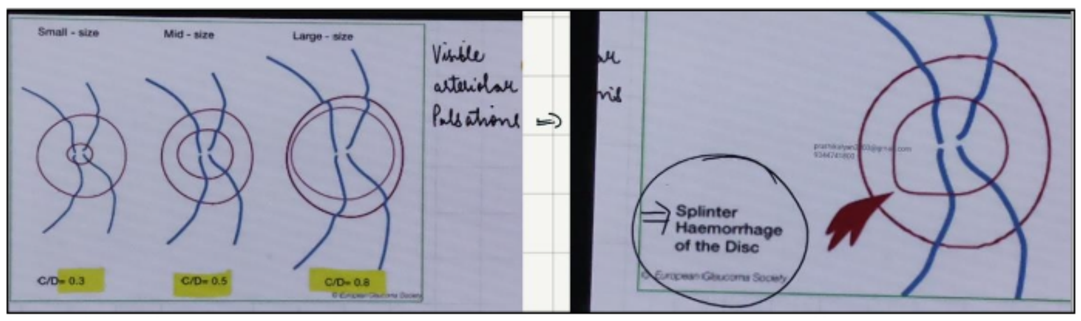
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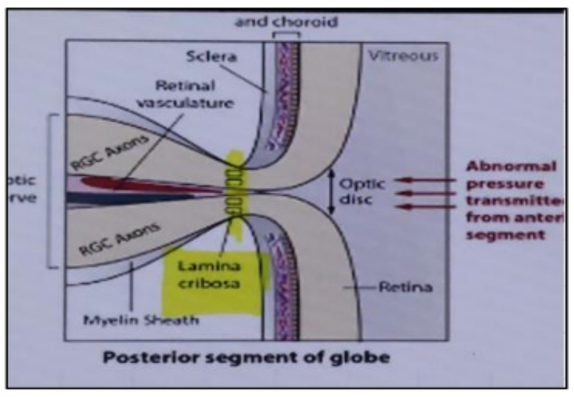
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Glaucoma (Part -1)

Topic Notes: 11



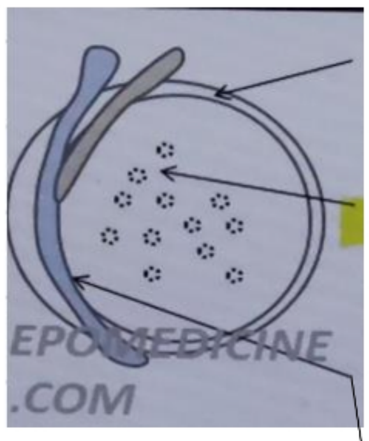


Lamina Cribosa

↓

Cribriform (or) Seive appearance

If ↑ IOP,



NRR thinning

- Crescentic shadow adjacent to disc margin

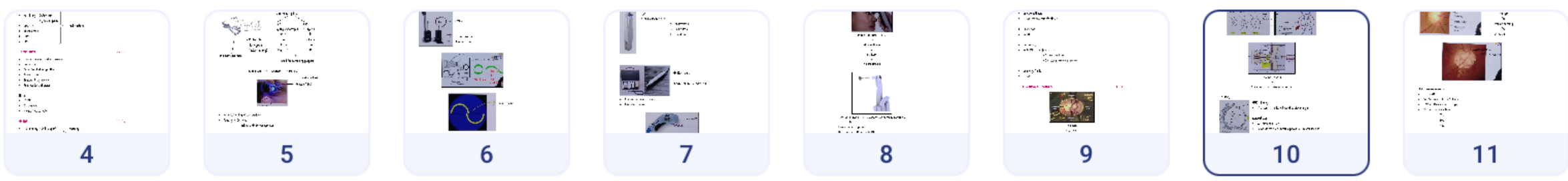
Central Cup

- C:D ratio 0.7 - 0.9
- Lamellar dot sign: slit like pores → Distended and Visible upto OD Margin

Blood vessels

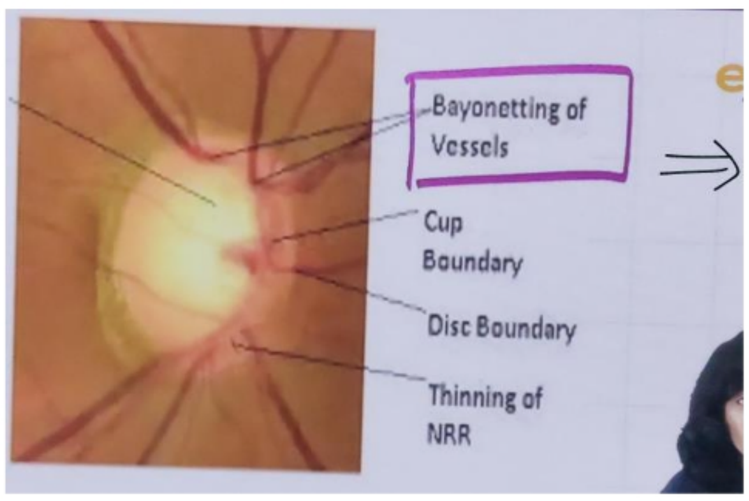
- Nasal shifting
- Bayoneting sign ("Z" appearance at edge of cup)
- Dark and sharply defined
- Pulsations

Pinch to zoom

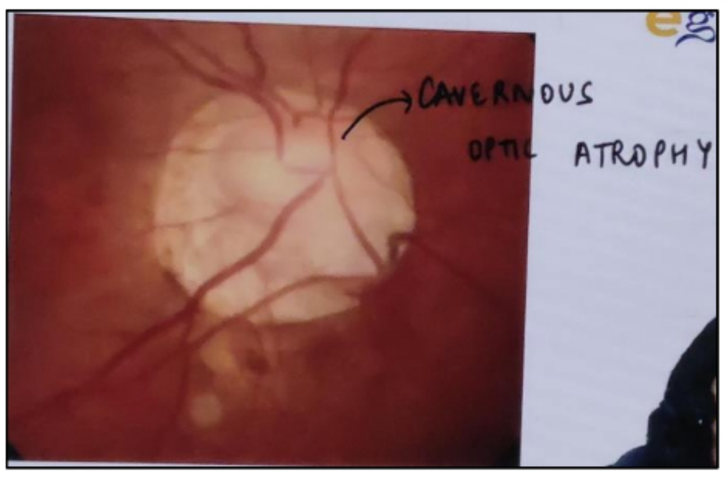


Glaucoma (Part -1)

Topic Notes: 11



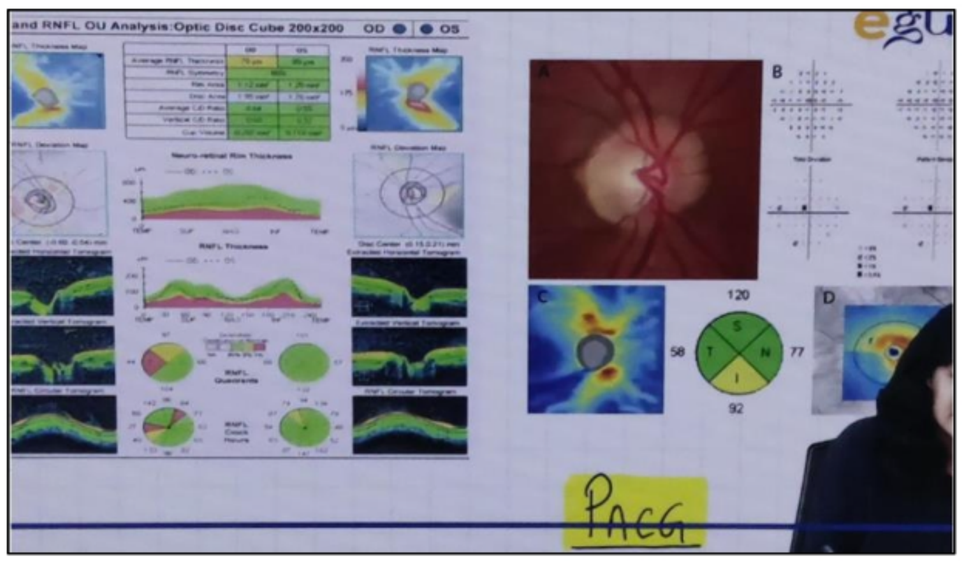
Breaking of vessels at OD margin
(or)
Double bending
(or)
Z - bending



OD changes seen by

- OCT - RNFL
- Ant. Segment OCT = 1310nm
- UBM = Ultra bio microscopy
- Slit lamp = Hruby lens
  +90D
  +60D
  +78D

OCT - RNFL



Pinch to zoom

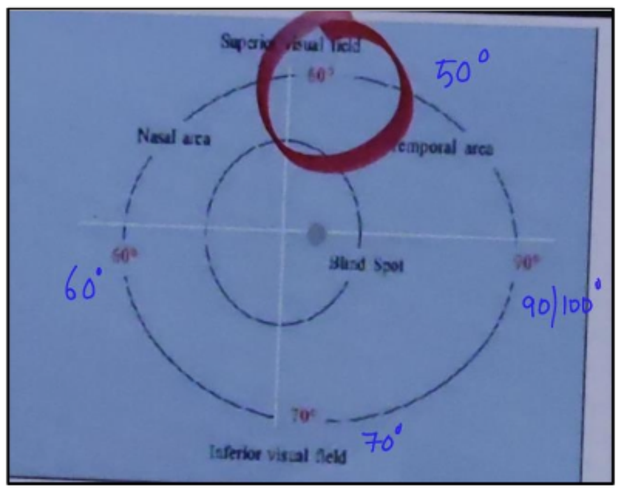
Glaucoma - Part 2

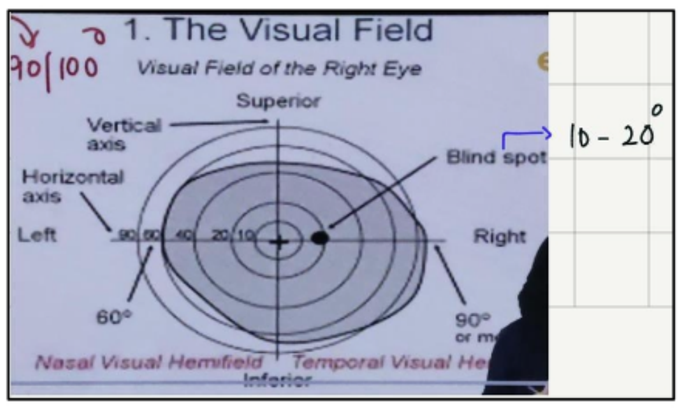
Visual field defects

(C) # Visual field defects in POAG

In Corona Baring of Patients Should Be Done Cautiously To	Isoptre contraction Baring of blind spot Paracentral scotoma Sidel's scatoma Bjerrum / Arcuate Double Arcuate Central L.OV Tubular vision
Treat Earliest VFD is - a) Isopter contraction b) Enlargement of blind spot c) Siedel's scotoma d) Arcuate scotoma	Temporal island also lost Earliest VFD e is visually significant ↓ Para central scotoma

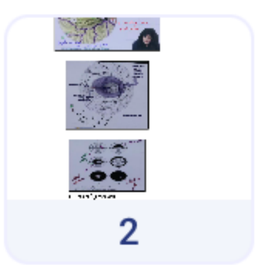
NORMAL VISUAL FIELD → ISOPTER

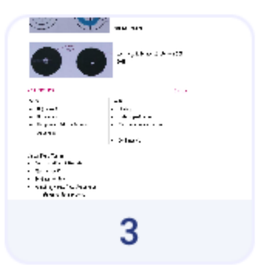




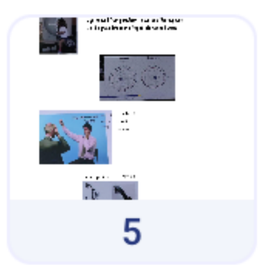
Pinch to zoom

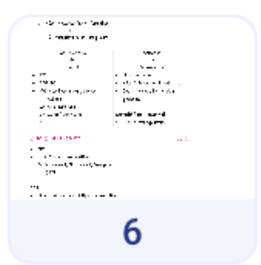

1

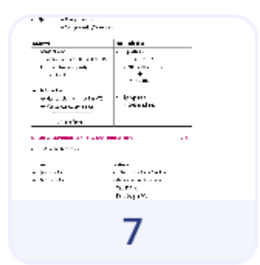

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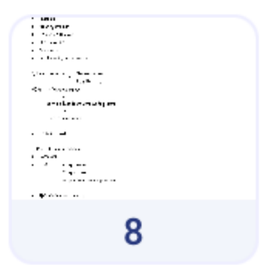

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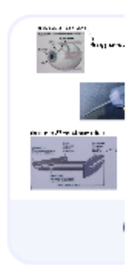

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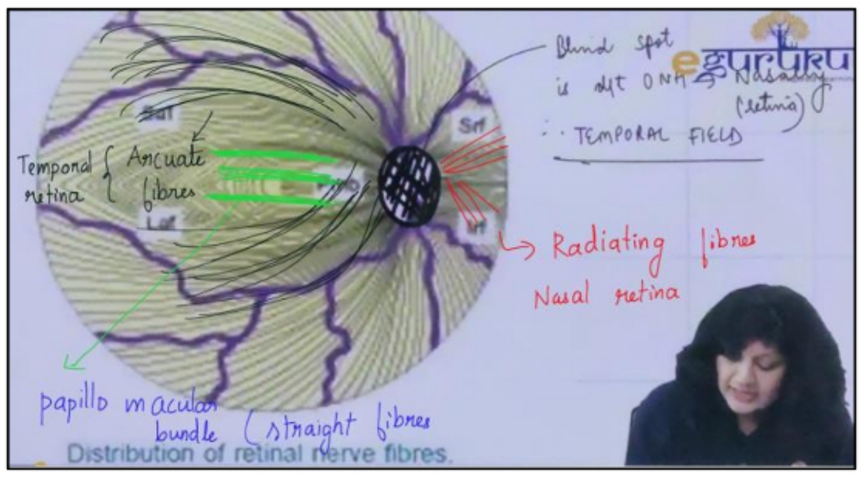

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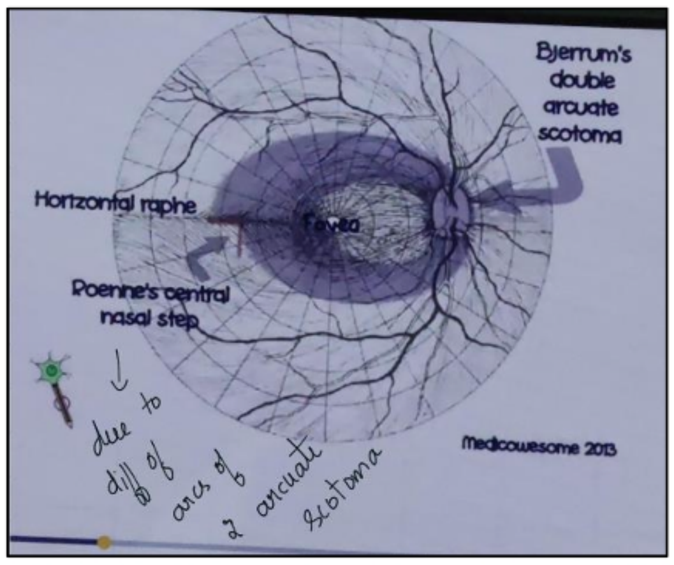

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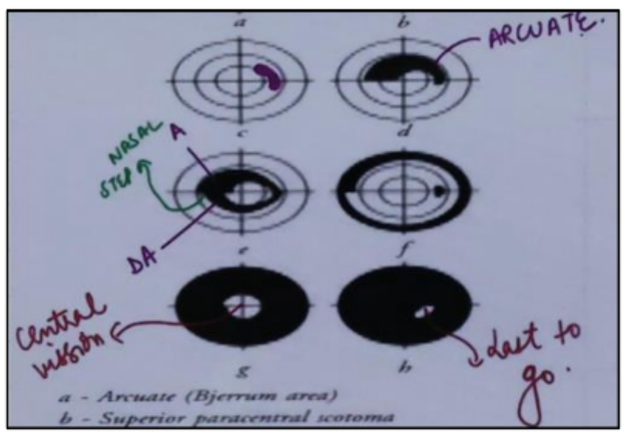


Glaucoma (Part -2)

Topic Notes: 13







a – Arcuate (Bjerrum area)

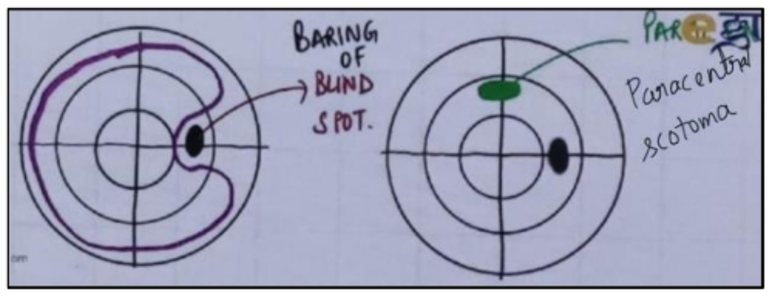
b – Superior paracentral scotoma

c – Seidel's scotoma

d – Bjerrum's (arcuate) scotoma

e – Double arcuate (ring) scotoma with superior

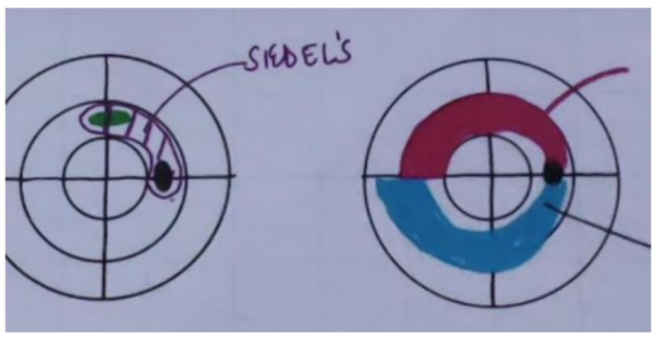
I) ISOPTER CONTRACTION



Pinch to zoom

Glaucoma (Part -2)

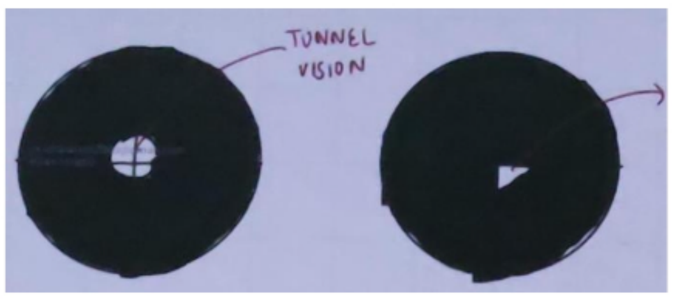
Topic Notes: 13



Arcuate

Arcuate fibres 10-20° → Bjerrum area

Double Arcuate



Last to go is Temporal field → NEET 2018

PERIMETRY

19:02

Static

- Obj is fixed
- Goldmann's
- Humphrey's field analyser = automated

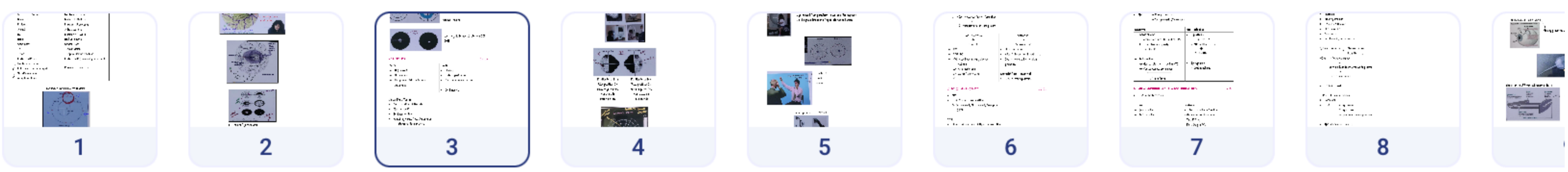
Kinetic

- Moving obj
- Lister's perimeter
- Bjerrum's tangent screen
- Gold monn's

Visual Field Testing

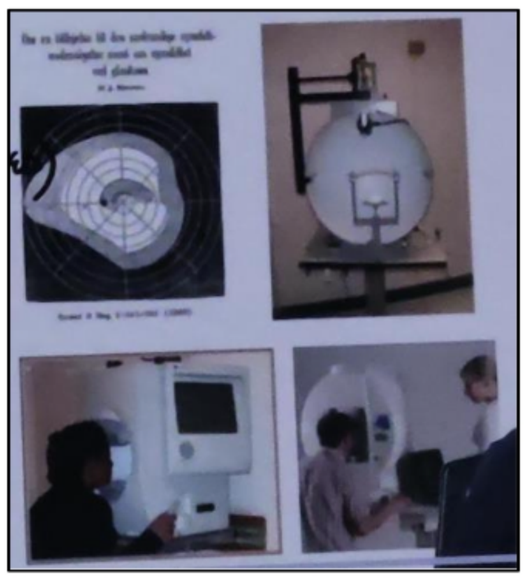
- Confrontation → Bedside
- Bjerrum → K
- Goldman → S+K
- Humphrey visual field (Automated)
  - Standard white on white
  - SITA (Swedish Interactive Threshold Algorithm)
    - Standard
    - Fast
  - SWAP (Short Wavelength Automated Perimetry)
- Octopus
- Medmont

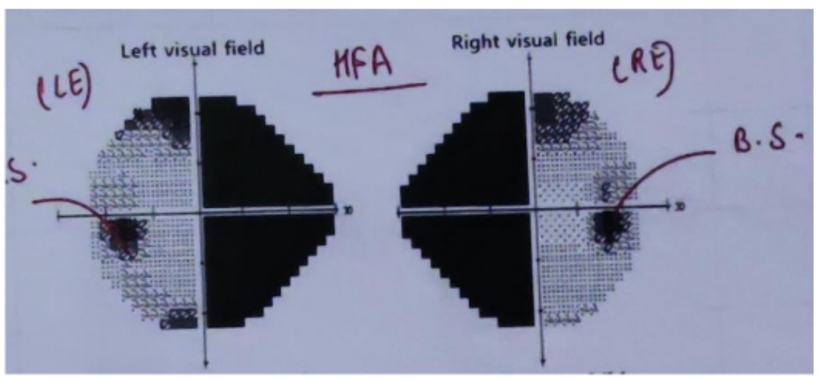
Pinch to zoom



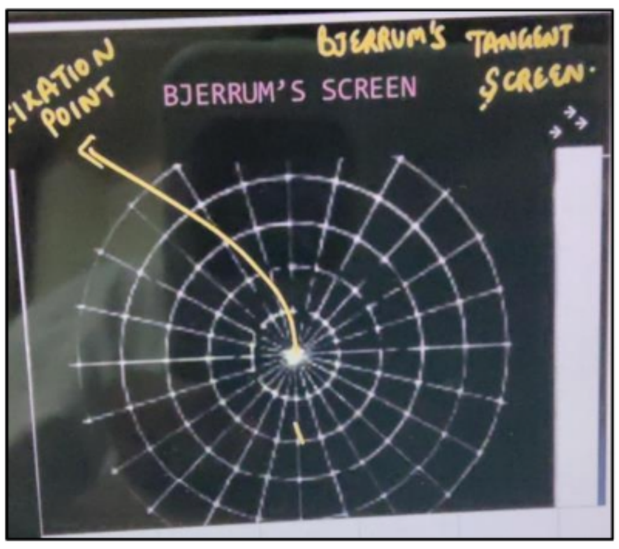
Glaucoma (Part -2)

Topic Notes: 13

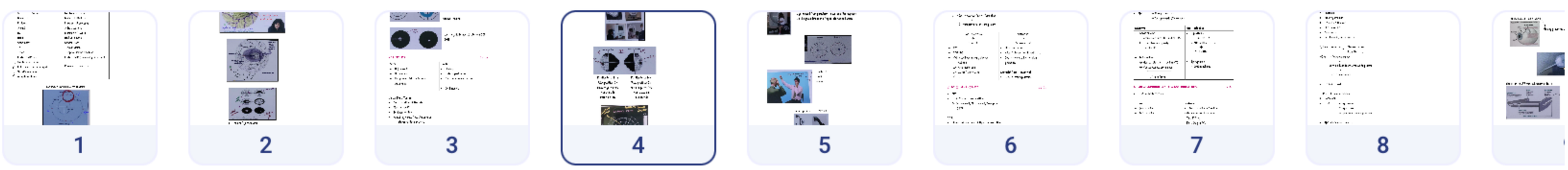




Fixation loss: 2/14	Fixation loss: 1/14
False positive: 0%	False positive: 0%
False negative: 0%	False negative: 7%
MD: 21.56 dB	MD: -20.63 dB
PSD: 14.74 dB	PSD: 15.91dB



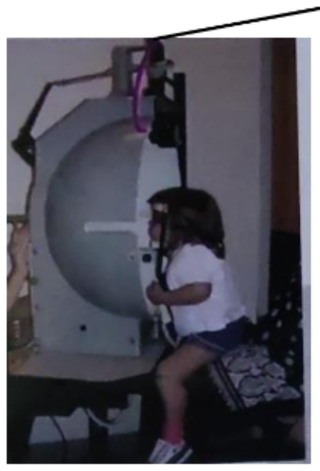
Pinch to zoom



Glaucoma (Part -2)

Topic Notes: 13

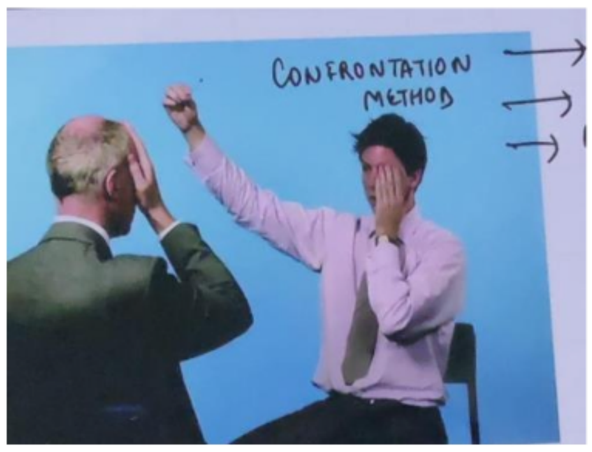
BOWL → GOLDMANN'S PERIMETER



Goldmann perimetry

Light moved from periphery to center of hemisphere

Child signals detection of light with tap on buzzer



Peripheral

Kinetic

Bedside

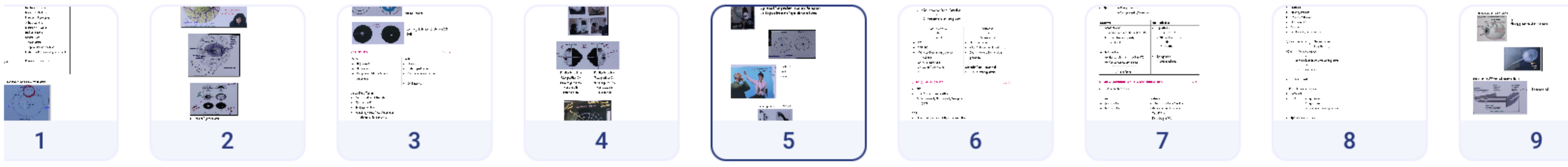
Lister's perimeter → ARC Like



VF charting

Central	Peripheral
0 - 30°	30° - Beyond
Compimeter	Perimeter

Pinch to zoom



ANTI GLAUCOMA DRUGS *26:39*

1) B Blockers
   - MC used
   - MOA: ↓ Aqueous humor formation
     ↓
     (-) β receptors → on Pars plicata

Non - Selective	Selective
↓	↓
Timolol	Betaxolol (β_1)
• MC • 0.5%, BD • C/I in cardiopulmonary diseases 1) Asthma 2) Atherosclerosis 3) COPD / CHF / CAD 4) DM	• ↓ aq formation • Adv: ↑ Blood flow to optic disc • Doc in Normal / Low tension glaucoma Carteolol [Non - selective] • DOC in Hyperlipidemia.

2) PGF2∝ ANALOGUES *28:45*

- DOC
- MOA: ↑ uveoscleral outflow

  Eg: Latanoprost, Bimatoprost, Travoprost
  (MC)

ADR:

- Pigmentation of iris → Hyperpigmentation
  ↓
  Unilateral = Heterochromia
- Hypertrichosis and Trichomegaly
  ↓ ↓
  ↑ no. of eyelashes ↑ length of eyelashes
  ∴ FDA has approved this

- Pigmentation in periocular skin
- Intra - ocular inflammation
- Reactivation of H. Simplex
- CME in Diabetes → DR

} β blockers preferred

Glaucoma (Part -2)

Topic Notes: 13

3) ∝ - Adr analogs

- MOA: ↓ aq. Formation
  ↑ aq. Outflow
- ADR: • Allergic reactions
  • Tachyphylaxis (Tolerance)

Selective	Non - Selective
• Apraclonidine = Before procedures (risk of ↑IOP) Eg: Laser Trabeculoplasty Surgical PI • Brimonidine → Neuroprotection = used in NTG → Causes Apnea, Drowsiness C/I in infants	• Dipevifrine = C/I in sys HTN = DOC in HTN uveitis ↓ Ocular HTN • Epinephrine = CME in aphakia

4) CAI =CARBONIC ANHYDRASE INHIBITORS 32:40

- MOA: ↓ Aq formation

Topical

- Dorzolamide
- Brinzolamide

Systemic

- Acetazolamide = DIAMOX

= Before cataract surgery

Tab. 250 mg

= First drug in ACG

(Ophthal emergency)

- Methazolamide

ADR

- Should not be used in pts c̄ sulpha drug allergy (eg: Topiramate = sulpha drug

↓

B/L 2° ACG

↓

Sulpha drugs → CD effusion

↓

Forward rotation of iris - lens diaphragm

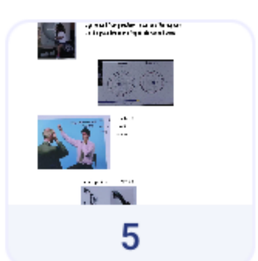
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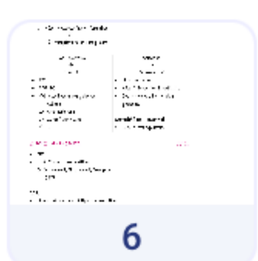
ACG

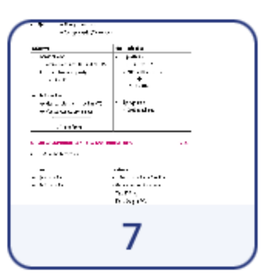
Pinch to zoom

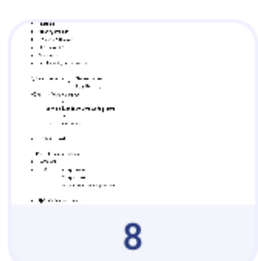

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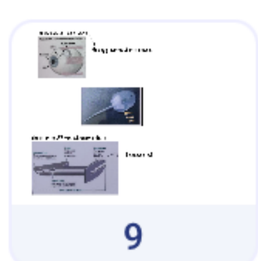

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- Anorexia
- Blood dyscrasias
- Crisis (Sickle cell)
- GI discomfort
- Depression
- Hypokalemia, Parasthesias

5) Hyper osmotics — Glycerol = oral
Mannitol = IV

MOA: ↓ Vitreous humor
↓
Shifting fluid from vitreous to plasma
↓
Used in emergency

- C/I in CHF, ARF

6) Rho – Kinase inhibitors

- Netarsudil
- MOA: ↓ aq formation
  ↑ aq outflow
  ↓ Episcleral venous pressure

- ADR: Vortex Keratopathy

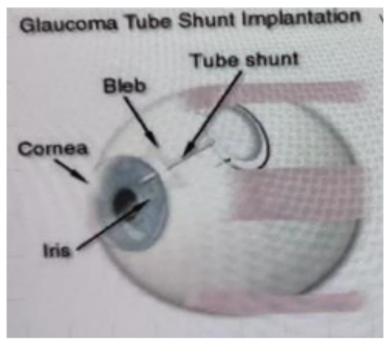
SURGERY *36:20*

- Laser trabeculopathy
  Argon
  Diode
  Freq doubled NdiYAG

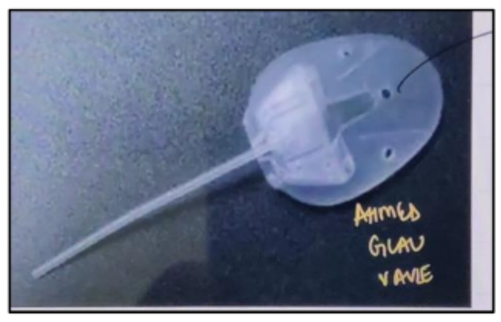
- MOA: ↑ aq outflow
- Rx for fellow eye
- Trabeculectomy

- Fistula b/w AC and subconjuctival space created
- Bleb — Mitomycin - C
  5 - FU

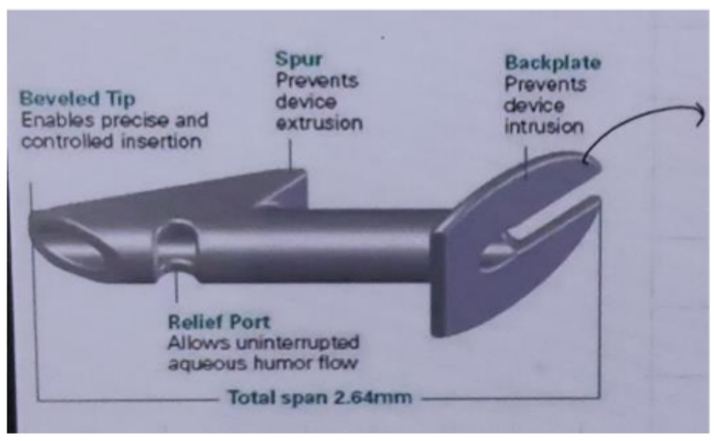
SETON SX Q- NEET 2014



Placing glaucoma shunts in Beeb.



The Ex-PRESS™ Mini Glaucoma Shunt



Stainless steel

ANGLE CLOSURE GLAUCOMA *39:24*

Risk factor

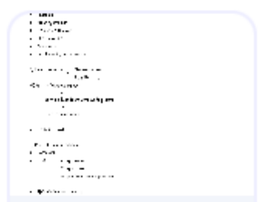
- Small eye ball
- Small cornea
- Shallow Ant. Chamber
- Hypermetropes
- Females
- > 50 yrs
- Type A personality

Pinch to zoom


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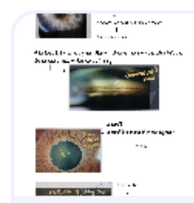

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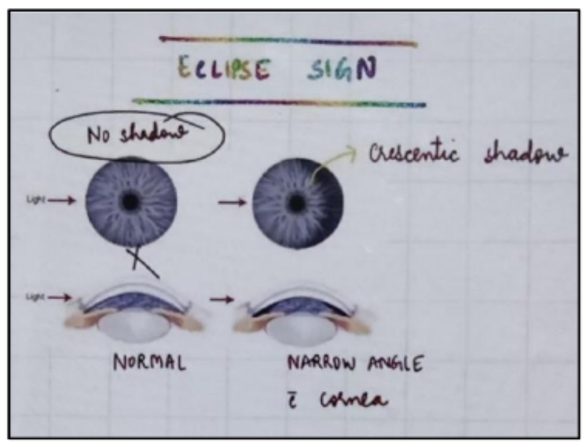

11


12


13

Glaucoma (Part -2)

Topic Notes: 13



Attack of PACG

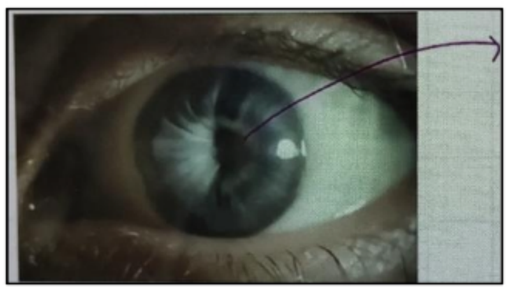
↓

Mid dilatation of pupil

↓

Iris bombe formation

1) Dim light
2) Emotional stress
3) Dark room procedure
4) Pharmacological mydriasis
5) Rainy season.

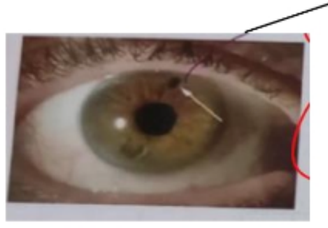


Iris Bombe formation

Stages of ACG

Stage I

Stage II



I Latent stage

↓

II) Intermittent stage

Investigation

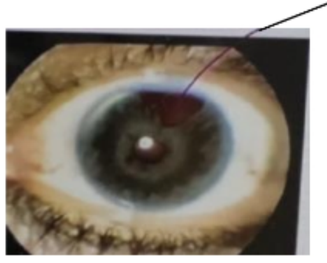
↳ Nd: YAG 1064 NM

TPC — LI, PI

Treatment

↳ Laser Iridectomy

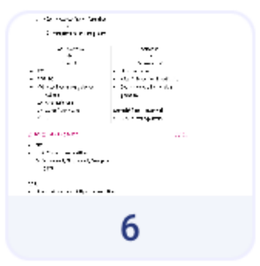
↳ Peripheral Iridectomy



Peripheral Iridectomy / surgical

Pinch to zoom


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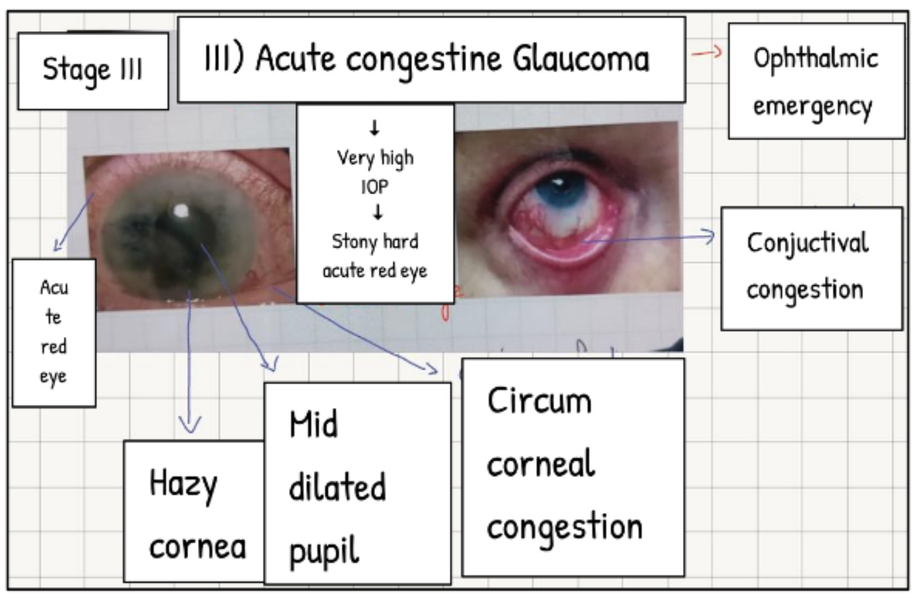

11


12


13

Glaucoma (Part -2)

Topic Notes: 13



ACG ➜ DOC: Pilocarpine (Miotic) ➜ Active miosis

↓

Before this

- Acetazolamide
- I.V mannitol

} Given

ADR

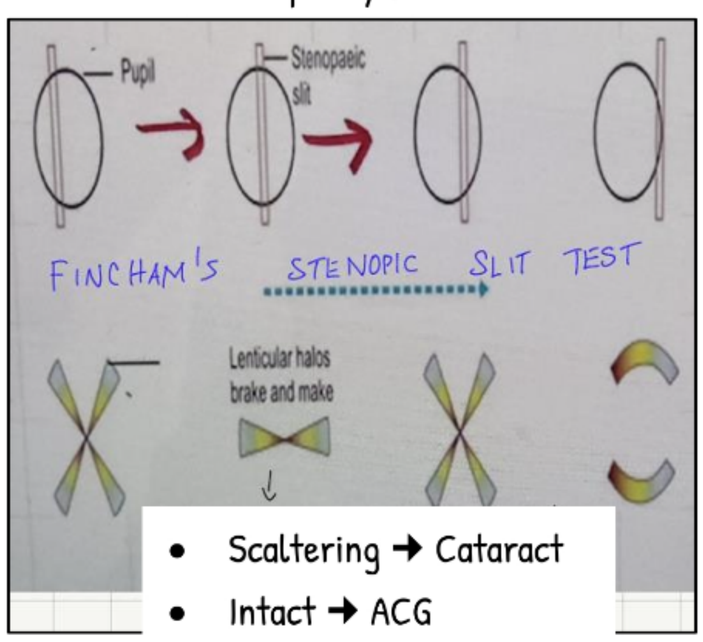
- Iris cyst
- Ant. Subcapsular cataract
- Accomodative spasm

↓

Induced myopia

[Note:

Colored halos seen in Corneal opacity]



Pinch to zoom



Glaucoma (Part -2)

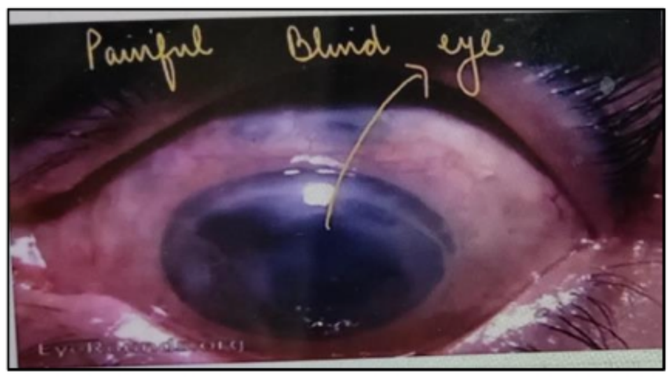
Topic Notes: 13

Stage IV



IRIS BOMBE
↓
Acute congestive glauc.
↓
Peri ant synechae
↓
Chronic congestive glaucoma
↓ ↓
Stage IV Treatment = Trabeculectomy

Stage V



V) Absolute Glaucomas
↓
T/t - Laser PC / cryo / Diathermy
Enucleation

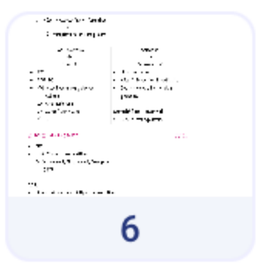
SECONDARY GLAUCOMA 53:10

Secondary Glaucomas



RUBEOSIS IRIDIS → Neovascular Glaucoma
PDR CRVO
↓
100 day glaucoma

Pinch to zoom


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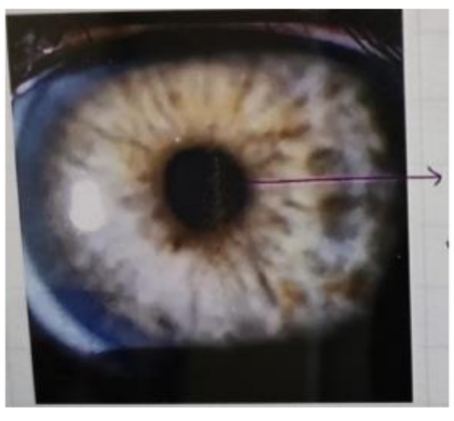
11

12

13

Glaucoma (Part -2)

Topic Notes: 13



Pigmentary glaucoma

KRUKENBERG SPINDLES

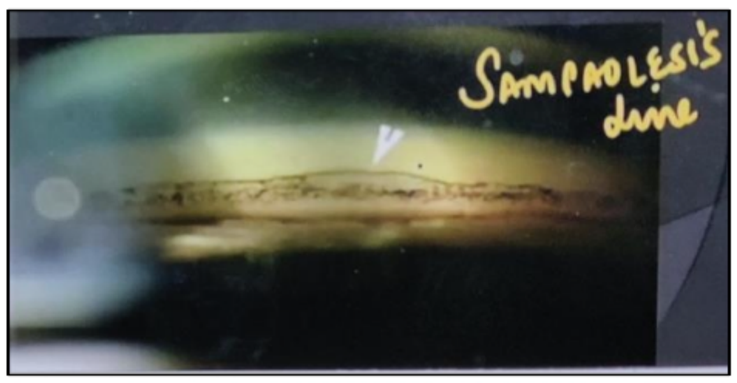
↓

Pigments on post. Surface of cornea

↓

Sampaolesis line

Which leads to increased pigmentation of trabecular meshwork and schwalbe's line (Sampaolesi's line). ➜ Gonioscopic finding



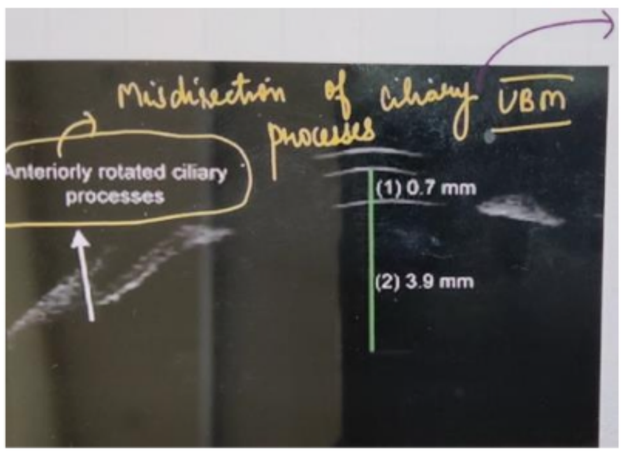


Dandruff

Dandruff like material in ant segment

↓

2° OAG.



Ciliary Block

(or)

Inverse glauc

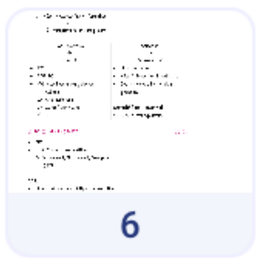
(or)

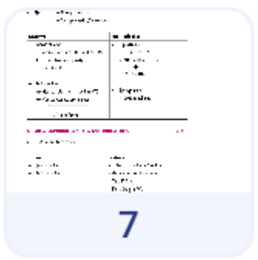
Malignant glauc.

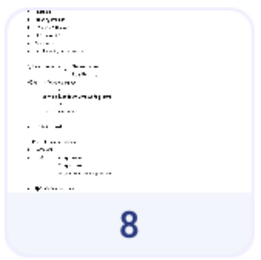
Because Atropine is given to break ciliolenticular block

Pinch to zoom


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13

Orbit and Lacrimal Apparatus

Proptosis/Exophthalmos

- Ant displacement of eyeball
- Measured by Exophthalmometer
  - Hertel's (Adults)
  - Luedde's (Children)

Causes

Children

- U/L = Cellulitis
- B/L = Metastasis → from AML (or) Neuroblastoma

Adults

- Thyroid eye disease
- Female
- Middle age
- Smoking
- 90% Hyperthyroidism
- 6% Euthyroidism
- 4% Hypothyroidism

PATH - THYROID EYE DISEASE 03:51

- Problem in 1° - orbital fibroblasts → Proptosis
- 2° - Extra - ocular muscles involved order of involvement
  Order of involvement:
  IR → MR → SR →LR → Obliques

  R - Rectus

- Whole belly of EDM involved sparing tondons
  ↓
  Coca Cola bottle sign →

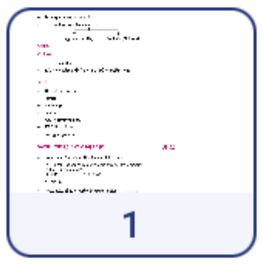


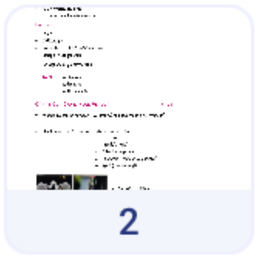
Path - Cavernous sinus

Structure through centre and Lat wall

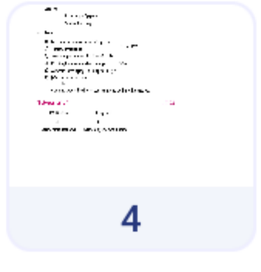
Centre	Lat wall
• Internal carotid art • VI nerve	• III, IV, V, -1st, 2nd division nerve

Pinch to zoom


1


2


3


4

Orbit & Lacrimal Apparatus

Topic Notes: 4

CAVERNOUS SINUS THROMBOSIS 06:57

- H/O = Orbital cellulitis
  = Acute ethmoidal sinusitis

Features

- Fever
- Chills, Rigor
- Proptosis U/L → B/L in 50% of cases
- Diplopia in Lat gaze (LR_6)
- Pathognomic sign, Mastoiditis

- Treat : Analgesics
  Antibiotics
  Anticoagulants

CARATICO - CAVERNOUS FISTULA 09:43

- Abnormal opening between ICA (artery) and cavernous sinus (venous)

- Blood flows from Artery to vein-Turbulence created
  ↓
  "Bandy's Triad"
  - Pulsatile proptosis
  - Chemosis (Edema of conjunctiva)
  - Bruit (Noise in head)

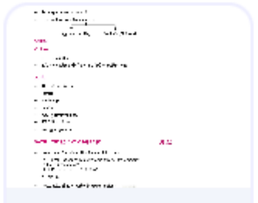


→ Coca-Cola bottle sign



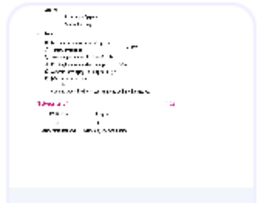
→ TRAM TRACK Appearance (TRA)
↓
Optic nerve meningioma

Pinch to zoom


1

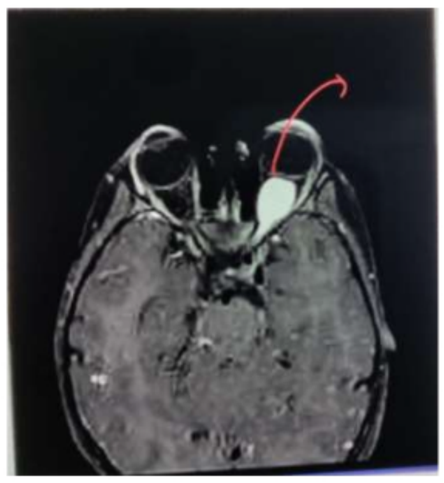

2


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4

Orbit & Lacrimal Apparatus

Topic Notes: 4



Fusiform enlargement → In optic nerve gliomas

EXOPHTHALMOMETER *13:14*



→ In Adults
↓
Hertel's Exophthalmometer

Ludde's Exophthalmometer

- In children → Ludde's exophthalmometer
- Transparent plastic mm ruler which is thicker than normal ruler
- Notch conforms to angle of lateral orbital rim
- Scale readings : 0mm (end of notch) to 40mm
- Parallax is minimized by using scale on both sides of the rod



LACRIMAL APPARATUS *13:49*

Congenital Dacryocystitis

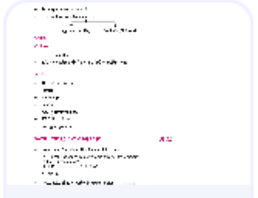
- Memb occlusion of Naso – Lacrimal duct

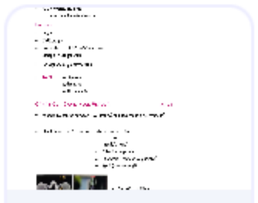
↓

15-18mm

Downward, Outward, Backward

Pinch to zoom


1


2


3


4

Orbit & Lacrimal Apparatus

Topic Notes: 4

- Occlusion by valve of Hasver
  ↓
  Leads to
  - Watering = Epiphora
  - Sticky discharge
- Treat :

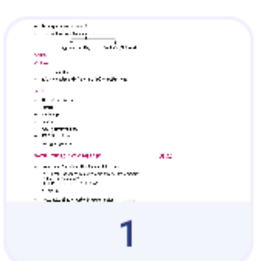
1) Lacrimal sac massage = Criggler's
2) Topical antibiotics
   } 0-1 yr
3) Syringing with normal saline → 1-2yr
4) Probing by bowman's Lacrimal probe → 2-3yr
5) Alternate syringing, Probing → 3-4yr
6) DCR surgery → ≥ 4yr
   ↓
   Opening created between Lacrimal sac and middle meatus

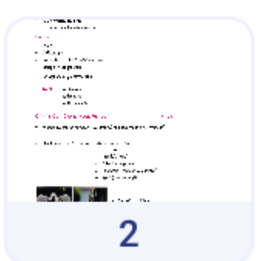
TUMORS OF LA

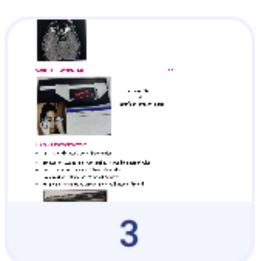
17:08

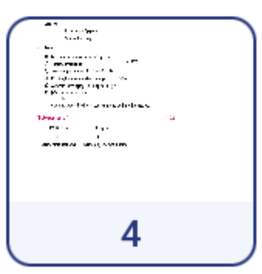
M/C Benign	M/C Malignant
↓	↓
Pleomorphic adenoma	Adenoid cystic Carcinoma

Pinch to zoom

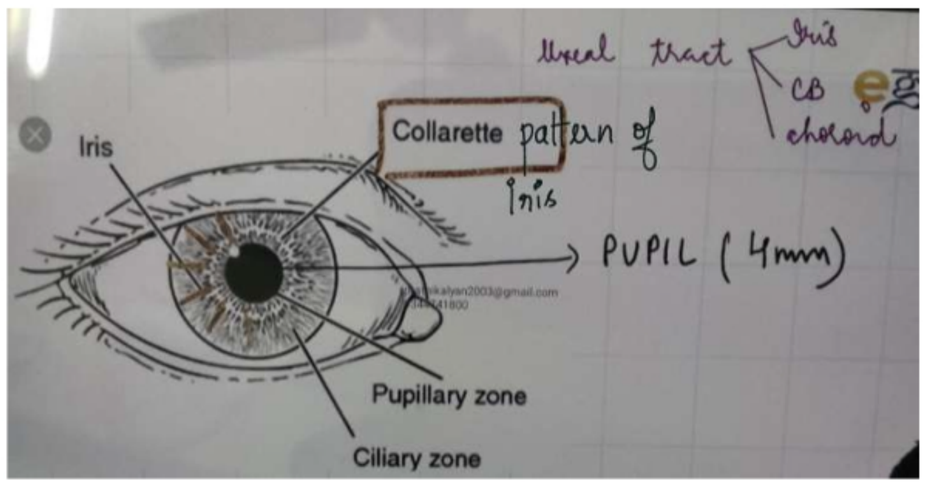








Uveal Tract

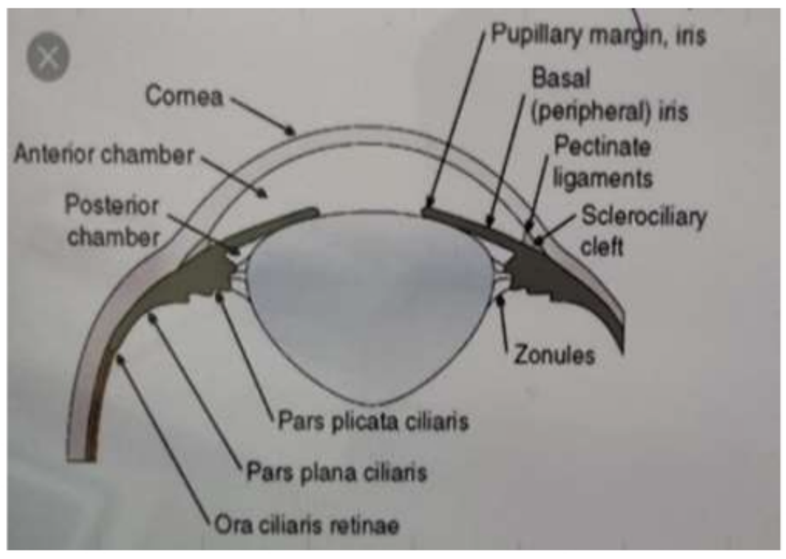


Iris muscles

Circular	Radial
Sphincter papillae ↓ Constriction (Parasympathetic)	Dilator papillae ↓ Dilation of pupil (sympathetic)

Ciliary Body

- Pars plicata (2mm) → Ant
- Pars plana (4mm) → Post, Smooth

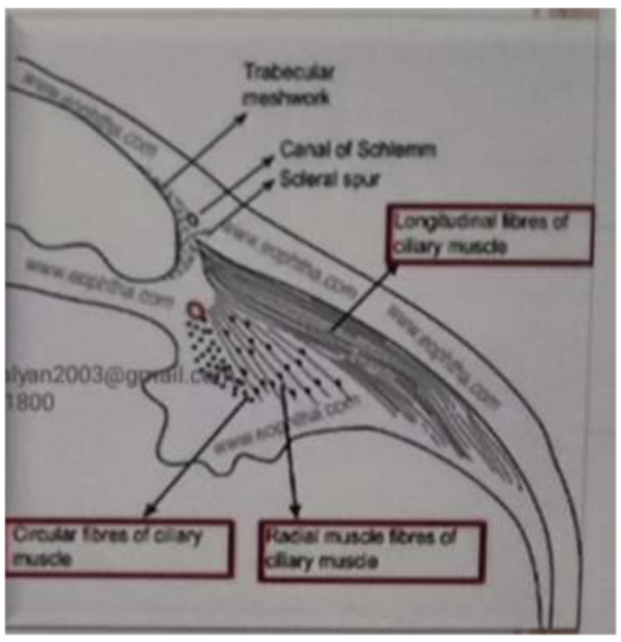


Ciliary Muscles

- 3 muscles fibers
  - Longitudinal muscle fiber : Contraction opens Trabecular meshwork and Schlemn's canal → Increase aq outflow
  - Circular muscle fiber : Contraction relaxes zonules, increases lens axial diameter and its convexity
  - Oblique muscle fibers : Contraction widen the uveal trabecular space → Increase aq outflow

Uveal Tract

Topic Notes: 11



MICROSCOPIC STRUCTURE OF CHOROID 05:36

1) Suprachoroidal Lamina
2) Stroma of choroid
3) Choriocapillaries
4) Bruch's memb = Basement memb of RPE

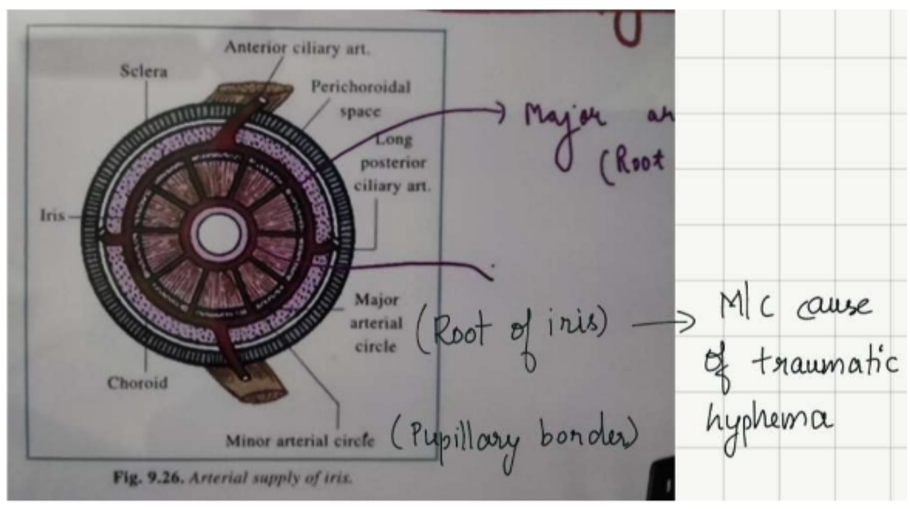
Lacquer crakes → High Myopia

Angiod Streaks → PEPS

Stroma of Choroid

- Outer layer/Haller's layer = Large sized vessels
- Middle / Sattler's layer = Medium sized
- Inner / Choriocapillaries = Small sized

Blood Supply



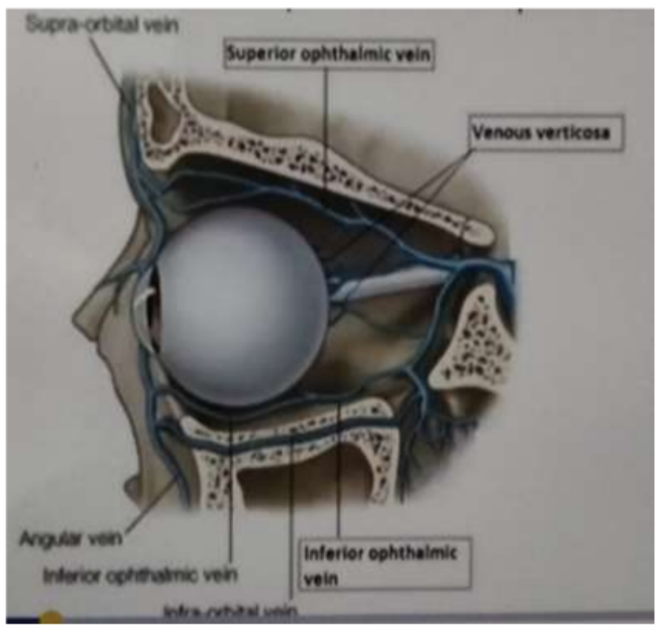
Pinch to zoom



Venous Drainage

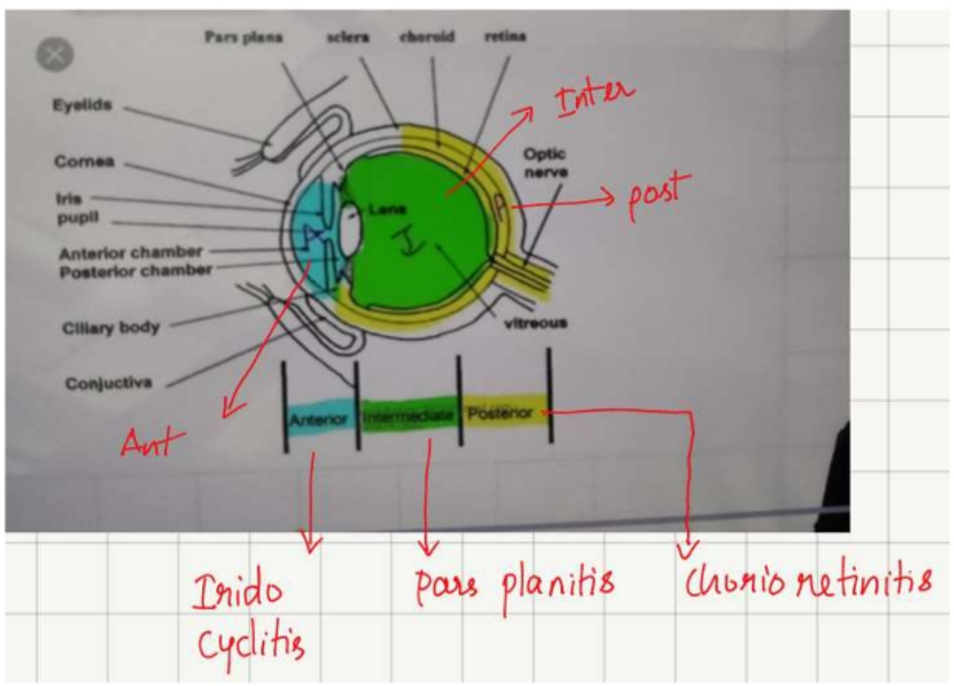
- Two superior vortex veins opens into superior ophthalmic vein
- Two inferior vortex veins open into inferior ophthalmic vein

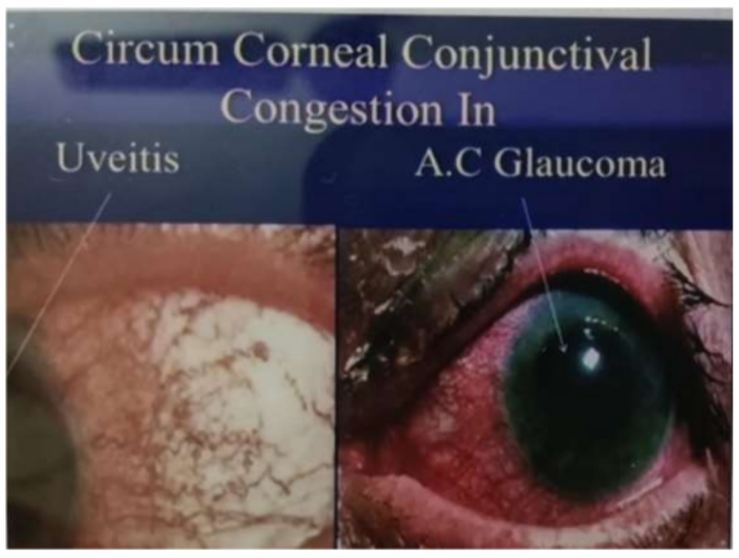
} Cavernous sinus



TYPES OF UVEITIS

11:00

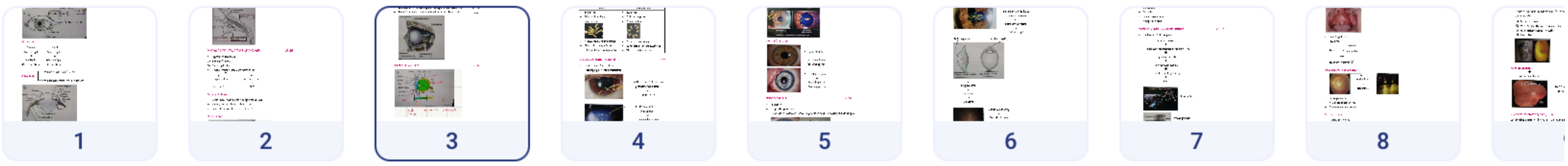




Deep ciliary injection

- Acute ant uveitis → Near limbus
- Acute congestive glaucoma

Pinch to zoom

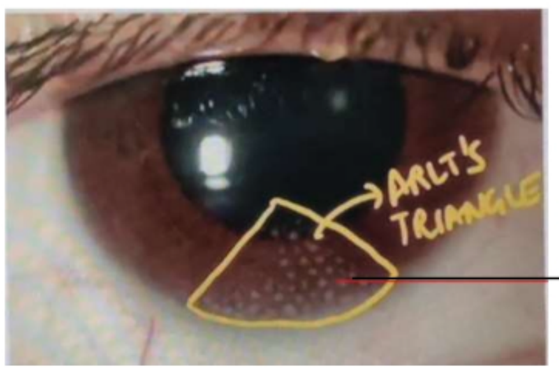


Conjuctival Vs Circumcorneal Congestion

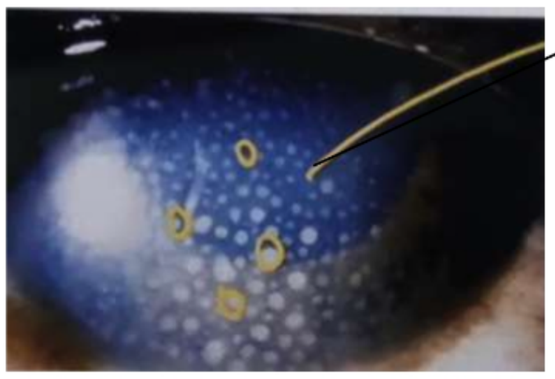
Conjuctival	Circumcorneal
• Bright red • Arborous branching • Near fornices  • Vessels move with conjunctiva • Blanch with phenylephrine • Fill from fornix towards centre	• Bluish red • Radial arrangement • Around limbus  • Do not move with conj. • Do not blanch with phenylephrine • Fill from limbus, outwards

ACUTE ANTERIOR UVEITIS *15:17*

- Earliest sign : Aqueous flare
- Most imp sign : Keratic precipitates



→ Small pigmented KP's in non-granulomatous diseases
↓
Lymphocytes



→ Mutton fat KP's (Macrophages)
↓
Granulomatous disease

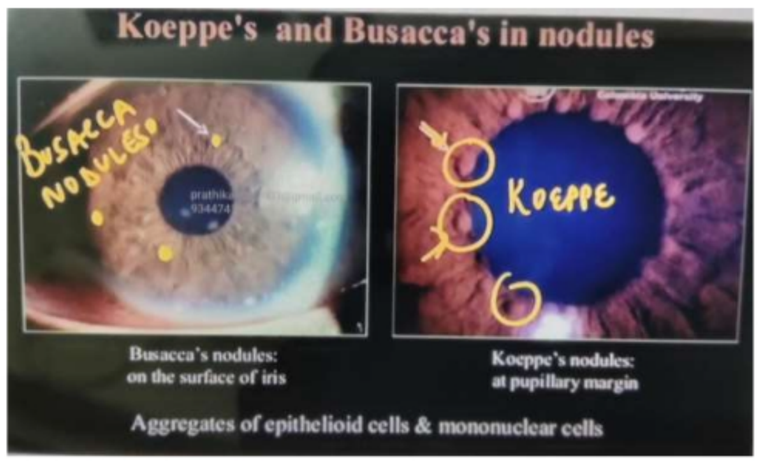
IRIS NODULES *17:25*

- In granulomatous diseases
- → Inflammatory
- → Non - inflammatory → Lisch nodules
- → Non - inflammatory → Burchfield nodules

Uveal Tract

Topic Notes: 11

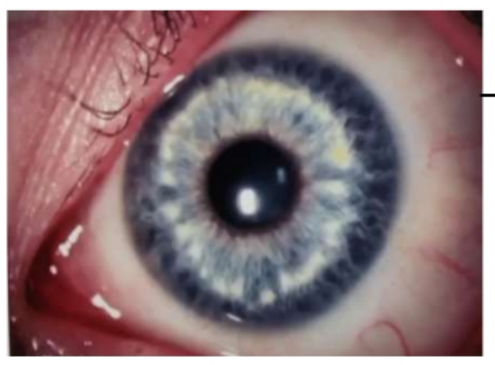
Inflammatory



Non - inflammatory



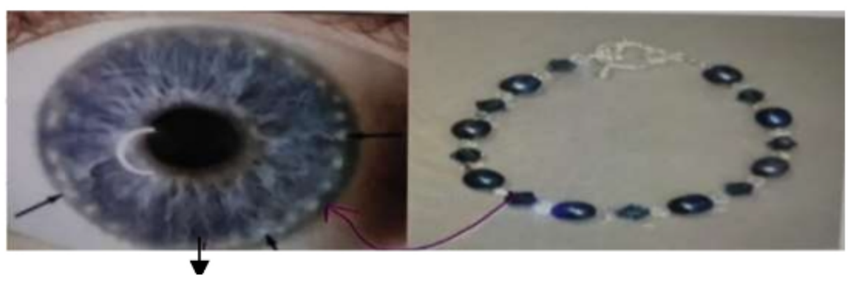
Lisch nodules
↓
Iris hamartomas
(Brownish spots)



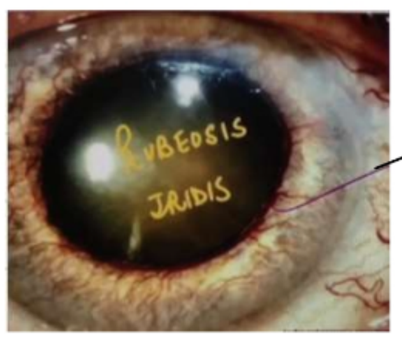
Brushfield spots
↓
Greyish spots in
Down's syndrome

IRIDOCYCLITIS 19:44

- In Leprosy
- Iris pearls appearance
- Complication : Cataract, Corneal degeneration, Occlusio papillae and Iris atrophy

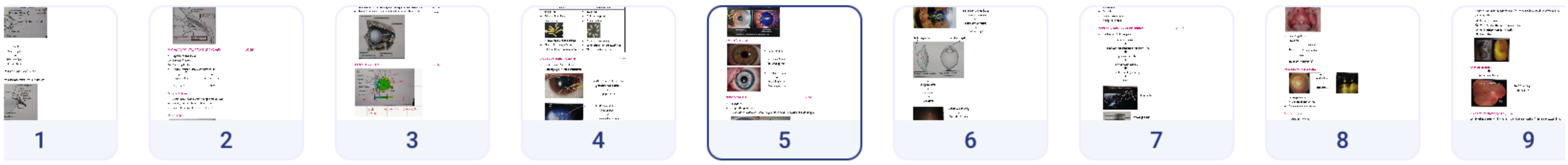


Iris pearls appearance



Vessels near iris margin
↓
Bleeding in angle of AC
↓
Ansler's sign

Pinch to zoom



Uveal Tract

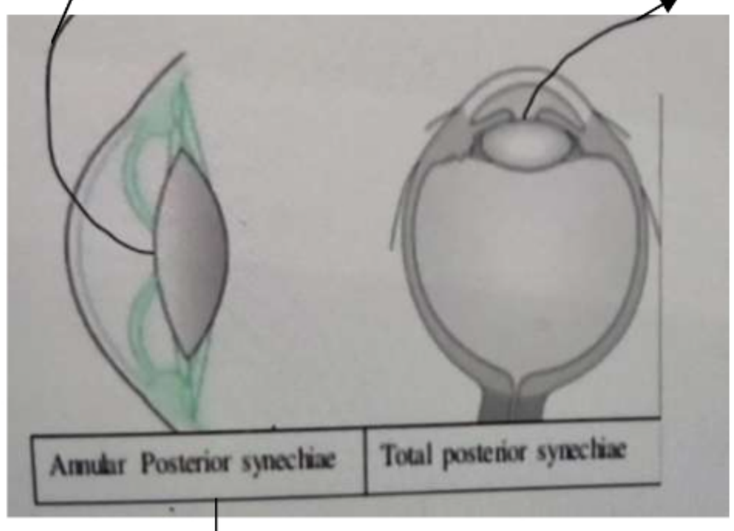
Topic Notes: 11



Irregular pupil
↓
In acute ant uveitis due to
segmental synechae
↓
Dilated with atropine
↓
"Festoned pupil"

Seclusio pupillae

Occlusio papillae

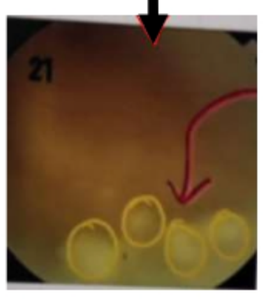


Ring synechae
↓
Iris bombe
↓
Glaucoma



Candle wax drippings
↓
Pre-retinal nodules
(Lander's sign)
↓
In sarcoidosis
↓

Snow banking ← Intermediate uveitis



Pinch to zoom

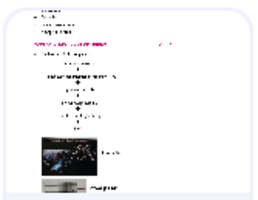

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Diff Diagnosis

- Candidiasis
- Sarcoidosis
- Ocular toxocariasis
- Multiple sclerosis

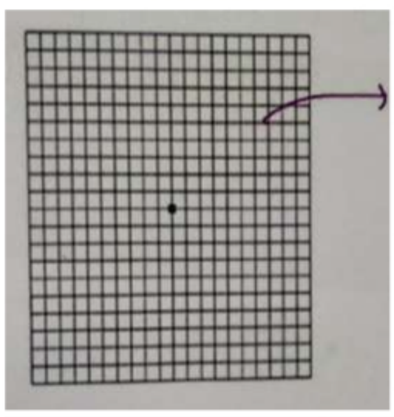
KAPLAN STEPLADDER APPROACH 25:37

- For treatment of pare planitis

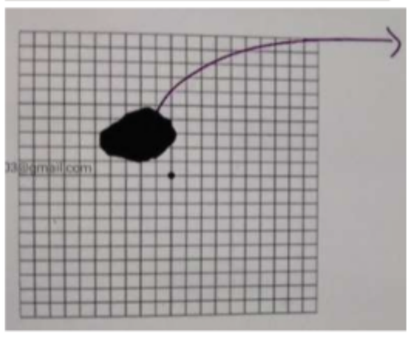
Periocular steroids
↓
Post subtenon injection of traimcinolone
↓
Systemic steroids
↓
Immunosuppressants
↓
Laser PC (or) Crytotherapy
↓
PPV



In Retinitis



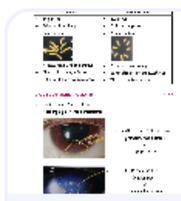
Amsler grid test



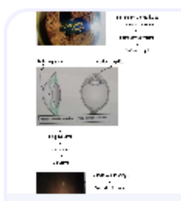
Positive scotoma → Choroiditis

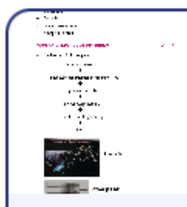
Pinch to zoom


3

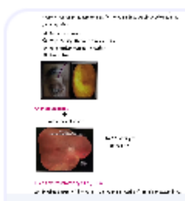

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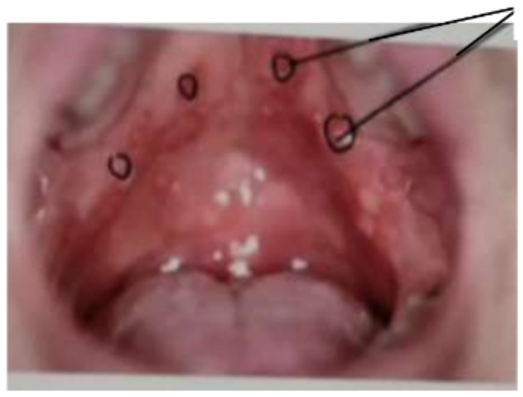

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Appathous ulcer under tongue

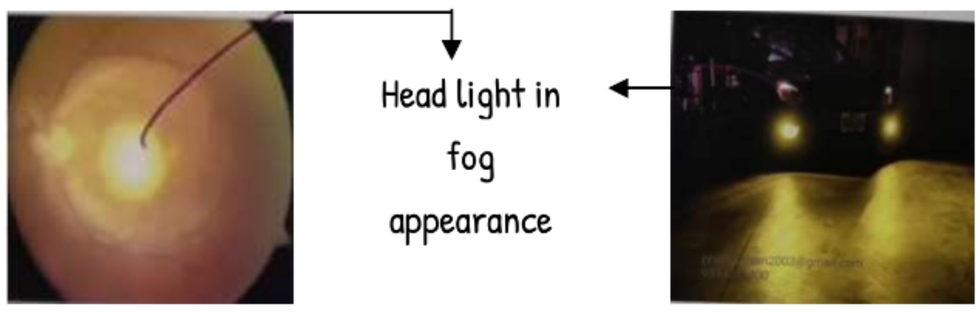


- Behcet syndrome
- HLA B+ve

Triad → Oral ulcer
Triad → Genital ulcer
Triad → Uveitis

- Transient Hypopyon (+)

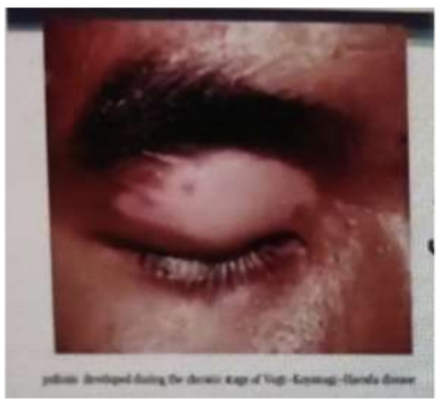
Headlight fog in appearance

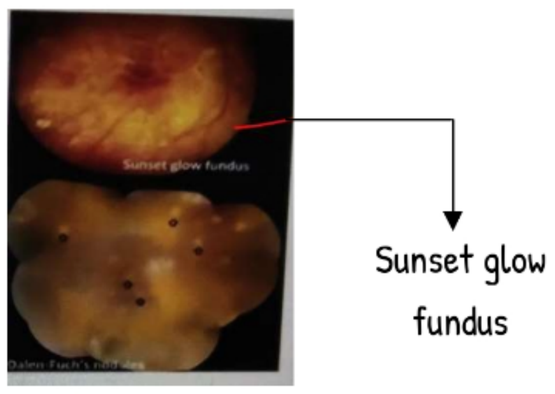


- In toxoplasmosis
- M/C cause of post uveitis
- Early macular involvement

VKH Syndrome

- Cutaneous = Vitilgo
- Ocular = Sunset glow fundus
- Neuro = Meningismus
- Ear : SNHL





Pinch to zoom

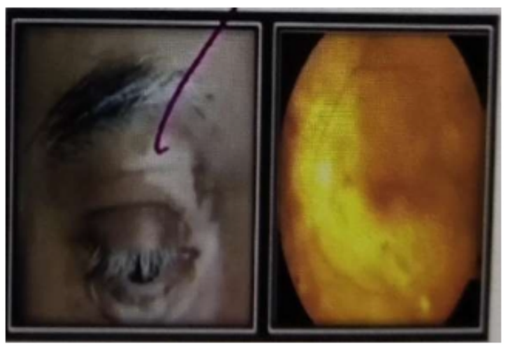


Uveal Tract

Topic Notes: 11

Q) A 35 year old male presents with sudden onset blurring of vision in both eyes. History taking reveals similar episode 4 months back. He has also been having a ringing sensation in his ears for past few weeks. Findings are shown below. What is your diagnosis ?

a) Behcets syndrome
✓b) Vogt-Koyangi-Harada syndrome = Ans
c) Fuch's Heterochormic iridocyclitis
d) Eale's disease



Chorioretinopathy

↓

Associate with uveitis



HLA-A29 strongest association

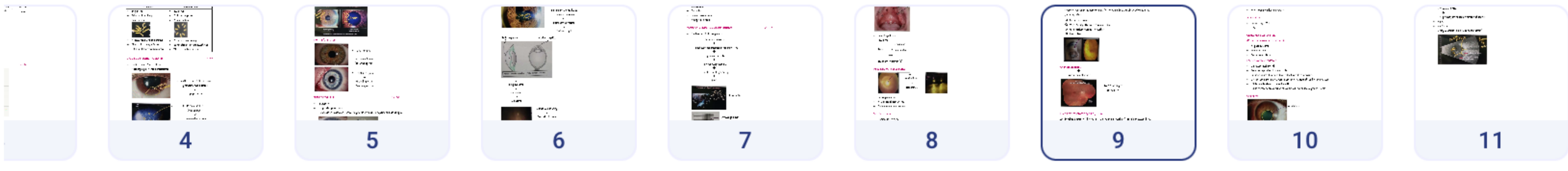
Fuch's heterochromic cyclitis (FHC)

An idiopathic disorder of the eye with heterochromia, uveitis of the lighter coloured eye, iridocyclitis, keratitic precipitates and often cataract



- U/L
- Affected eye lighter color
- Rubeosis iridis

Pinch to zoom



- Post synechae absent
- Stellate KP
- Non - granulomatous ant uveitis

Amsler sign

- Hemorrhage (AC)
- FHC

Glaucomat-ocyclitic crisis

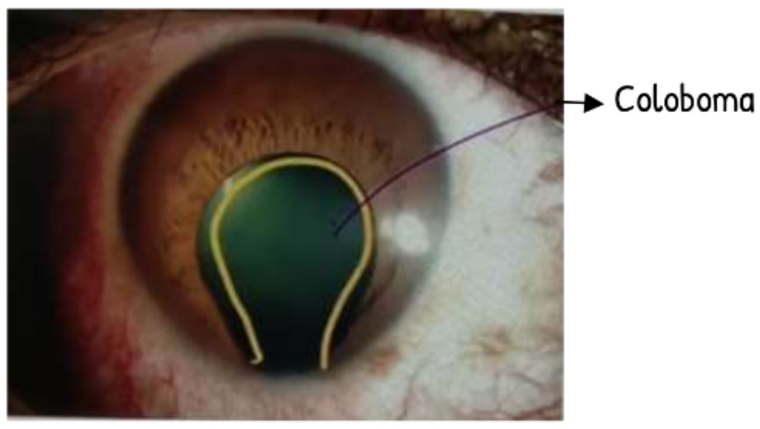
(Posner Schnlossman Syndrome)

- No post synechae
- No congestion
- Due to trabeculitis

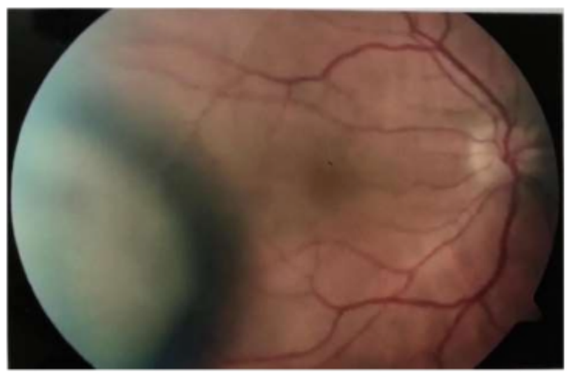
Features of this syndrome

- Uniocular involvement
- Recurrent episodes of mild cyclitis
- Duration of attack varying from a few hours to several weeks
- Corneal edema with a few keratic precipitates. Normal IOP between episodes
- IOP is usually elevated (40-60 mm Hg)
- IOP is related to the duration of uveitis but NOT to the degree of uveitis

Coloboma



- In infero-nasal quadrant (typical)



Pinch to zoom



4

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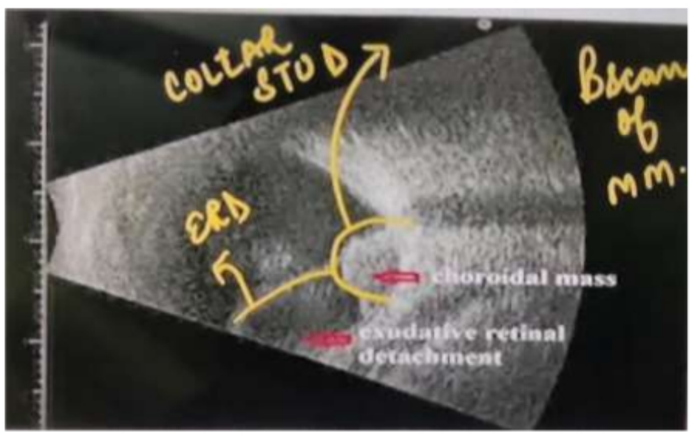
10

11

Uveal Tract

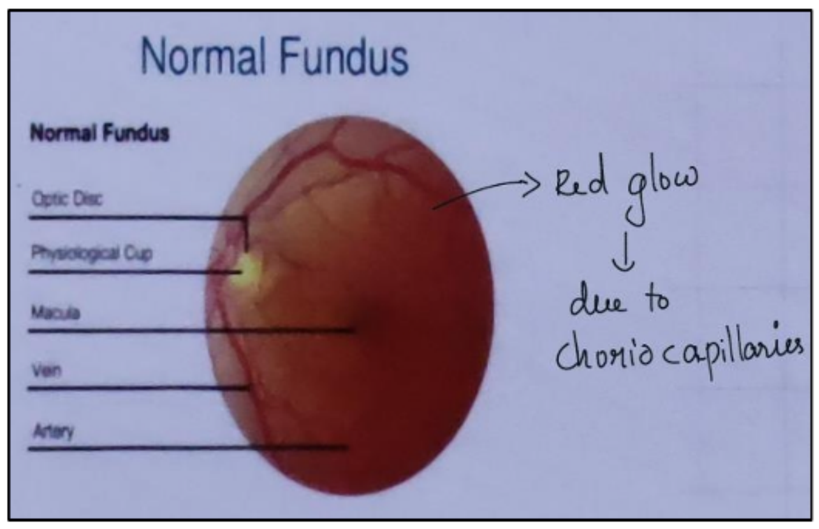
Topic Notes: 11

- Malignant melanoma of choroid
  ↓
  M/C cause of ERD
  ↓
- M/C primary intra ocular tumour of adults
- Males
- 40-70yrs
- Orange deposits in RPE (due to lipofuschin)

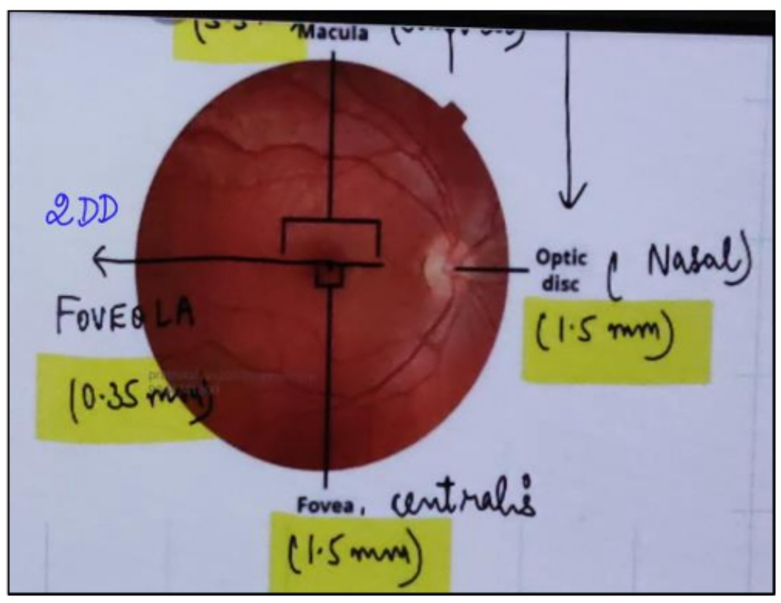


Pinch to zoom

Retina - Part 1



Retina — Central — Macula (Temporal)
Peripheral — Optic disk (Nasal) = 1.5mm



Distance b/w foveolar and optic disk

= 2 x DD

= 2 x 1.5

= 3 mm

- Foveola = 5 layers = Thinnest = Min. no. of layers
- Fovea centralis = Most sensitive

↓

Most cones

↓

Sharpest image formed

↓

6 layers

- Thinnest part of retina = Orra serrata

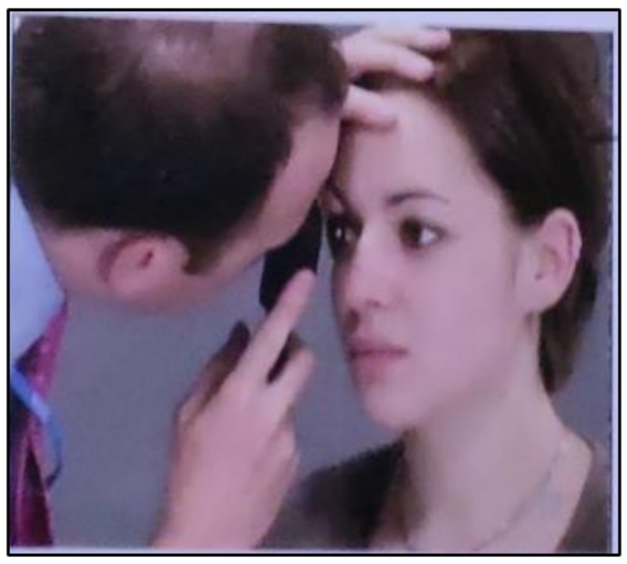
Retina (Part-1)

Topic Notes: 11

OPHTHALMOSCOPE = TO SEE THE RETINA

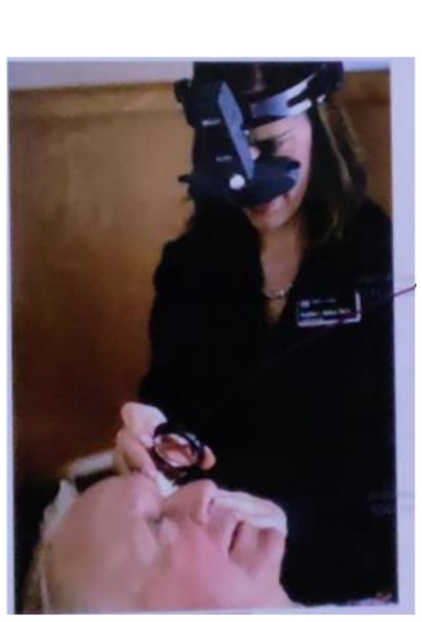
06:31

DIRECT



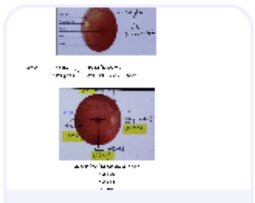
- Types: Direct
  Indirect

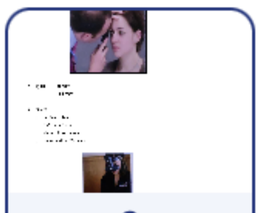
- Direct
  - Central retina
  - 2DD (Disk diameter)
  - Virtual, Erect image
  - Magnification: 15 times



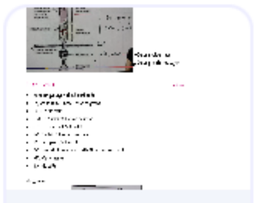
- Indirect
  - Peripheral retina
  - With +20D lens
  - 8DD
  - Periphery retina
  - Real, Inverted image

Pinch to zoom

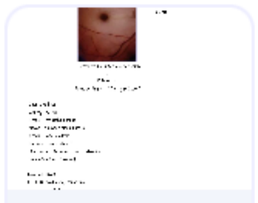

1


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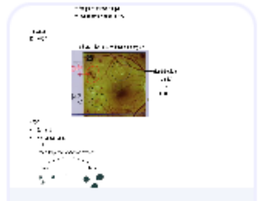

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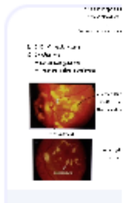

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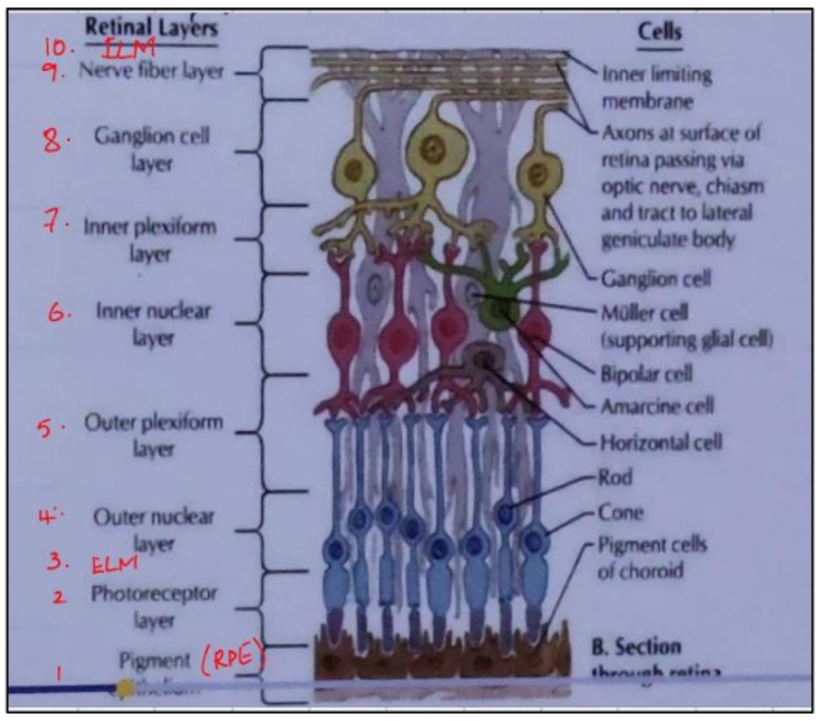

7


8



- Magnification = 5 times

LAYERS OF RETINA = 10 LAYERS *08:02*



RPE = Retinal pigmented epithelium

ELM = Ext Limiting Memb ILM = Int. limiting memb

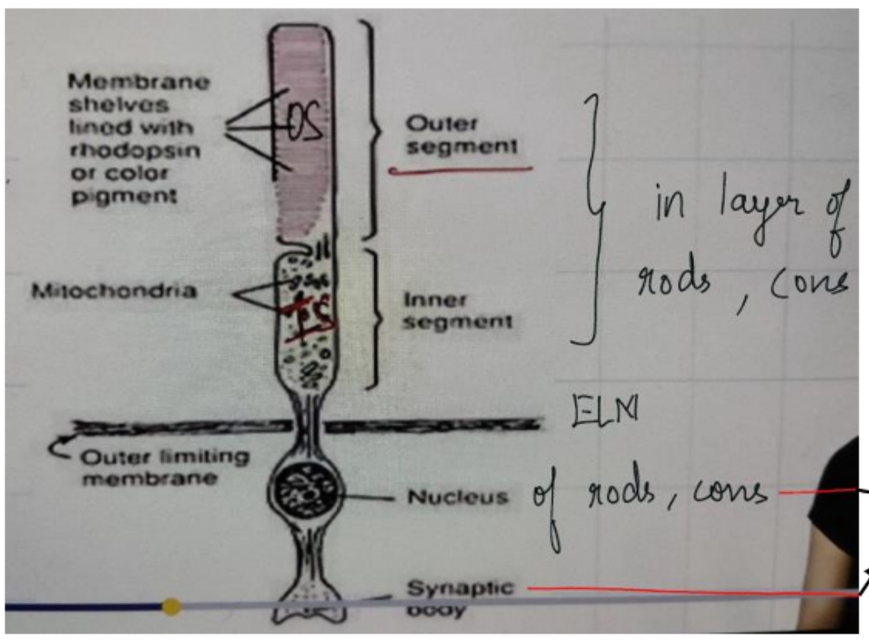
- RPE lies in contact with bruch's memb [Basal lamina of choroid]
  ↓
  Has melanin

- Photoreceptor = Rods
  Cones

- Most resistant to radiation = RPE
- Remaining 7 layers = Neurosensory retina
  ↓
  Btw this sub retinal space, has sub retinal fluid
- Most sensitive to radiation = Rods, Cones
- Most affected in retinal diseases = Outer plexiform layer
  Inner nuclear layer
- Nerve fibre layer = form optic nerve

STRUCTURE OF ROD, CONE

12:25

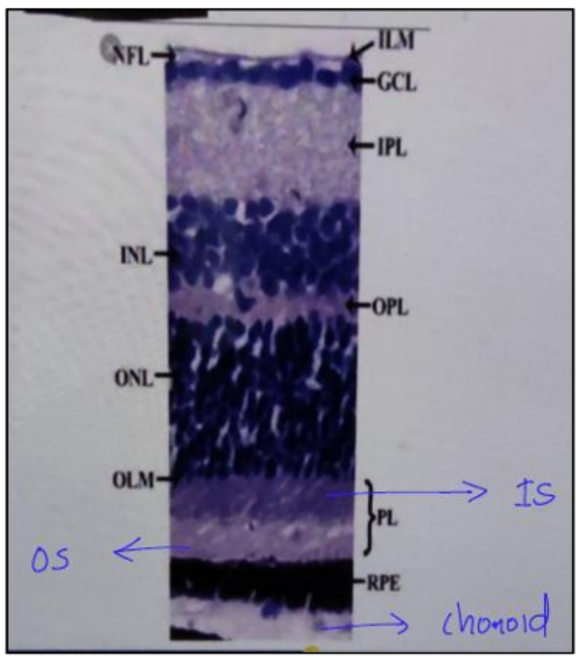


PHYSIOLOGY

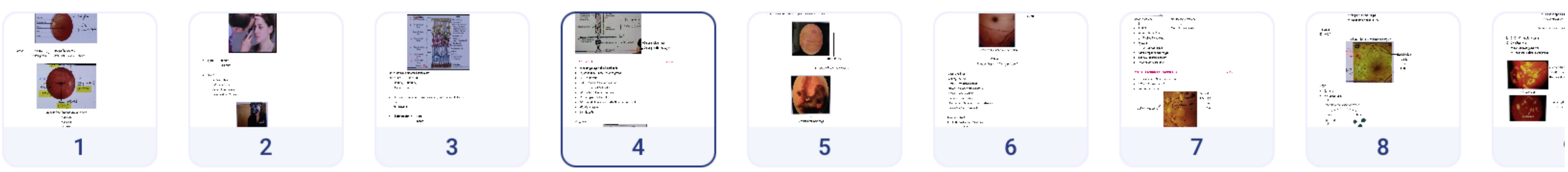
14:40

- RPE: Single layer of cuboidal cells
- Layers of R, C: Outer, Inner segment
- OLM → No cells
- ONL → Nuclei of I order neurons
- OPL→ Synapse b/w I and II
- INL: Nuclei of II order neurons
- IPL: Synapse b/w II and III
- GCL: Nuclei of ganglionic cells (III order neurons)
- NFL: Optic nerve
- ILM: No cells

Histology:



Pinch to zoom



Retina (Part-1)

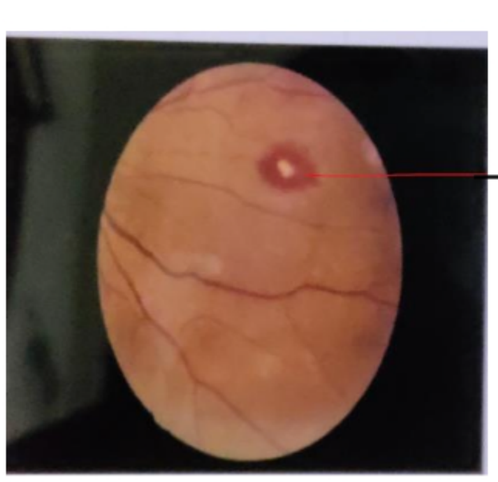
Topic Notes: 11

Blood Supply

- Central retinal artery

↓

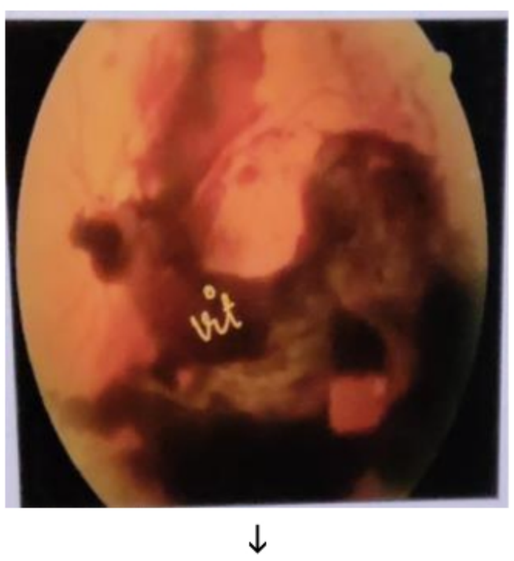
Except fovea centralis = supplied by choriocapillaries



ROTH SPOTS

↓

In subacute bacterial endocarditis



↓

Vitreous haemorrhage

↓

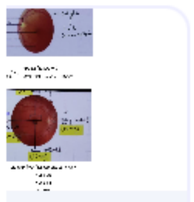
Blood in vitreous cavity

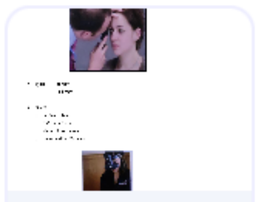
↓

No red glow

- Vitreous disease = have floaters
- Post segment disease = sudden, Painless loss of vision
- Spontaneous > Trauma
- Recurrent — Young = Eale's disease [Treat: Steroids]
  Elderly = PDR

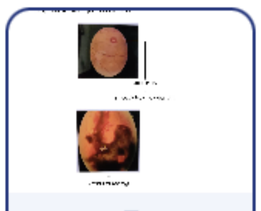
Pinch to zoom

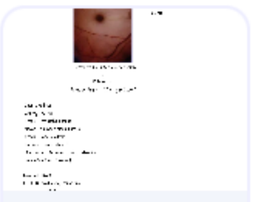

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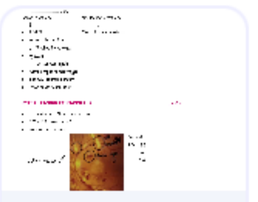

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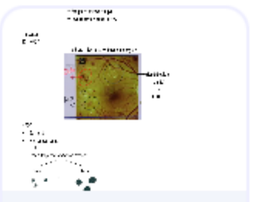

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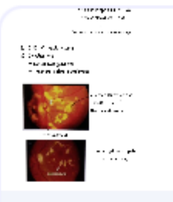

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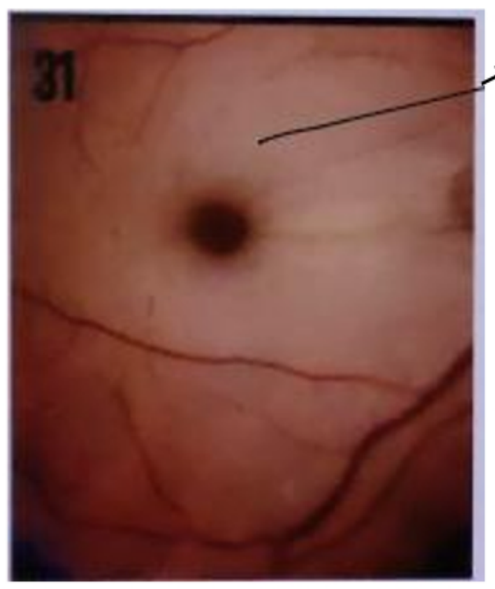

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CRAO



Central retinal arteriolar occlusion

↓

Pale retina

Fovea centralis = "Cherry red spot"

[Cherry red spot

Cherry - CRAO

Trees - Tay sachs disease

Never - Niemann picks disease

Grows - Gangliosidosis

Tall in - Trauma (Blunt)

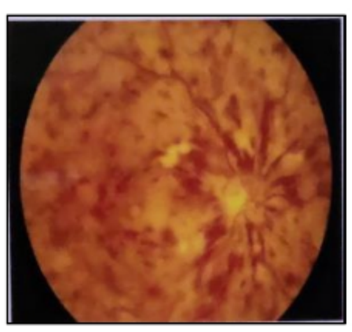
Mud γ - Metachromatic Leucodystrophy

Sand - Sandhoff disease]

Treat of CRAO

1. ↓ IOP to dislodge thrombus
2. IV drugs, Ocular massage
3. High flow O_2
4. Systemic — Steroids
   Anticoagulant

CRVO *29:57*



Central retinal venous occlusion
↓
Most common H/o of HTN, smoking

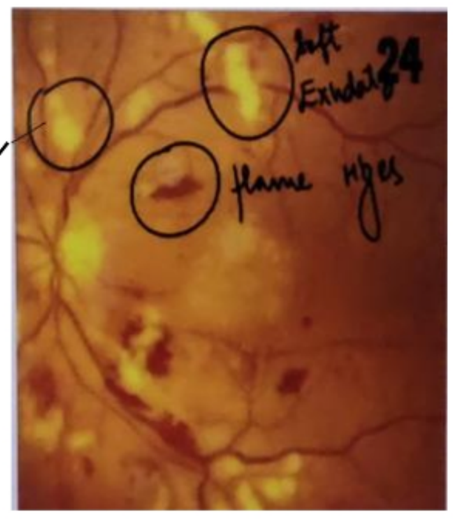
CRVO

Ischemic variety
↓
- ↑ VEGF
- Neovascularization
  - Flushed Tomato app
- Hypoxia
  - Cotton wool spots
- Flame shaped hemorrhages
- 100-day Glaucoma occurs
- Laser photo coagulation

Non Ischemic Variety
↓
Central macular edema

HYPERTENSION RETINOPATHY *32:47*

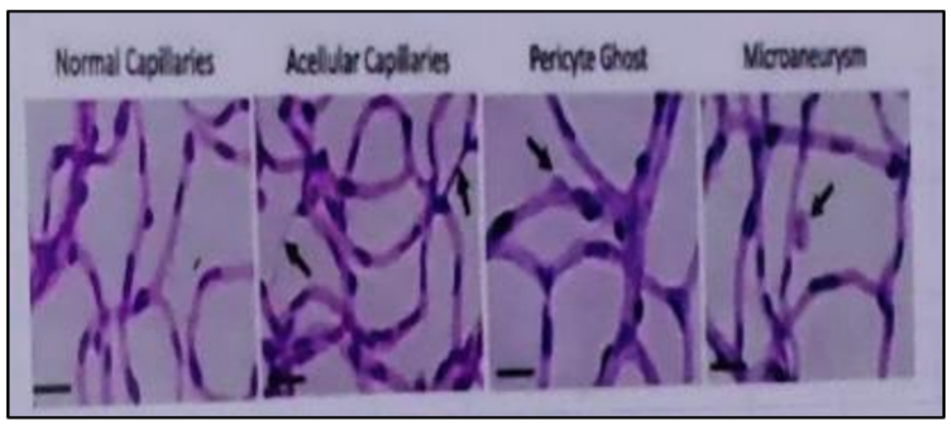
- Earliest sign = Nasal angiospasm
- A:V = 2:3 converts as 1:3
- No specific treatment



Cotton wool spots

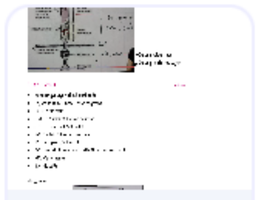
Earliest
A:V = 2:3
↓
1:3

DIABETIC RETINOPATHY *34:49*

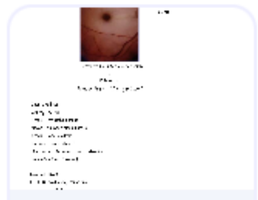


Pinch to zoom

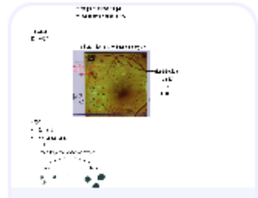

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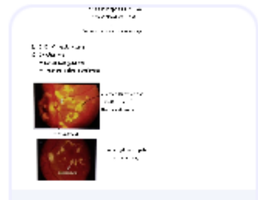

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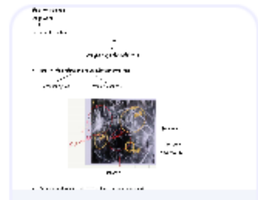

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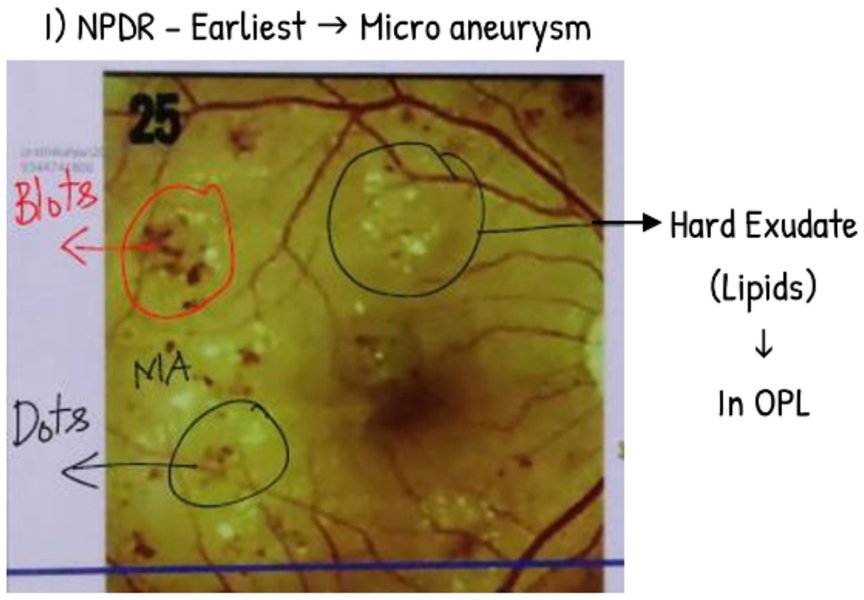

10


11

- Microangiopathy
- Microaneurysm = loss of pericytes
  = Hallmark of Dia. Retinopathy
  = Pin point hemorrhages
  = investigation done is FFA

4 Stages

1) NPDR

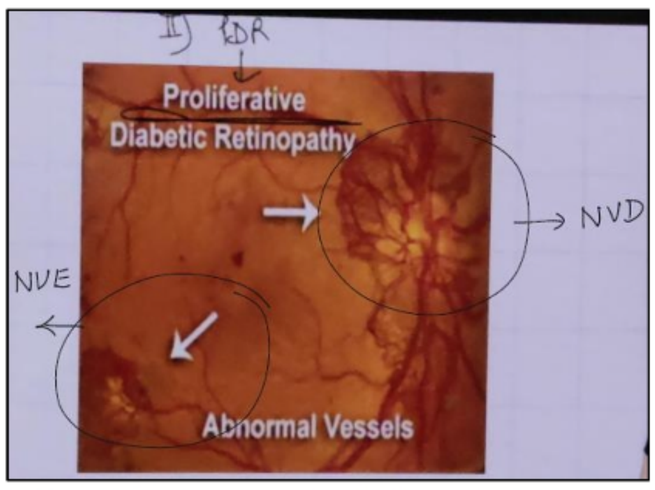


NPDR

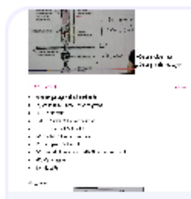
- Earliest
- Microaneurysm
  ↓
  Later deep hemorrhages develop



2) PDR

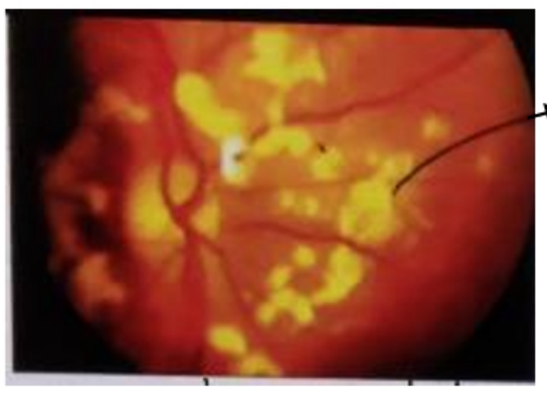


Pinch to zoom



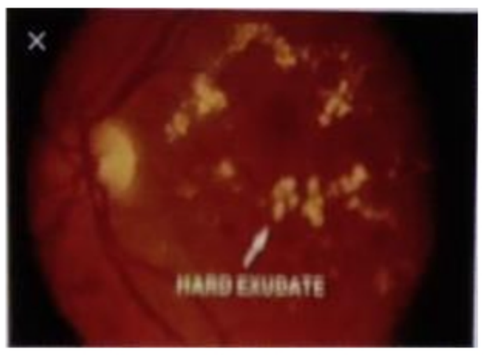
PDR
↓
Lot of neovascularisation
↳ Can be in optic disk = NVD
↳ Can be elsewhere = NVE
↓
Recurrent vitreous haemorrhage

3) CME = C. Macular edema
4) Complications
   → Neovascular glaucoma
   → Tractional Retinal detachment

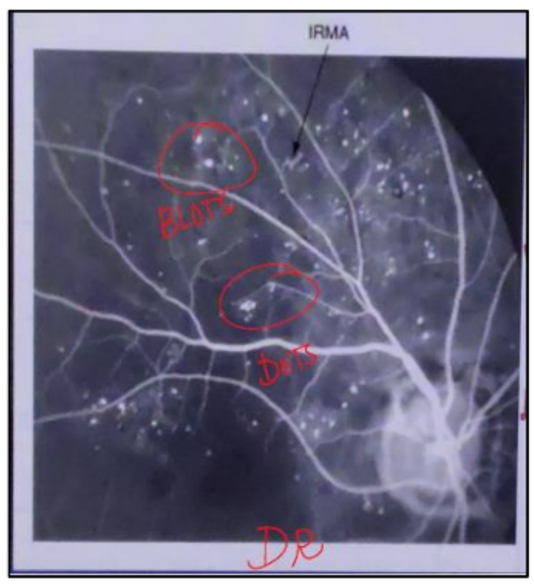


Larger, Fluffy, whitish
(Soft exudates)
Neuronal deposits

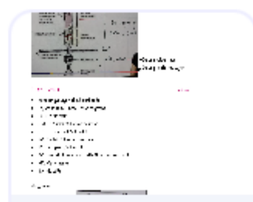
[Soft Exudates] ⤴

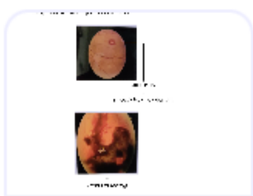


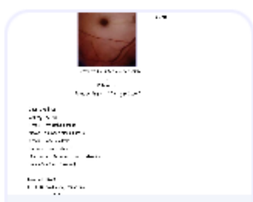
Smaller yellowish lipids
← [Hard exudates]



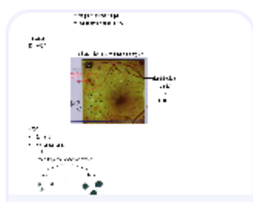
Pinch to zoom


4


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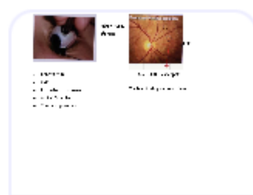

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Grey → CHOROID

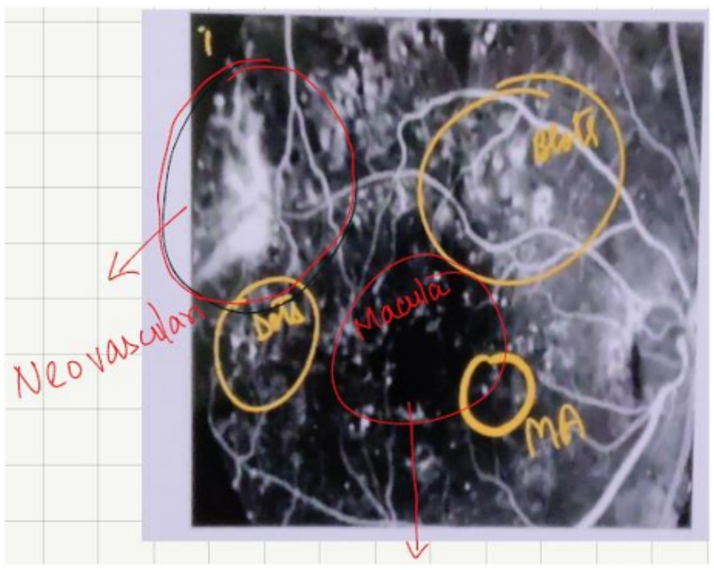
White → Retinal haemorrhage

Black → Ischemia

Large White
↓
Neo vascularisation

FFA
↓
Dye given by antecubital vein

- IRMA = Intra retinal micro vascular abnormalities
  - Microaneurysms
  - Venous changes



PDR stage

→ Ischemic Maculopathy

Ischemic

- Diminision of vision = is irreversible → Screening is must
  In diab. Retinopathy

DM
- Insulin - dep DM → M/C → Young onset → Screening within 5 yrs
- Non - insulin - dep DM → maturity onset → Screening immediately

[Most imp Risk factor: Duration of DM]

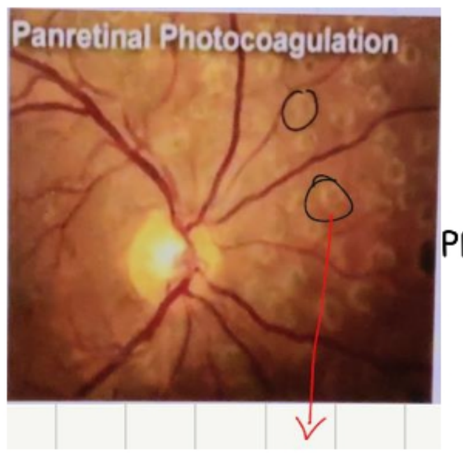
TREATMENT

46:50

T/tof DR



Intravitreous
Steroids
↵



PRP

- Control of BP
- PRP
- Intravitreous steroids
- Anti VEGF - PDR
- Treat complications

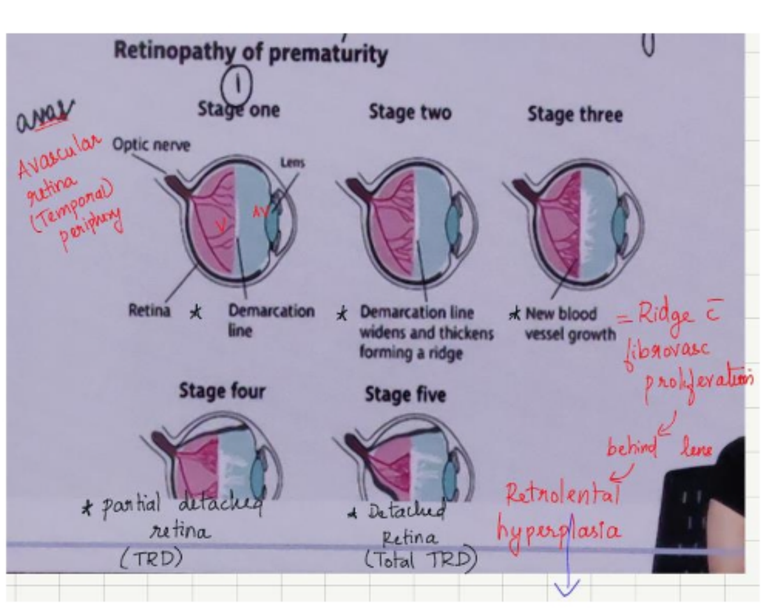
2500 - 3000 Laser spots
↓
Can lead to ring shaped scotoma

Retina - Part 2

Retinopathy of prematurity

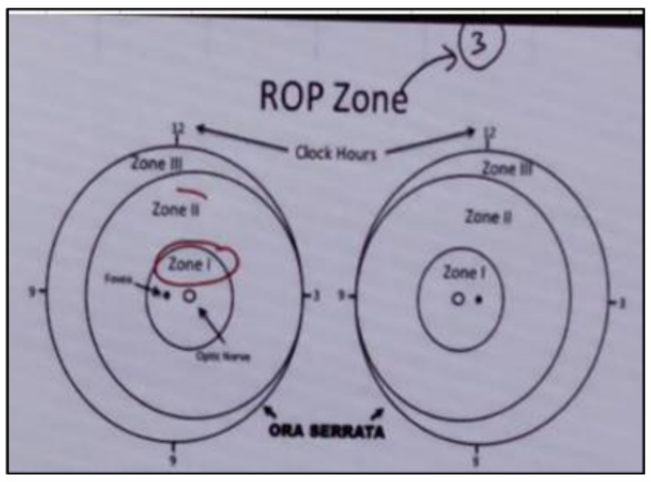
- < 32 weeks of POG
- < 1.5 kg body weight

↑ Conc of O_2 = Risk factor



D/D of Leucocoria

- TRD = Tractional retinal detachment



Zone I	Zone II	Zone III
Concentric circle centered on optic nerve. Radius = 2x distance from nerve fovea	Concentric annular area from outer border of zone I to the ora nasally and just beyond equator temporally	Temporal crescent from outer border of zone II to temporal ora serrata.

- See the extent
- See plus disease [Tortuous arteries Engorgement of Veins]

Severe ROP

- Threshold disease
  ↓
  - ≥ stage 3
  - Zone 1 (or) 2 involved
  - ≥ 5 clock hrs involved
  - Plus disease

- Treat Laserphoto coagulation of avascular retina upto orra serrata

SCREENING OF ROP

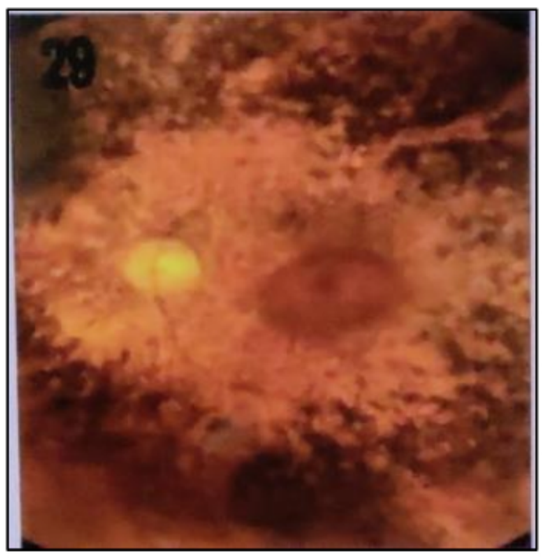
07:24

<28 wks of gestation
↓
Within 2 weeks of birth

> 28 weeks of gestation
- < 1.7 kg ↓ Within 3 weeks
- >1.7 kg ↓ Within 4 weeks

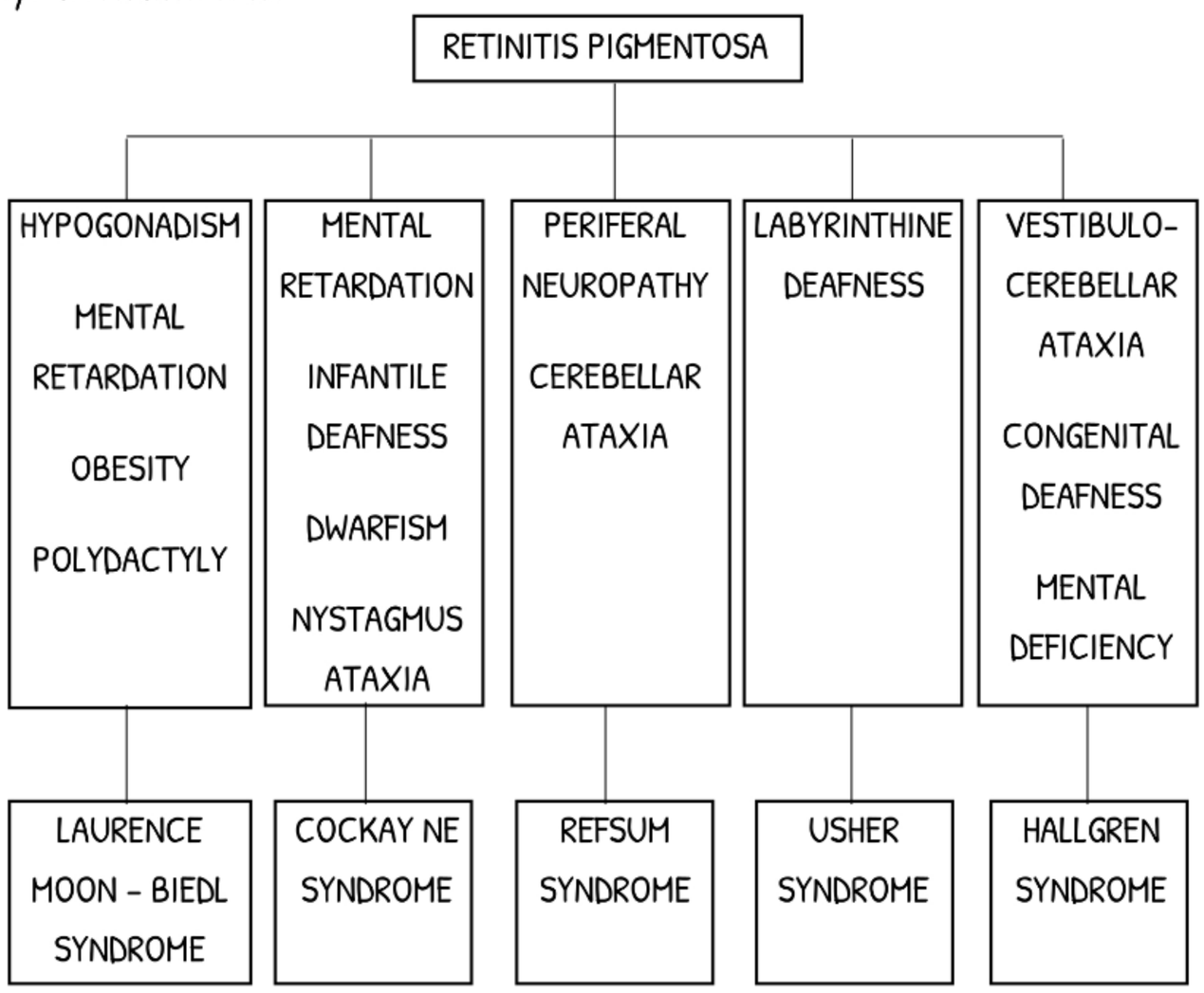
RETINITIS PIGMENTOSA

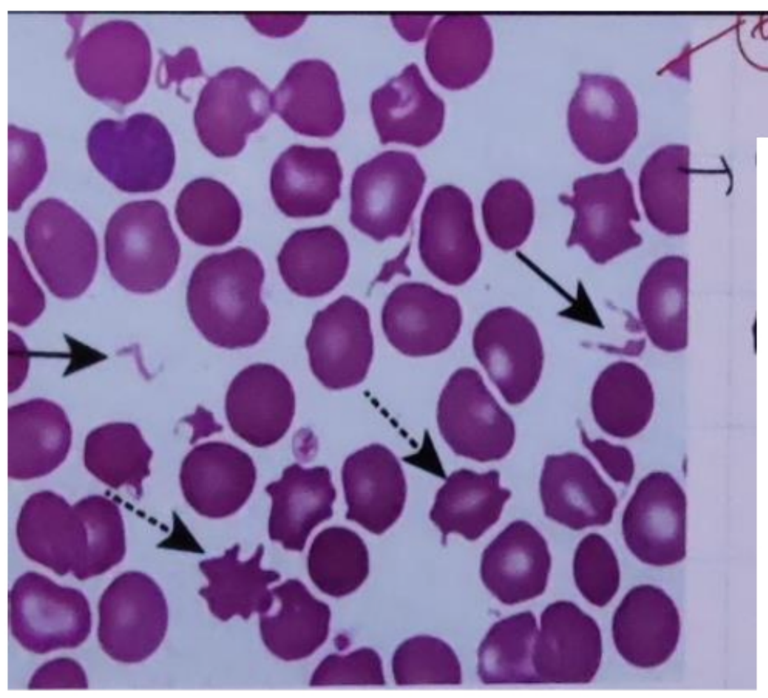
08:33



- Affects retinal pigment epithelium
- Mostly periphery affected [Rods] → Night blindness
- Triad
  - Pale Yellow waxy disc
  - Pigmentary spicules = ring shaped scotoma
  - Arteriolar attenuation

Iys association of R.P

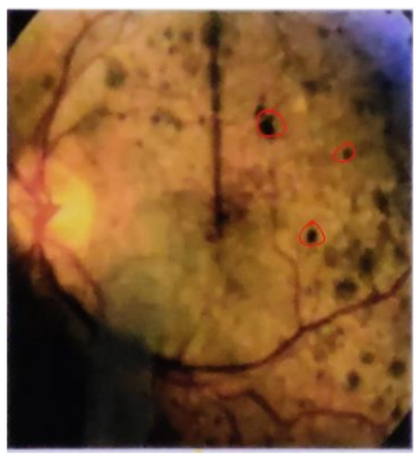




Acanthocytosis in R.P

↓

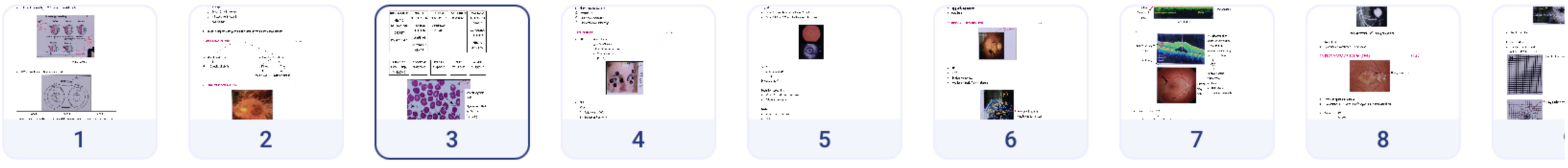
Syndrome called as Bassen Kornzurg syndrome



Black and white flecks

↓

Pinch to zoom



Retina (Part-2)

Topic Notes: 12

Salt and pepper retinitis

1) Congenital rubella
2) Congenital syphilis
3) Phenothiazine toxicity
4) Atypical RP
5) Fundus flavimaculatus
6) Maculocerebro facial degⁿ

TESTS IN RP

15:19

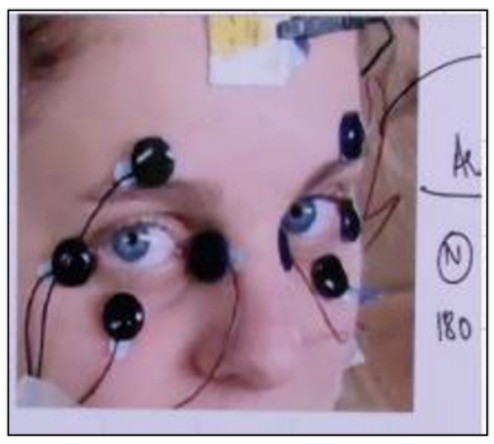
- EOG → Arden Index

  ≥ 185% = Normal

  180 – 150 = Borderline

  < 150 = Subnormal

  < 125 = Flat



- ERG

  Waves

  A = Rods, (ones [R>C]

  B = Bipolar cell activity

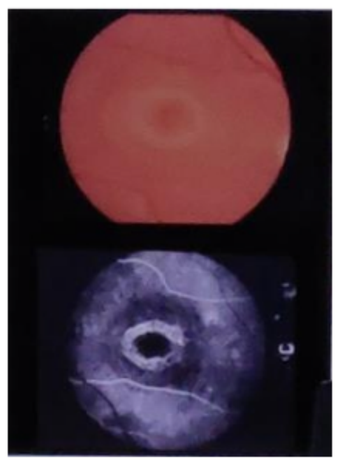
  C = RPE activity



Bull's eye Maculopathy:

"Bull's Eye" Maculopathy → Irreversible lesion → due to chloroquine (CQ) toxicity (5 yrs)

- Patient presents with fundus & FA findings.
- Patient taking 500mg/day hydroxychloroqine



MOA

CQ + Melanin of RPE

↓

Toxicity of R, C

Tests for screening

- Within 6 months of treatment
- Follow up annually

Tests:

- Visual acuity, fundus
- HFA
- Multifocal ERG
- Spectral OCT
- Auto florescence

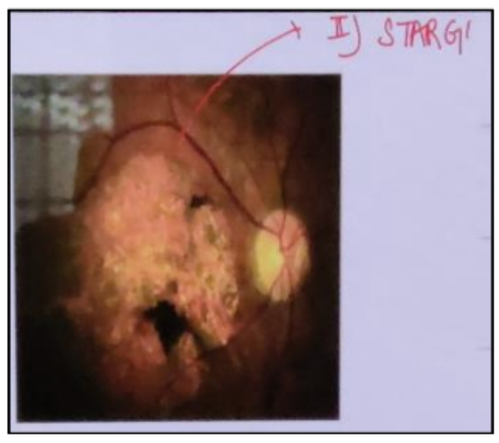
MACULAR DYSTROPHIES

20:19

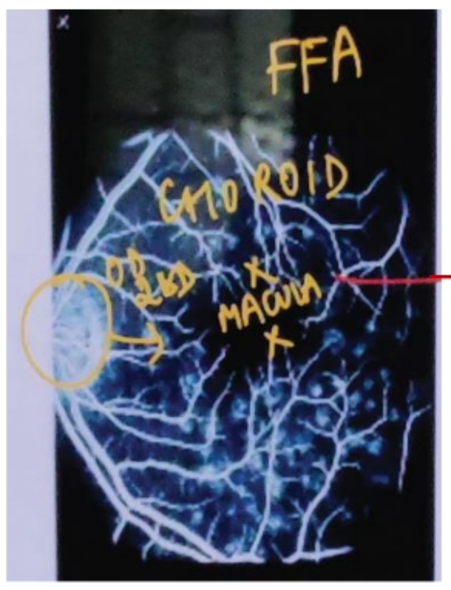


- Best disease = given by FD Best
- AD
- II m/c
- Egg yolk appearance
- EOG done

STARGARDTH'S DISEASE 21:39

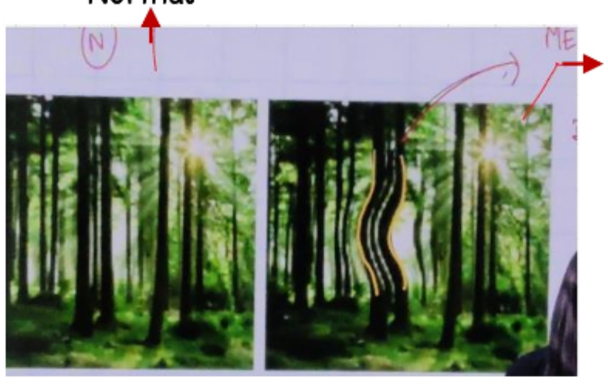


- AR
- M/C
- Beaten bronze app
- FFA done = Dark / silent choroid



No choroid seen in Macula due to macular dystrophy.

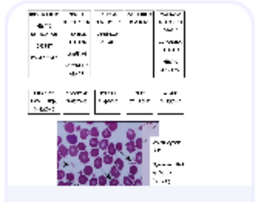
Normal



Metamorphosia
↓
Distorted images seen (Macular disease)

Pinch to zoom

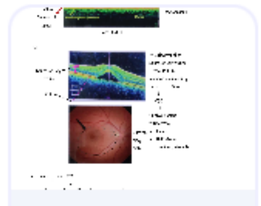

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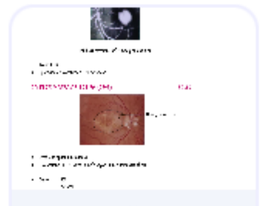

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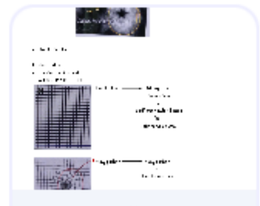

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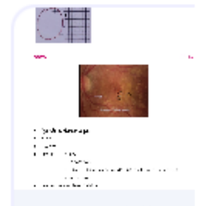

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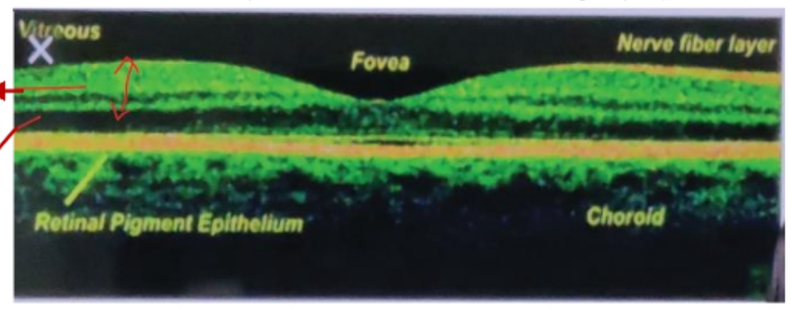

9


10

Retina (Part-2)

Topic Notes: 12

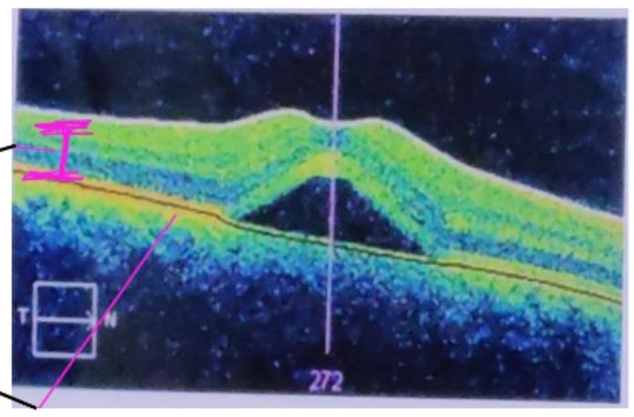
OCT – Optical coherence Tomography



Normal OCT

Optical coherence tomography

CSR:



→ Detachment of Neurosensory retina / from RPE in macular area leading to SRF collection.

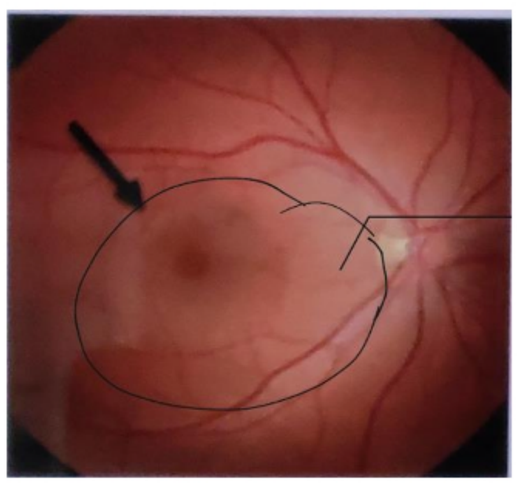
↓

CSR

↓

Central serous retinopathy

- Males
- H/O stress smoking, steroids



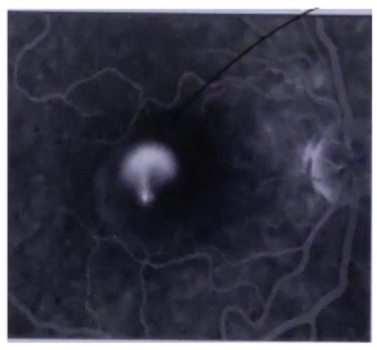
Central ring sign

- Investigation is FFA

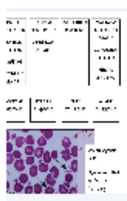
  ↓

  Mushroom (or) umbrella (or) smoke stack pattern

IOC is FFA



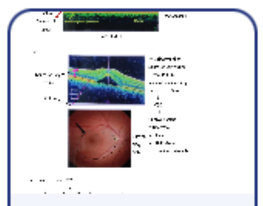
Pinch to zoom

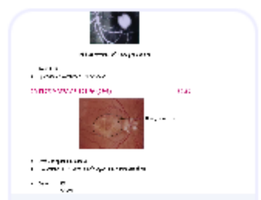

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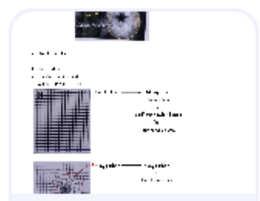

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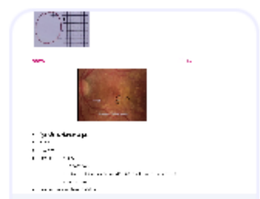

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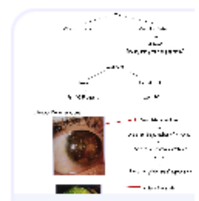

6

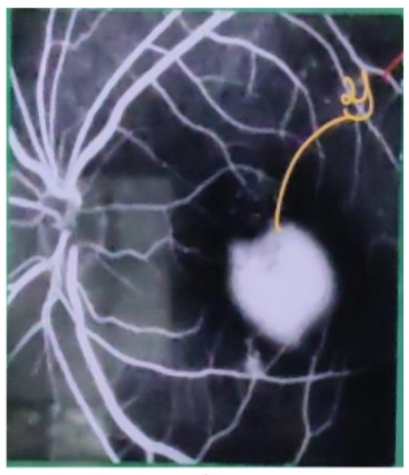

7


8


9


10


11



↓

Ink blot pattern (or) Enlarging dot sign

Treat CSR

- Spontaneous resolution = 4-12 weeks

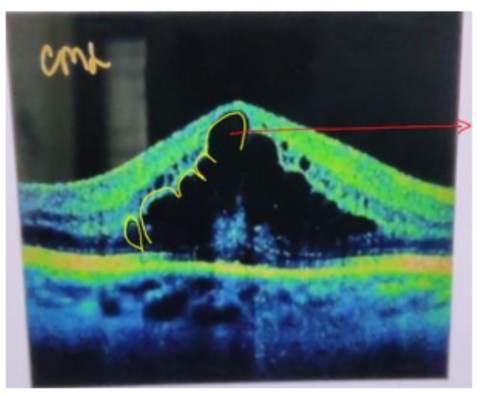
CYSTOID MACULAR EDEMA (CME) *30:30*



Honey comb app

- Cyst like spaces in macula
- Collections in OPL (or) Henle's layer , INL = Petalloid fibres

- Cause: RP
  Uveitis
  Niacin toxicity
  Intra ocular surgery → Irwin Gass
  (Cataract) Syndrome

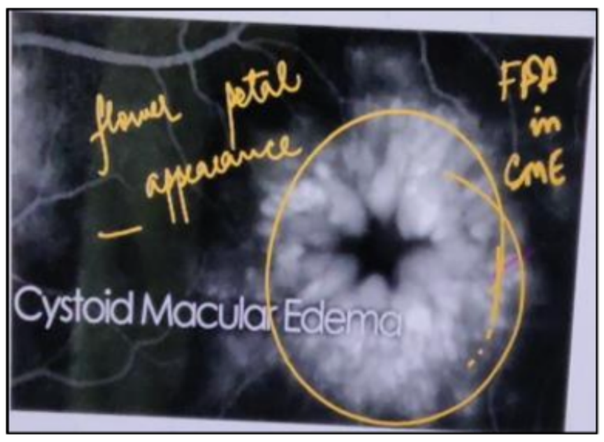


Cyst like spaces
↓
Cystoid macular edema

OCT

Retina (Part-2)

Topic Notes: 12

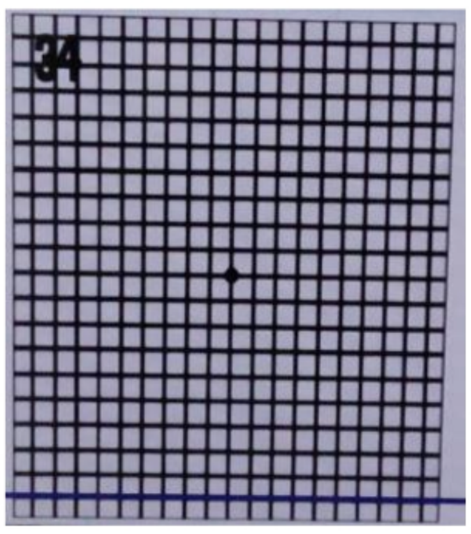


- Treat: Steroids

Amsler Grid test

- Macular function test

AMSIER GRID TEST (MF)



Macular Fxn ⟶ 400 squares

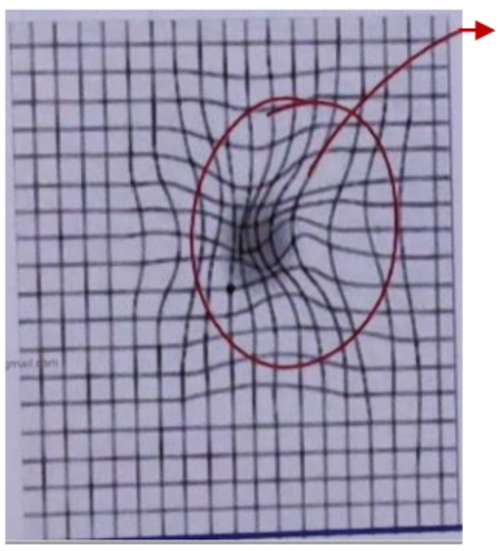
5mm x 5mm

↓

To diff b/w Macular disease

(or)

Optic nerve disease

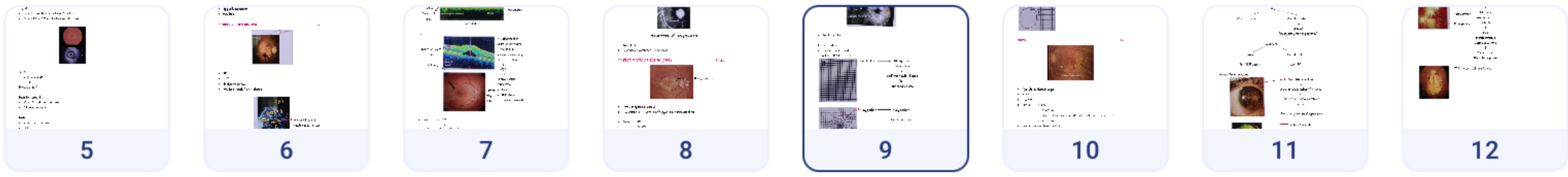


Wavy pattern ⟶ Wavy pattern

↓

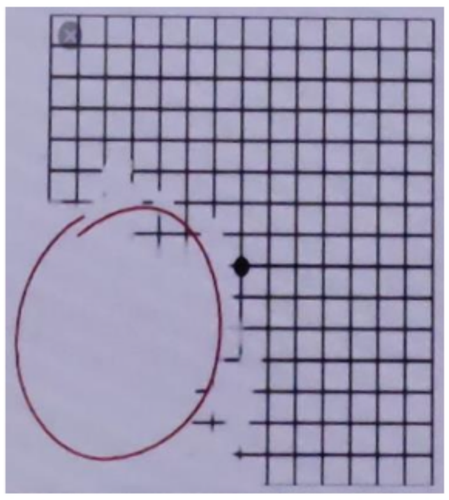
Macular diseases

Pinch to zoom



Retina (Part-2)

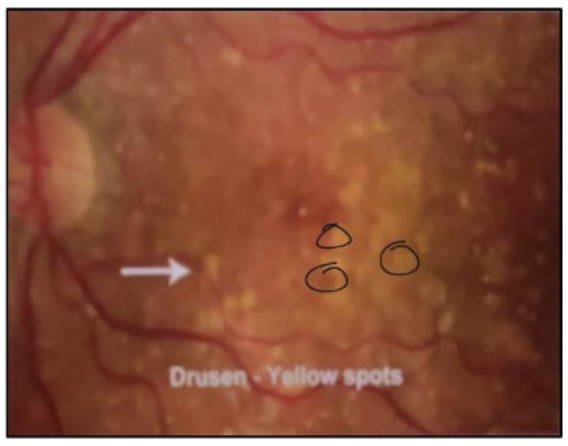
Topic Notes: 12



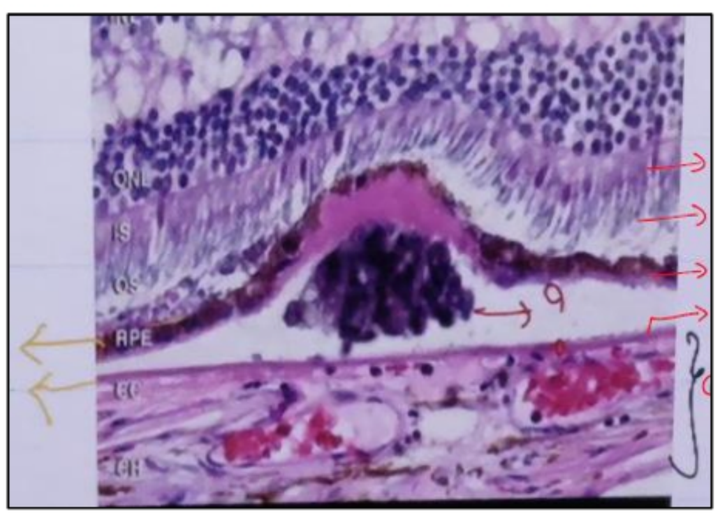
→ Missing line pattern
↓
Optic nerve diseases

ARMD

35:14



- Age related Macular degen
- M = F
- ≥ 60 yrs
- Dry ARMD = 90%
  = Drusens seen
  = Extracellular deposits b/w RPE and Bruch's memb of choroid
  = Hard exudates
- Gradual, Painless loss of vision
- Treat: Multivitamins
  +
  Anti - oxidants



→ Drusens
IS
OS
RPE
Bruch's memb
CHOROID

Pinch to zoom



Wet ARMD

- Choroidal Neovascularization

FFA

Classic pattern

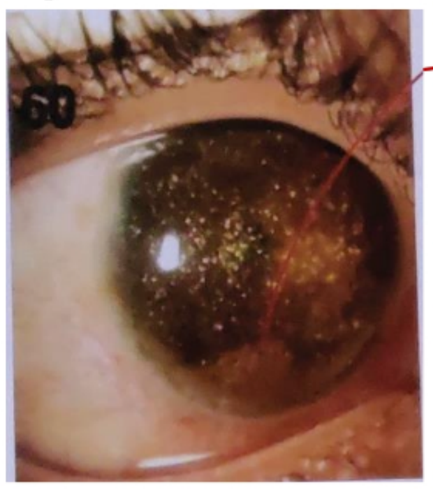
Occult / Hidden
↓
Do ICGA
[Indocyanin green angiography]

Treatment

Foveal
↓
Anti VEGF agents

Extrafoveal
↓
Laser PC

Vitreous Degenerations



Synchisis Scintillans
↓
Lysis (or) Liquefaction of vitreous
↓
Cholesterol crystals settle at bottom
↓
"Shower of golden rain" appearance



Asteroid Hyalosis
↓
Star shaped Ca bodies in normal vitreous gel
↓
Starry sky appearance

Retina (Part-2)

Topic Notes: 12

HIV Retinopathy



More common
↓
Pizza pie app

HIV Retinopathy
↓
CD_4 count < 50
↓
M/C ocular infection is CMV retinitis
↓
M/c manifestationis
cotton wool spots
↓
Pizza pie (or)
Brush fire app seen



More specific Brush fire app

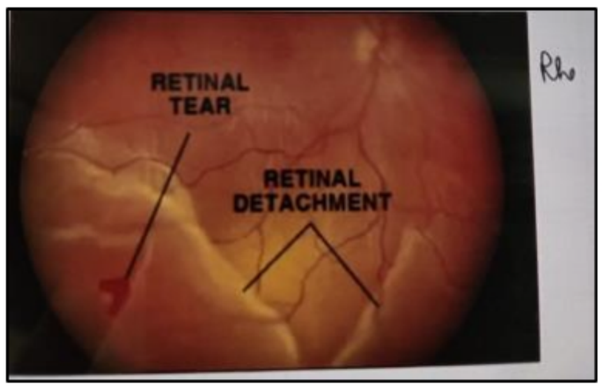
Pinch to zoom

Retina - Part 3

Retinal detachment (RD)

- Separation b/w Retinal pigment epithelium and Neurosensory retina

1) RRD (m/c)



Rhegmatogenous Retinal detachment

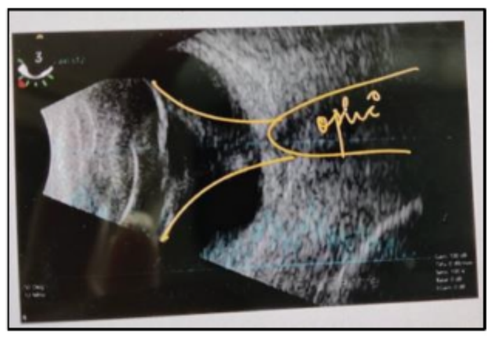
- Retinal hole → Most imp risk factor
  → Horse - shoe shaped in Sup. Temporal Quadrant
- Males
- > 60 yr
- Trauma
- Aphakia
- Pseudophakia
- High myopia
- Lattice deg

Clinical features

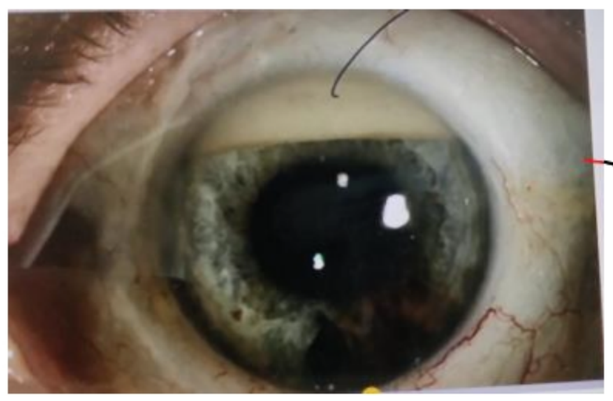
- Vitreo - retinal traction — Photopsia (Flasher of light)
  Floaters (Black spots)

- B scan USG done
  ↓
  Brightness scan (2D USG)
  ↓
  Funnel shaped

B scan USG



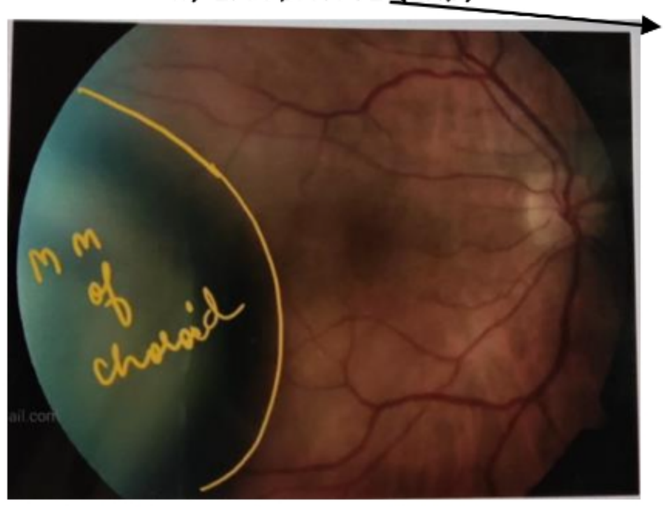
- Treatment
  - Sealing of retinal hole by Laser PC
  - Scleral Buckling
    ↓
    Silicone patch
  - Int tamponade — SF6 gas / Silicone oil



Inverse
Hypopyon like

EXUDATIVE RETINAL DETACHMENT (ERD) 07:03

II) EXUDATIVE (ERD) → Collection
↓
Sudden



- Collection of exudates, fluid, tumor
- Sudden painless loss of vision

- No photopsia
- No floaters

- B scan = Convex / smooth RD
- Treat: only of cause

TRACTIONAL RD

09:03

- Pulling of retina by dense VH (or) fibro vascular tissue in vitreous cavity

  Eg: PDR = (Gradual)

  Trauma

  Eale's disease

  ROP

- Gradual Painless loss of vision
- B scan USG = Tent / concave RD



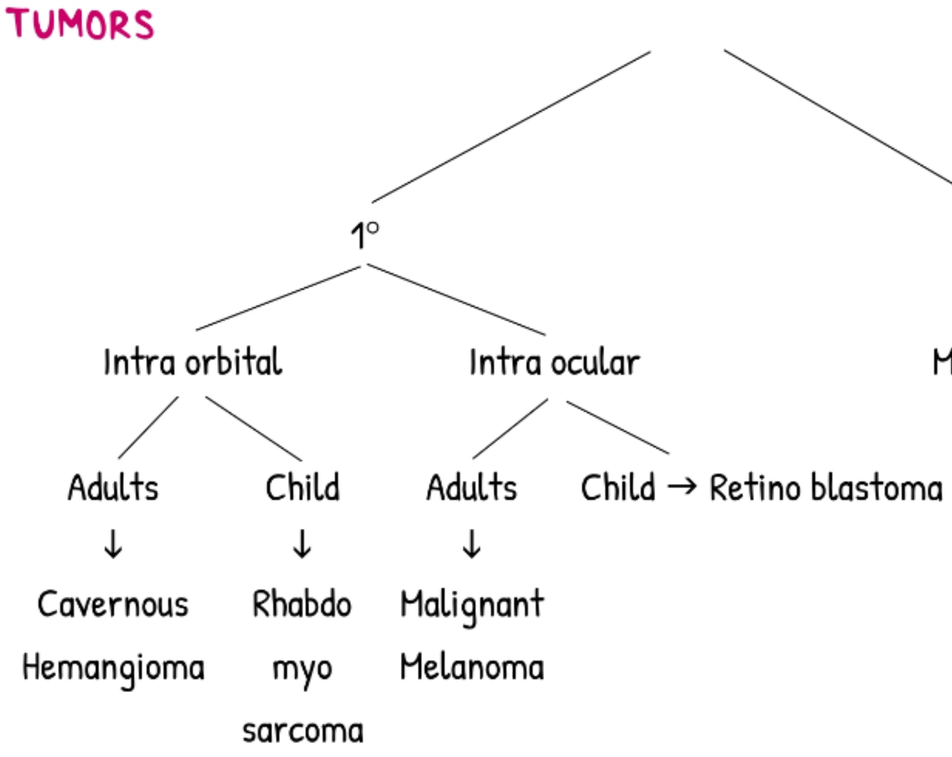
- Treat: Stop vitreous Hemorrhage = Laser PC

  Remove old vitreous hemorrhage

  RD suturing

TUMORS

11:57

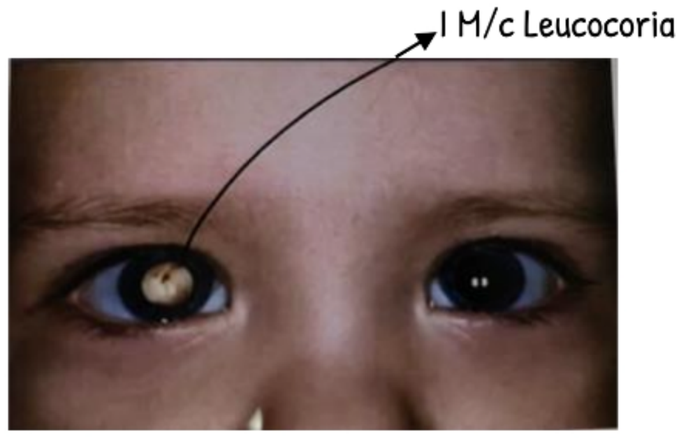


RETINOBLASTOMA

13:33

- 2 gene mutations in Rb gene (13q 14)
- 1.5 yrs = M/C age
- M/c tumor ass. With Rb = osteosarcoma (2°)
- Trilateral Rb = B/L Rb + Pinealoblastoma (1°)

- 1st M/C sign = Leucocoria
  2nd = Squint
  3rd = Glaucoma





Unilateral leukocoria



Bilateral leukocoria



Secondary glaucoma and buphthalmos

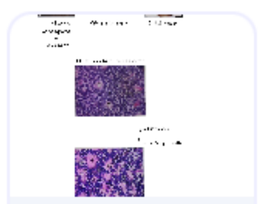
Pinch to zoom


1


2


3


4


5


6



Iris nodules and
pseudohypopyon
↓
Pseudo uveitis

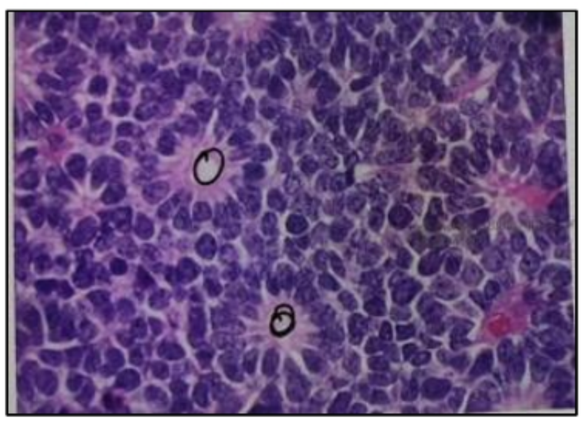


Orbital inflammation

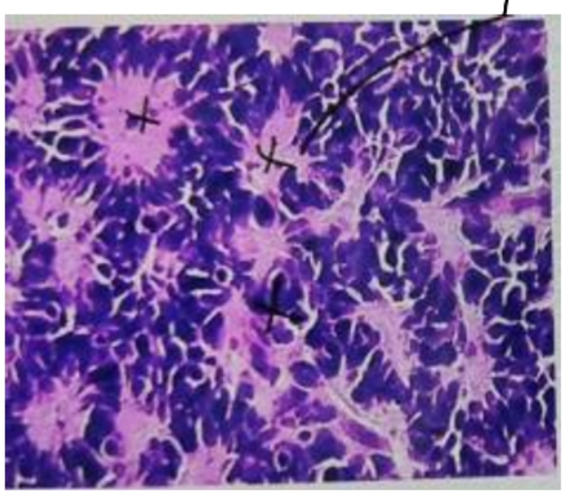


Orbital invasion

M/E 1) Flexner Wintersteiner rosettes



No Lumen seen
↓
Horner Wright rosettes



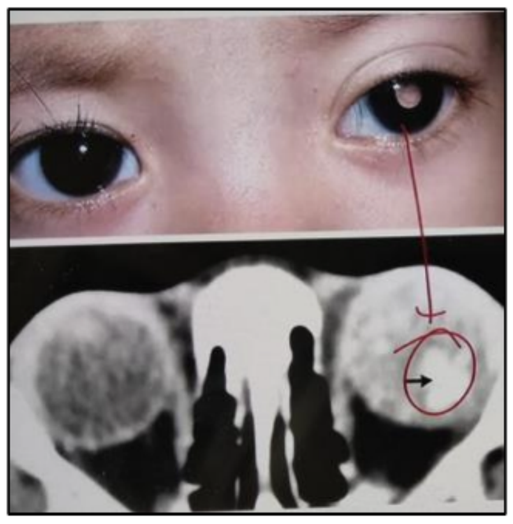
Tests

1) B scan

B-scan USG of Retinoblastoma showing solid, posterior intraocular mass contains strong particulate reflections attributable to intralesional calcification.



2) CT scan
↓
Not done usually to avoid radiation
↓
So best IOC: MRI scan



Treatment:

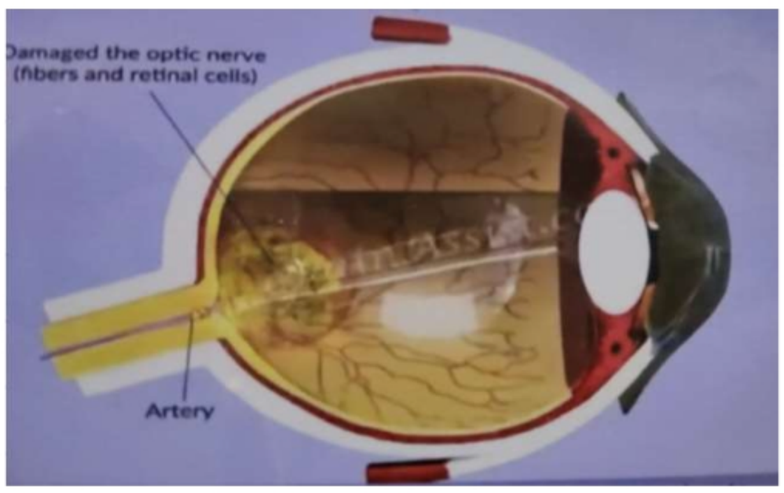
- U/L < 10mm — Cryo / Laser
- U/L ≥ 10mm → Enucleation
- B/L → chemo (VEC)

- Vincristine
  Etoposide
  Carboplatin

- Life long surveillance

Ocular Ischemic Syndrome

Ischemic Eyeball Pain



- Most common cause of ischemia is hypoperfusion 2° to occlusion of carotid artery
  ↓
  90% stenosis

- Ischemia is the decrease of blood supply to a tissue. It can be local, caused locally by a thrombus or embolus, or global due to a low perfusion pressure
- Hypoxia is lack of oxygen to a tissue from any cause
- Syndrome is a group of symptoms which consistently occur together
- Stenosis means abnormal narrowing of blood vessels
- Perfusion pressure, refers to the pressure gradient that drives coronary blood pressure, meaning the difference between the diastolic aortic pressure and the right atrial end diastolic pressure

Etiology

- Rare condition results from chronic ocular hypoperfusion 2° to carotid artery stenosis
- U/L (80%)
- Chronic insufficiency of ophthalmic artery

Pathogenesis

- Ipsilateral Atherosclerotic Carotid Stenosis (> 90%)
  ↓
  50% reduction of I/L perfusion pressure
- Associate with Dia, HTN, IHD, Cerebro-vascular disease

Ocular Ischemic Syndrome

Topic Notes: 4

CAROTID STENOSIS 06:33

- Atherosclerotic occlusive carotid artery disease

  ↓

  Associate with ulceration at bifur of common carotid artery

- Associate with male, old age (60-90yrs), smoking, Carotid HTN, DM, Hyperlipidemia

Manifestations

- Amaurosis jugax
- Retinal artery occlusion (due to embolus)
- TIA stroke
- Asymmetric dia retinopathy

Symptoms

- Loss of vision
- Transient blackouts
- Pain = Peri-ocular/Periorbital
- Delayed dark adaptation

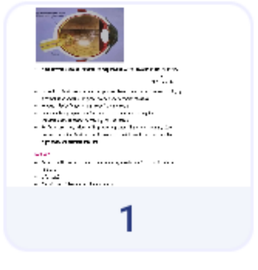
Signs

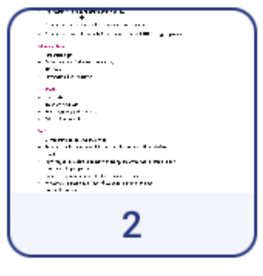
- Cornea may show oedema and striae
- Anterior chamber may reveal fain adueoqus flare with few, if cell (ischaemic pseudoiritis)
- Pupil may be mid dilated and poorly reacting, iris shows rubeosis iridis (in 66% cases) and atrophic patches
- Cataract may occur as a complication in advanced cases
- Neovascular glaucoma is a frequent sequelae to anterior segment neovascularisation

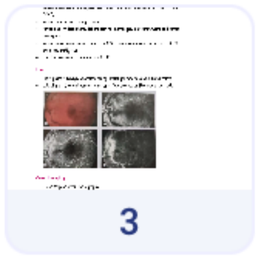
Anterior segment examination

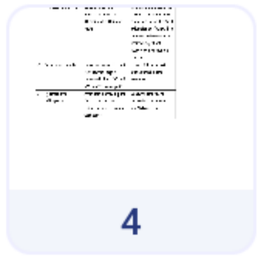
- Diffuse episcleral injection
- Aq flare with a few cells (Ischemic pseudo-iritis)
- Iris atrophy
- Rubeosis iridis is common
- Cataract

Pinch to zoom









Ocular Ischemic Syndrome

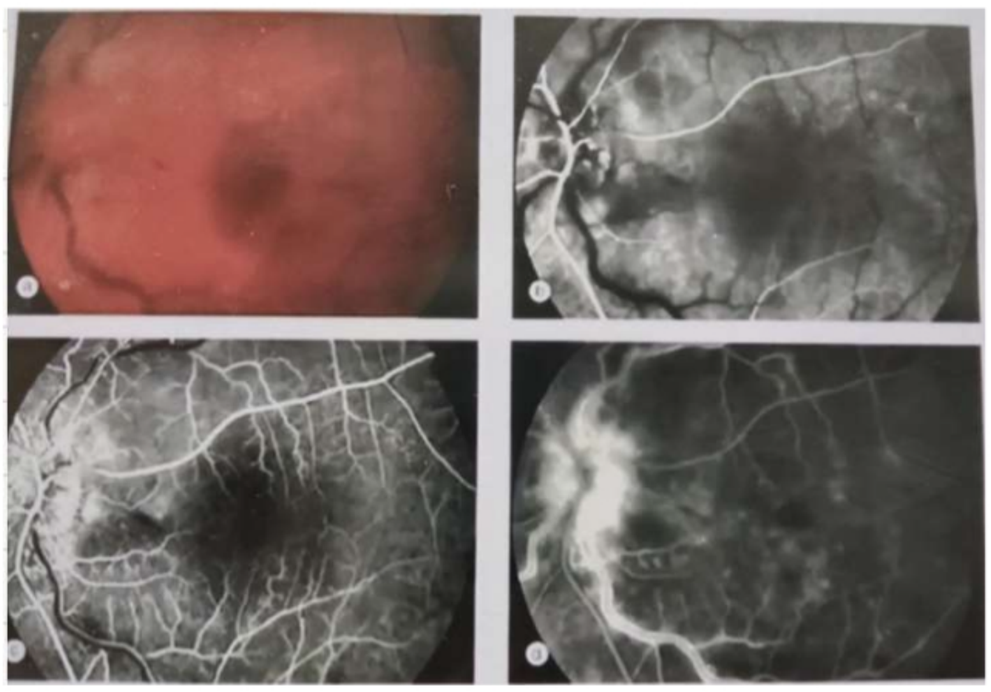
Topic Notes: 4

Fundus Examination

- Venous dilatation with irregular calibre but no or only mild tortuosity (Diff from CRVO)
- Retinal arterial narrowing is present
- Retian show midperipheral dot and blot haemorrhages, microaneurysms and cotton wool spots
- Retinal neovascularisation is noted in 37% cases, which may be in the form of NVD and occasionally NVE
- Macular oedema is a common complication

FFA

- Early phase = Delayed choroidal filling, prolonged artero-venous transit time
- Late phase = Disc and Perivascular hyper fluorescence and leakage at pot. pole

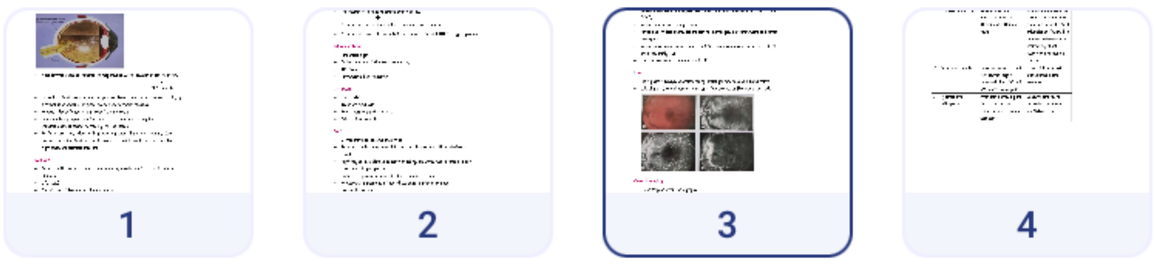


Carotid imaging

- Color Doppler ultra - Sonography
- MR angiography
- Digital subtraction angiography

- Anterior segement manifestation : are treated with topical steroid and mydriatics
- Neovascular glaucoma may be treated medially or surgically
- Proliferative Retinopathy can be treated with PRP although the outcome is considerably less certain than in PDR
- Macular Oedema may respond to intra-vitreal steroid or anti-VEGF agents or carotid surgery

Pinch to zoom



Ocular Ischemic Syndrome

Topic Notes: 4

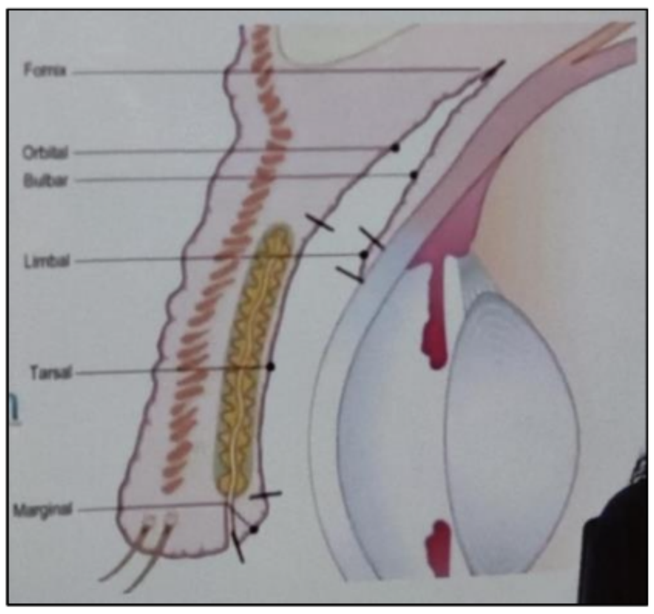
Condition	Similarities	Differences
1. Non-ischemic CRVO	Unilateral retinal haemorrhage venous dilation and cotton wool spots	Veins are more tortuous, haemorrhages are more numerous, normal retinal arteriolar perfusion, disc oedema, and sometimes opticocilary shunt vessels can be seen on the disc
2. Diabetic retinopathy	Micro aneurysm, dot and blot haemorrhages, venous dilation, NVD and NVE, cotton wool spots	Usually bilateral, with characteristic hard exudates
3. Hypertensive retinopathy	Arteriolar narrowing and focal constriction, retinal haemorrhage and wool spots	Usually bilateral, no marked venous changes, and NVD and NVE

Conjunctiva

Parts

- Palpebral (Lids) — Marginal, Tarsal, Orbital
- Bulbar (Eyeball)
- Fornix

Parts of Conjunctiva



LAYERS OF CONJUNCTIVA

02:49

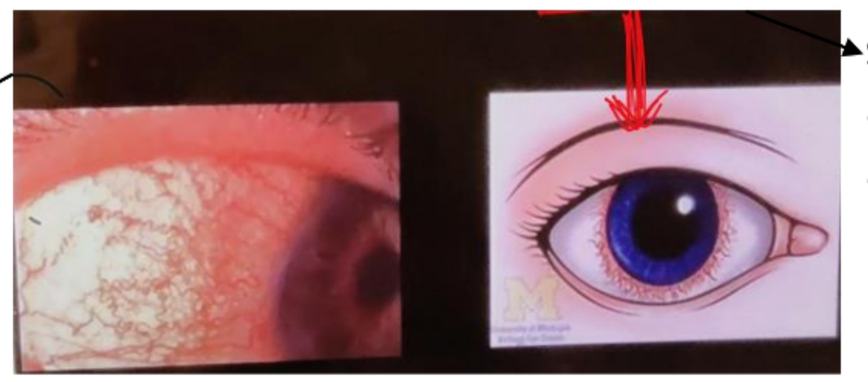
- Epithelium = NK stratified sq. epi = Goblet cells (mucin)
- Adenoid } = Follicles
- Fibrous } Substantia propria

↓

Degenerations

Circumcorneal congestion

CCC

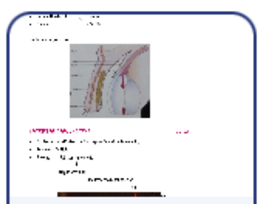


From limbus to fornix

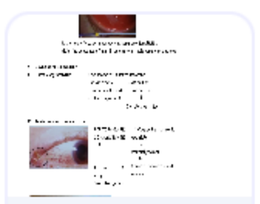
Seen in

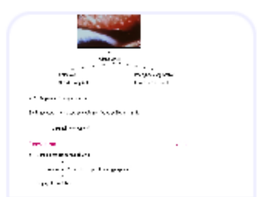
- ACG
- Acute ant uveitis

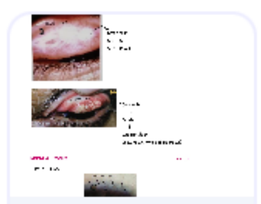
Pinch to zoom

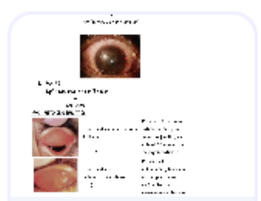

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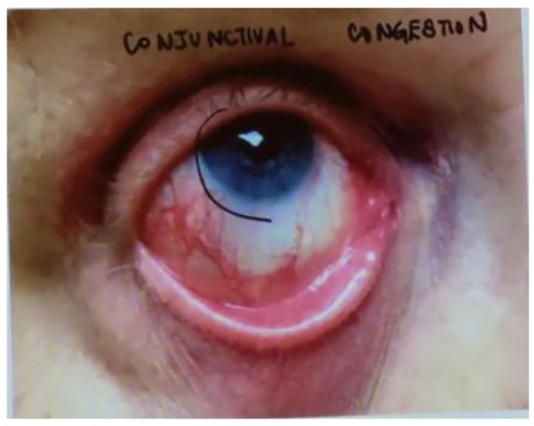

6


7


8

Conjunctiva

Topic Notes: 11



From fornix to limbus

Conjunctival vs. Circumcorneal congestion

Conjunctival	Circumcorneal
• Bright red. (Superficial)	• Bluish red. (Deeper)
• Arborous branching.	• Radial arrangement
• Near fornices.	• Around limbus
• Vessels move with conjunctiva.	• Do not move with conj.
• Blanch with phenylephrine -Topical	• Do not blanch with phenylephrine.
• Fill from fornix towards centre.	• Fill from limbus, outwards.

Conjunctivitis

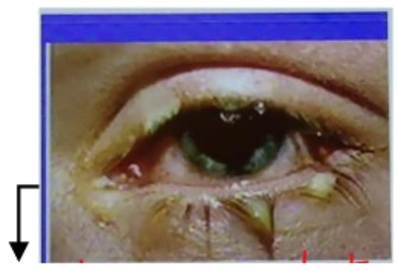
- Infections > Non - infections

↓

Bacterial = Stap. Aureus [m/c]

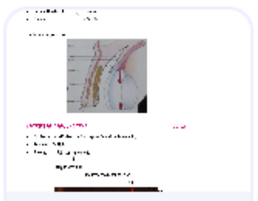
↓

Acute mucopurulent conjunctivitis [m/c]

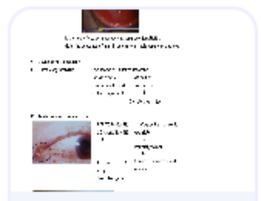


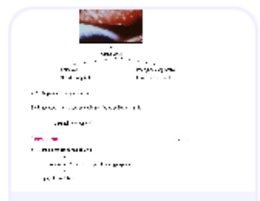
Acute mucopurulent conjunc.

Pinch to zoom


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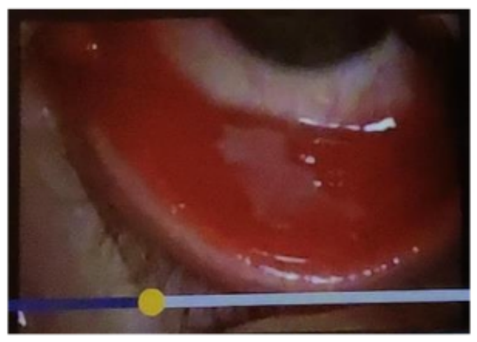

7


8

Conjunctiva

Topic Notes: 11

Membranous conjunctivitis



It is picture of eye with adenoviral keratoconjunctivitis

Note the presence of membrane in lower palpebral conjunctiva

- Coloured halos present
- Memb conjunctivitis

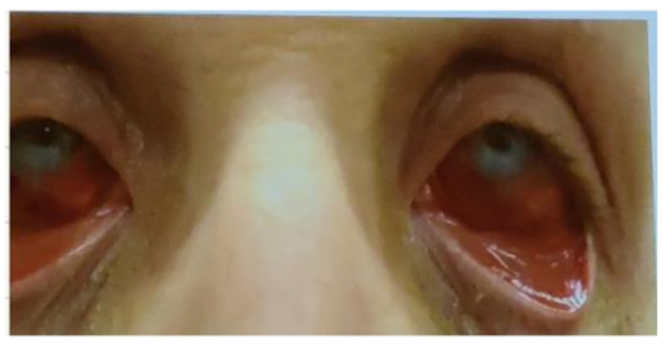
True memb = Densely adherent
↳ Bleeding on peeling
↓
Symblepharm test

Pseudo memb
= loosely adherent
= Bleeding absent

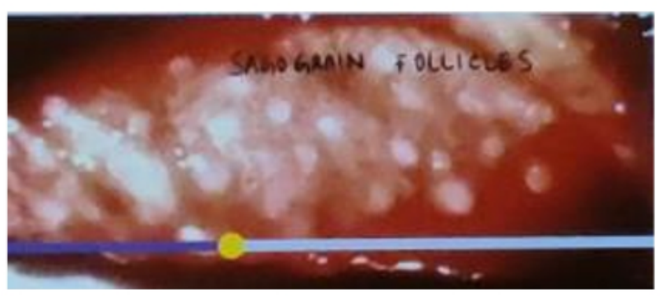
1) Acute angular conjunctivitis



ACUTE ANGULAR CONJUNCTIVITIS
↑
→ Caused by moraxella axenfeld
↓
Proteolytic enz
↓
Eczema, maceration at angles ← Treatment:
Zn ±
Oxytetracycline

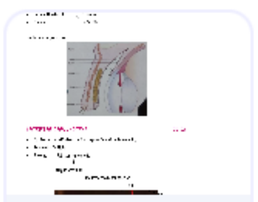


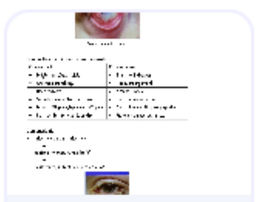
D/D
Acute red eye
(2)
→ Acute hemorrhagic conjunctivitis
↓
Pico rNA family

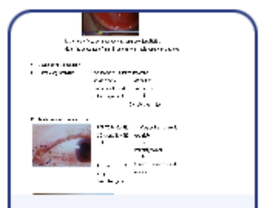


↳ Entero virus - 70
Adeno virus
Cox virus

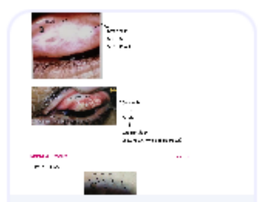
Pinch to zoom

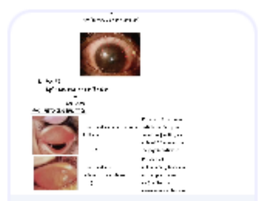

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Conjunctiva

Topic Notes: 11

3) Follicular conjunctivitis

Sagograin follicles



↓

Adeno virus

Epidemic	Pharyngo conjunctival
Kerato conjunct.	Fever [viral fever]

4) Acute purulent conjunctivitis

↓

By Gonococcus = also causes systemic features like arthritis

+

Corneal involvement

TRACHOMA

18:36

- Chronic kerato conjunctivitis

  ↓

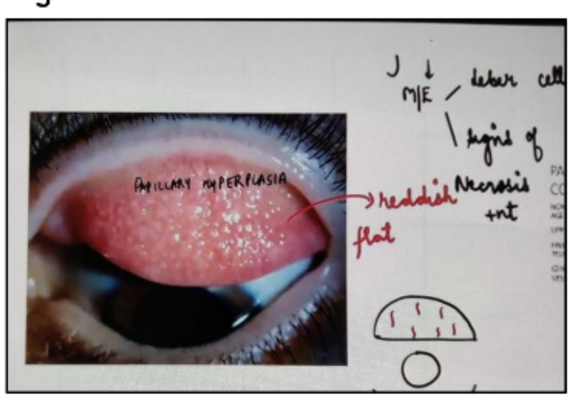
  Mixed response [Both follicle, papillary hyperplasia]

  ↓

  Sagograin follicles

Sagograin follicles

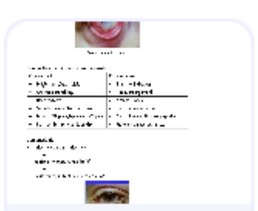
- In microscopy
  - Leber cells
  - Signs of necrosis

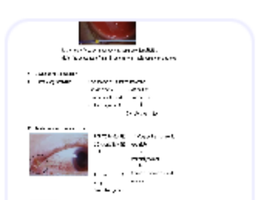


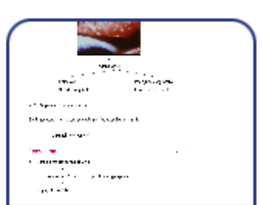
PAPILLARY HYPERPLASIA

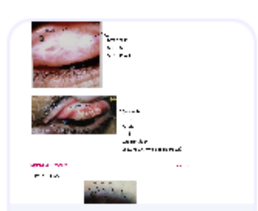
Pinch to zoom

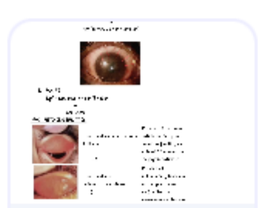

1

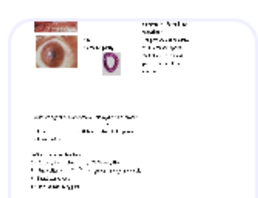

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- Arlt's line seen
- Scarring in sulcus subtarsalis



Scarring in
SULCUS
SUBTARSALIS

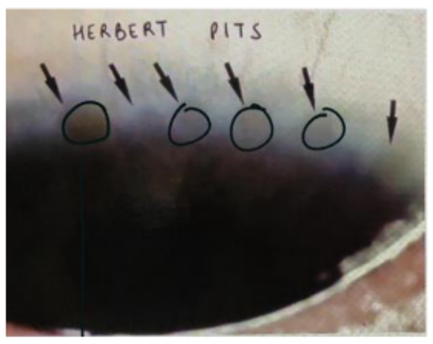


Dead cells
+
Debris
↓
Corneal ulcer
(only complication of trachoma)

CORNEAL SIGNS

22:57

CORNEAL SIGNS

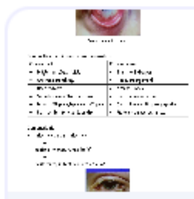


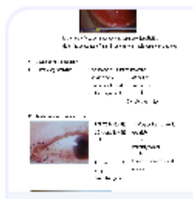
↓
Dark colored, beneath Limbus

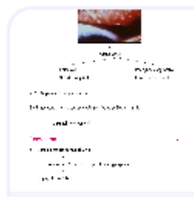
1) Herbert follicles = SAGOGRAIN FOLLICLES
2) Herbert Pits ↙

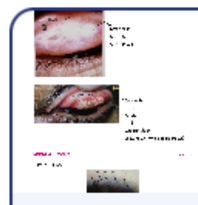
Pinch to zoom

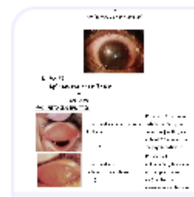

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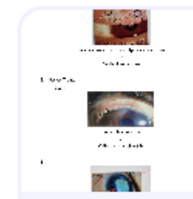

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Conjunctiva

Topic Notes: 11

Follicles
↓
Leads to depressions
↓
Pits (formed as it is avascular)



3) PANNUS

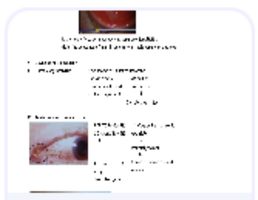
Supf Vascularization + Infiltration
↓
Cor. Ulcer

WHO - FISTO CLASSIFICATION

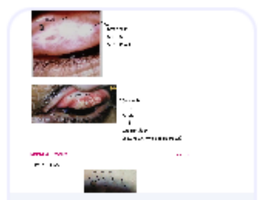
	TF: Trachomatous inflammation - Follicular (F)	Presence of 5 or more follicles in the upper tarsal conjunctiva, each at least 0.5 mm in size. (sagograin follicles)
	TI: Trachomatours Inflammation - intense (I)	Pronounced inflammatory thickening of the upper tarsal conjunctiva, which obscures more than one half of the normal tarsal vessels. [Papillary hyperplasia]
	TS: Trachomatous Scarring (S)	The presence of easily visible white lines, bands, or sheets in the tarsal conjunctiva. Scarring may obscute the tarsal vessels. [ARLT'S line]

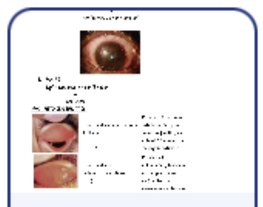
Pinch to zoom


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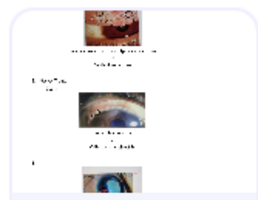

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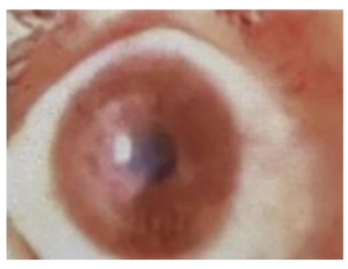

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10



TT:
Trachomatous Trichiasis (T)

At least 1 eyelash that rubs the globe or evidence of recently removed in - turned lash (epilation)



CO:
Corneal Opacity



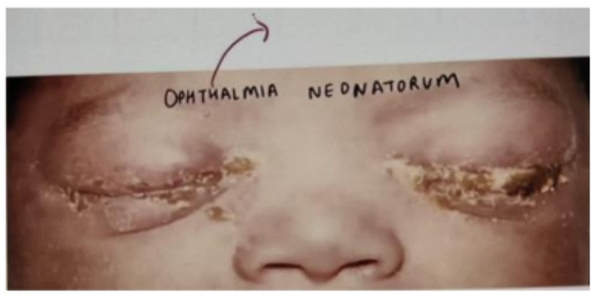
The presence of an easily visible corneal opacity that obscures at least part of the pupillary margin

Causative agent of trachoma = Chlamydia trachomatis
↓
H.P bodies ← Obligate intracellular parasite
[Inclusion bodies]

SAFE strategy for Trachoma

S = Surgery for trachiasis
A = Antibiotics — 1% Tetracycline / 1 gm azithromycin once stat
F = Facial cleanliness
E = Environmental hygiene

OPHTHALMIA NEONATORUM (ON) *30:20*



- Conjunctivitis in neonates (<28 days)
- Even watering should be suspected for conjunctivitis as tear formation takes b/w 4-6 weeks

Conjunctiva

Topic Notes: 11

ON

- 48.72 hrs of birth
  - Chemical → Mild → Not common nowadays → Grede's method (1% $AGNO_3$ solution)
  - Gonococcal → Virulent →
    - Bilateral, Purulent
    - Congestion, chemosis
    - Corneal involvement present

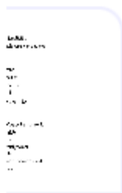
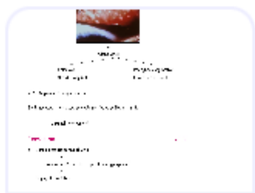
    Treatment = BAC therapy
    B = Bacitracin ointment
    A = Atropine ointment
    C = IM ceftriaxone injection
- >72 hrs
  1) M/C = Chlamydia trachomatis
  2) H. Simplex type II
  3) Other bac
     ↳ Staph
     ↳ Streptococcus

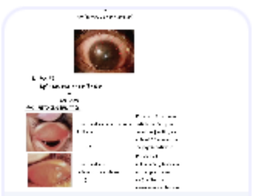
NON-INFECTIOUS CONJUNCTIVITIS 35:36

- M/C is Allergic-of this Vermal kerato conjunctivitis(or) spring cataract is most common

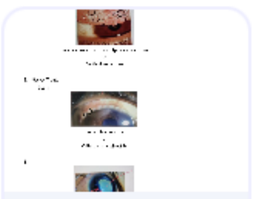
  VKC
- Common in males
- Itching, Burning sensation,
- Foreign body sensation
- Due to Type - I hypersensitivity reaction to allergens
- Hot, humid climate
- Self limiting
- "Ropy discharge" → can form a pseudomembrane
  ↓
  "Maxwell Lyon sign"

Pinch to zoom



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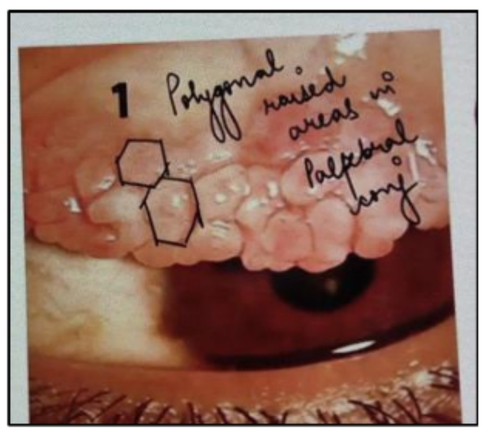
10

11

Conjunctiva

Topic Notes: 11

1)

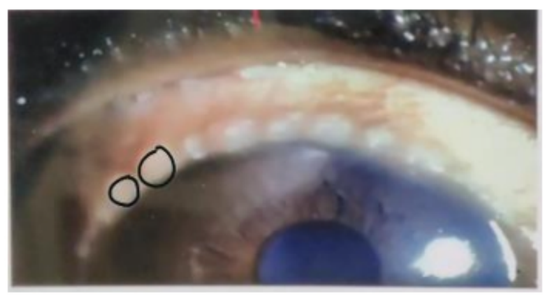


Polygonal raised areas on palpebral conjunctiva

↓

Cobblestone papillae

2) Horner Tranta Spots

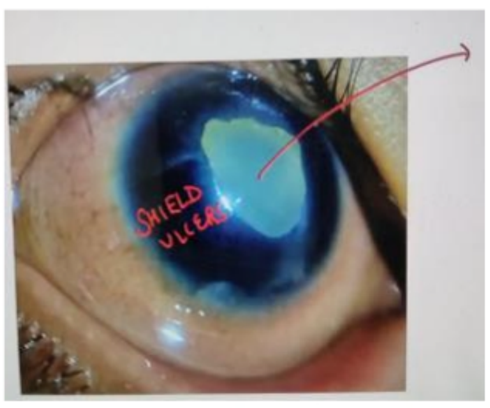


Horner Tranta spots

↓

Collection of eosinophils

3)



Shield ulcer on cornea

↓

→ Treat: Olapatidine

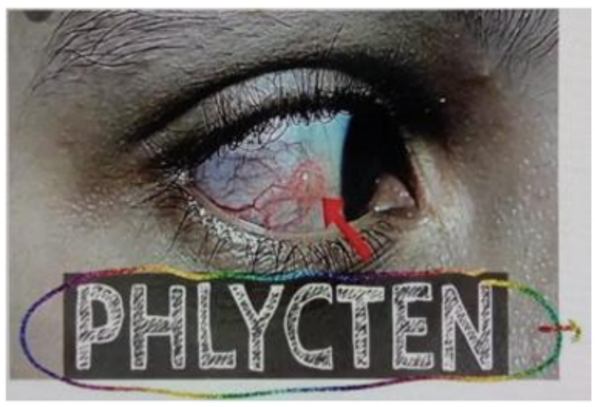
↓

No response

↓

Steroids

4) Phlyctenular KC



Phlyctenural kerato conjunctivitis (PKC)

↓

Nodular

PKC

- Females
- As nodule
- Type iv reaction
- Endogenous allergy to staph and TB proteins
- TOC: Steroids
- Sacrofulous ulcer

  ↓

  Fascicular ulcer

  ↓

  Miliary ulcer

  ↓

  Ring shaped infiltrate

VKC

- Males
- Diffuse
- Type - I rn
- Exogenous allergen
- TOC: olapatidine
- Shield ulcers

DEGENERATIONS *44:58*

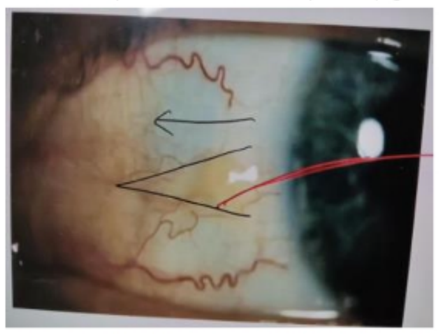
- In substantia propria

Pingnecula	Pterygium
• Lipid → Yellowish discoloration • Stationary • M/c on nasal conjunctiva (Apex away from cornea) • No growth, Due to elastotic degeneration.	Wing shaped fold of conjunctiva over cornea

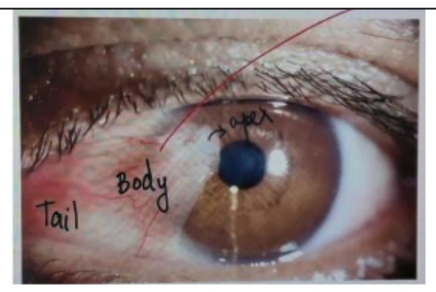
Conjunctiva

Topic Notes: 11

- Can be a precursor of pterygium

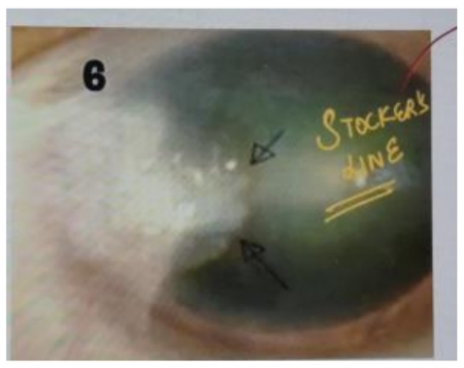


Pingnecula



Pterygium

- M/C diminishion of vision: Astigmatism [WTR]
- Can cause obstruction of pupillary axis



Stocker's line = Due to Fe deposition ant to advancing head of pterygium

- TOC: Surgical excision

↓

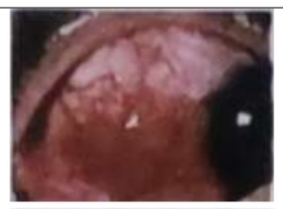
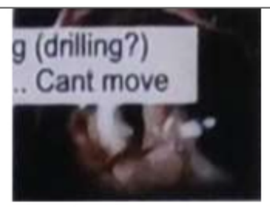
Recurrence (upto 80% cases)

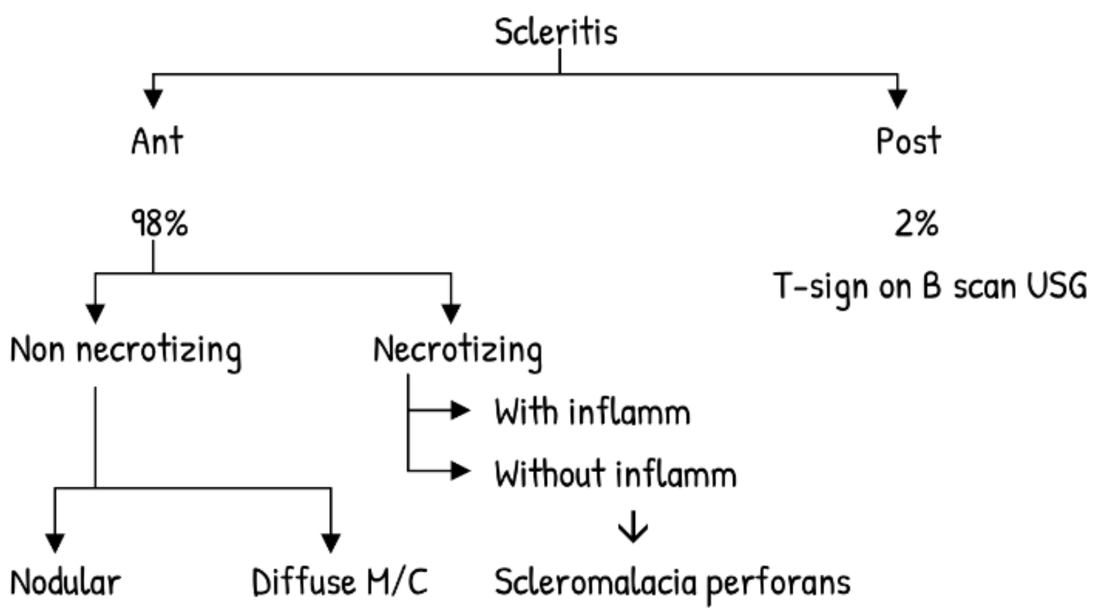
↓

- Mitomycin - C
- Thiotepa
- β radiation
- Conjunctiva autografting
- Amniotic memb grafting

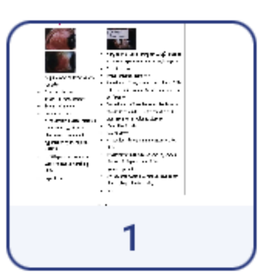
Pinch to zoom

Sclera

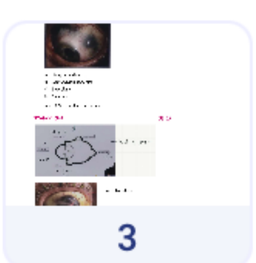
Episcleritis	Scleritis
 	
• No pain come to doctor due to red color • Affects episclera • Types - diffuse, nodular • Bright red in color • No sclera edema • No treatment needed, resolves spontaneously, idiopathic, other causes could gout, hypertensivity etc topical NSAIDS • By 10% phenylephrine drops vessels undergo blanching white • Superficial	• Very painful, Deep boring (drilling) wakes up early due to pain, can't move eye, Dangerous • Affects sclera • Types-anterior, posterior • Anterior - diffuse, nodular, necrotizing (with inflammation - can perforate, scleromalacia, perforans) • Posterior - can't see the color, tenderness, proptosis, visual loss, ultra sound B scan - T sign. Treat with systemic steroids • Violet blue in color • Sclera edema • Associated with Autoimmune disorders RA, SLE etc • Treatment oral NSAIDS, 2 step- systemic steroids, 3 step immunodulators - cyclophosphomide • By 10% phenylephrine drops vessels do not blanch (deep[blood vessels) • Deep

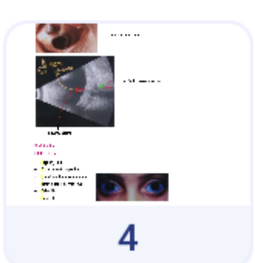


Pinch to zoom


1


2


3


4

Sclera

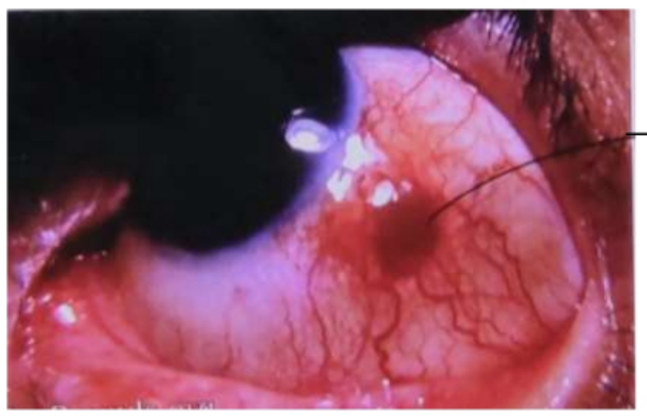
Topic Notes: 4



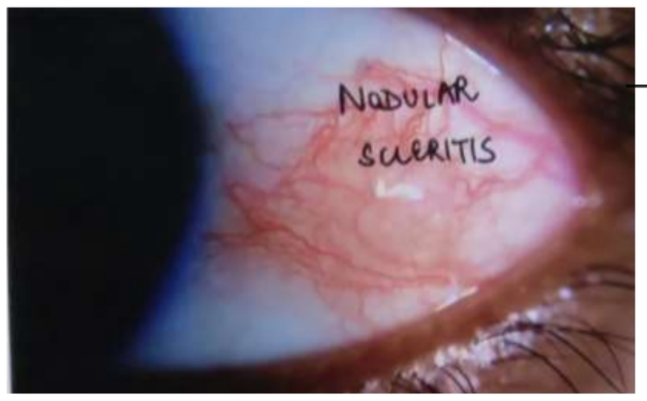
Episcleritis
↓
Sectoral involvement



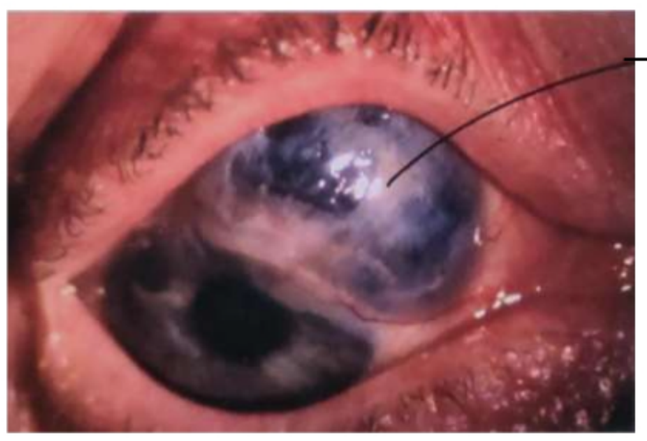
Diffuse Scleritis



Nodular Episcleritis



Nodular Scleritis



Scleromalacia
Perforans

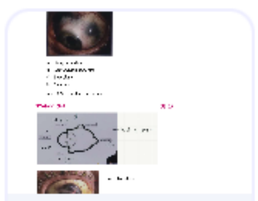
Pinch to zoom



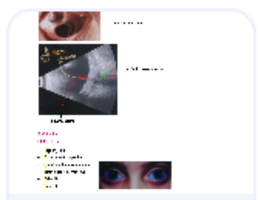
1



2



3



4

Sclera

Topic Notes: 4

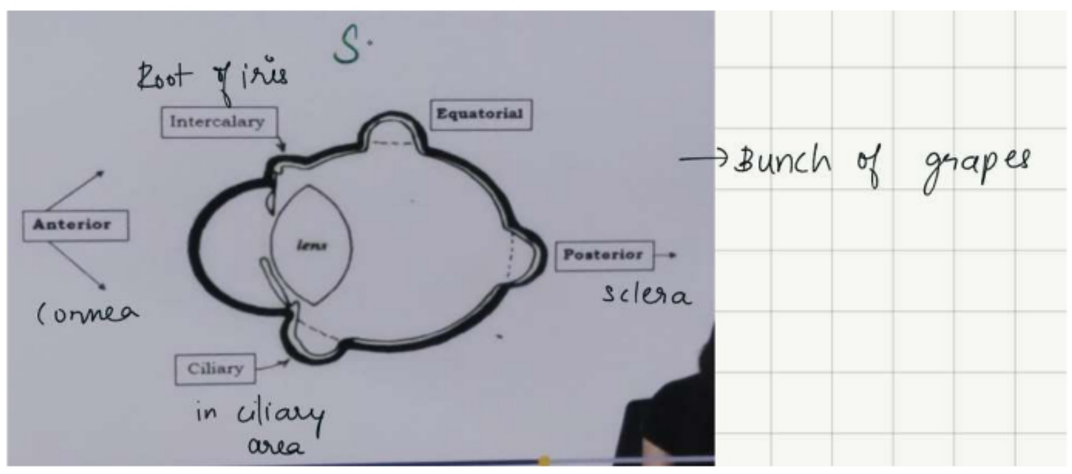
Q) Patient of RA presents with ocular finding. Diagnosis :

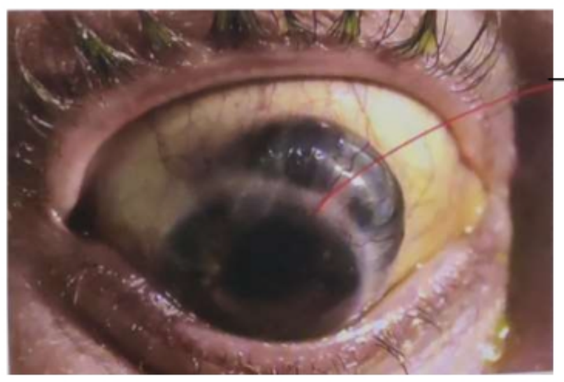


A. Malignant melanoma
B. Scleromalacia perforans
C. Staphyloma
D. Coloboma

Ans : B. Scleromalacia perforans

STAPHYLOMA 08:45



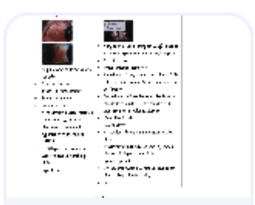


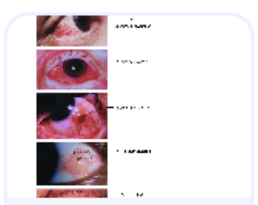
→ Inter calary

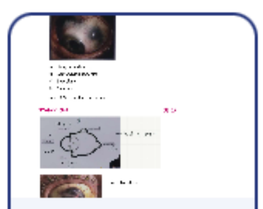


→ Corneal protrusion
↓
Ant staphyloma

Pinch to zoom


1


2


3

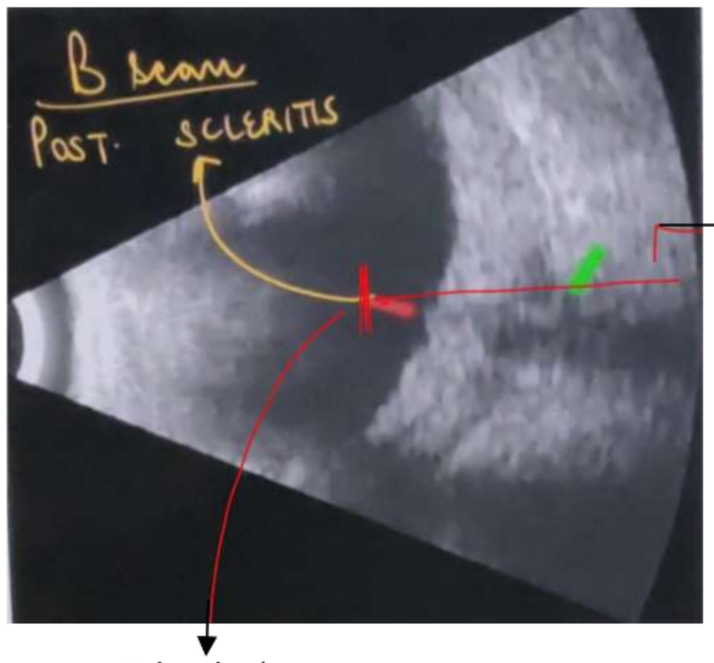

4

Sclera

Topic Notes: 4



Ciliary
↓
4mm behind limbus



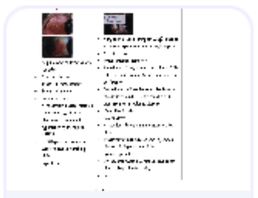
Blue Sclera

HOPES Belief

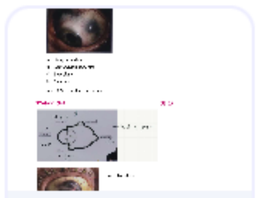
- High myopia
- Osteogenesis imperfect
- Pseudoxanthoma elasticum
- Ehlers-danlos syndrome
- Scleritis
- Bupthalmos

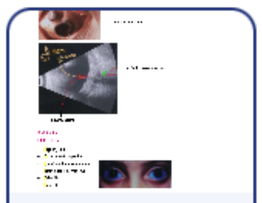


Pinch to zoom


1


2


3


4

Trauma

Trauma



- Blunt trauma = M/C
- Sub conjunctival haemorrhages

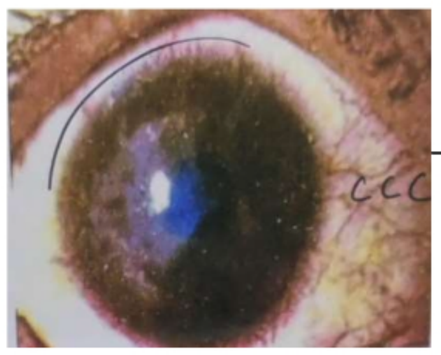
→ Superficial

Conjunctival Vs Circumcorneal congestion → Deeper

Conjunctival	Circumcorneal → AAU / ACG
• Bright red	• Bluish red
• Arborous branching	• Radial arrangement
• Near fornices	• Around limbus
• Vessels move with conjunctiva	• Do not move with conj.
• Blanch with phenylephrine → Imp	• Do not blanch with phenylephrine
• Fill from fornix towards centre	• Fill from limbus, outwards

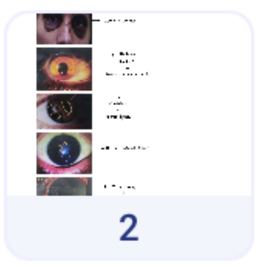


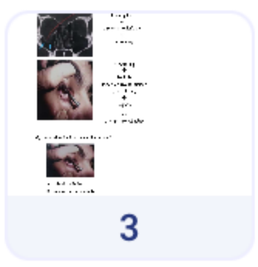
→ Conjunctival congestion



→ CCC


1


2


3

Trauma

Topic Notes: 3



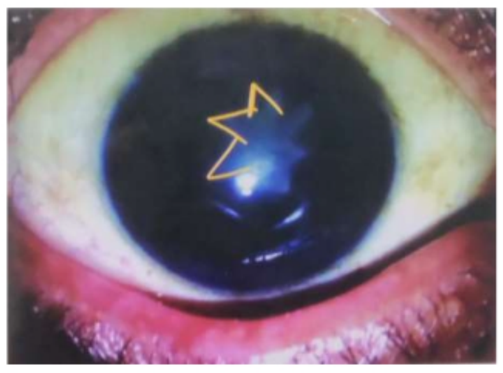
Raccoon/Pauda sign



Hyphema
(Blood in AC)
↓
From major arterial circle



Iridodialysis
↓
D shaped pupil



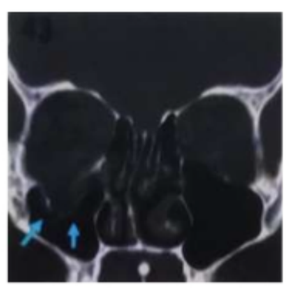
Rosette (or) Stellate Cataract



Vossious ring
↓
Imprint of pupuillary margin
of Iris on Ant surface

Q) Most common wall of orbit involved in a blowout fracture is

A. Medial
B. Floor
C. Lateral
D. Roof



Pinch to zoom



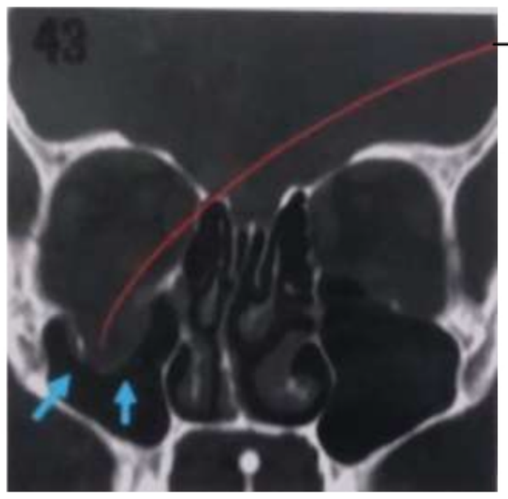
1



2



3



Blowout

Investigation
↓
X-ray orbit water's view
↓
Tear drop sign



Penetrating
↓
By 10FB
M/C = Chisel and Hammer
(chips of iron)
↓
Magnetic

∴ MRI is C/I
CT scan is investigation

Q) What should not be done in this patient ?



A. Visual acuity test
B. Removal of foreign body
C. Primary survey
D. Antibiotics

Ans : B. Removal of foreign body

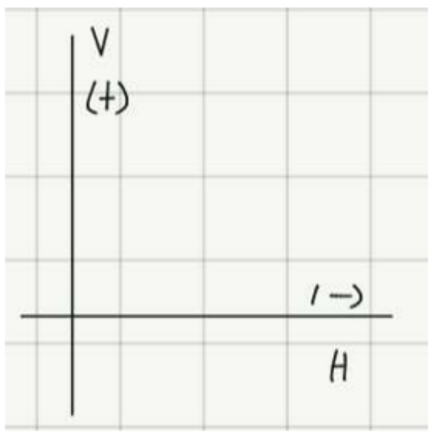
Do's	Dont's
1) Survey	Remove FB
2) V/A (ERG)	Touch
3) Antibiotics	Cover
4) Ref to ophthalmologist	Wash rub

Of eye

Astigmatism

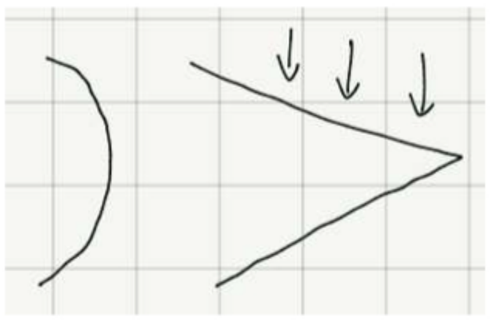
- Diff refractory error in atleast 2 principal meridians

Horizontal | Vertical

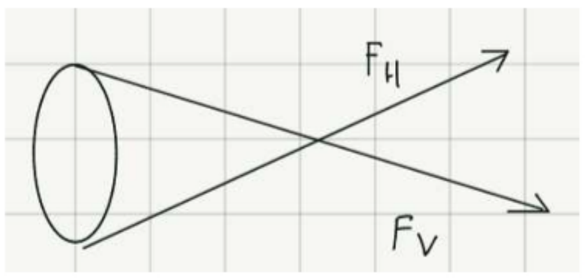


Due to uneven ITORIC surface

Keratoconus



- Rays don't come to point focus rather forms focal lines → STORM's CONOID



Distance between 2 focus = Focal interval of storm

Types

Regular | Irregular

2 meridans are $\perp^{ar}$ to each other

Not $\perp^{ar}$ to each other

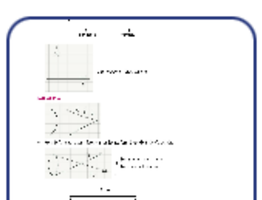
Regular

WTR | ATR

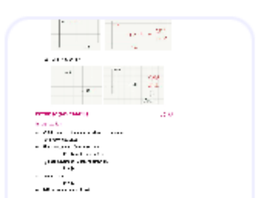
Vertical Power > Horizontal Power

Horizontal power > Vertical power

Pinch to zoom

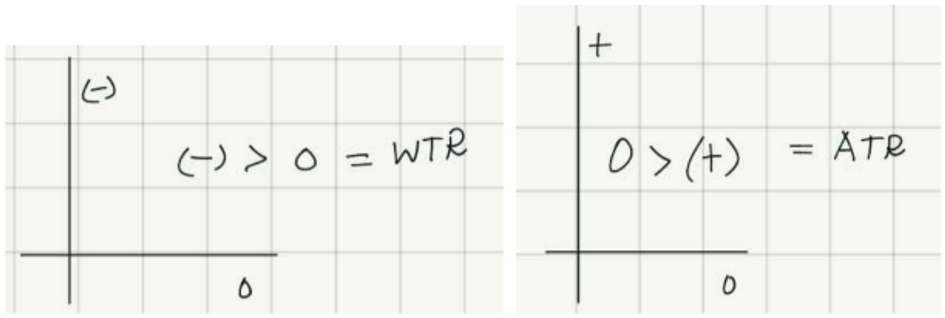

1


2

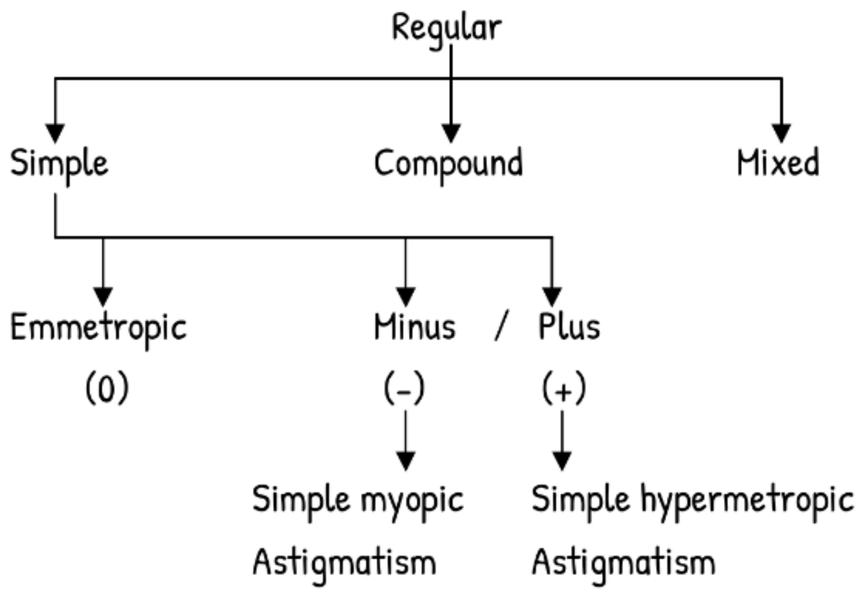

3


4

Minus > Zero > Plus
(-) (0) (+)

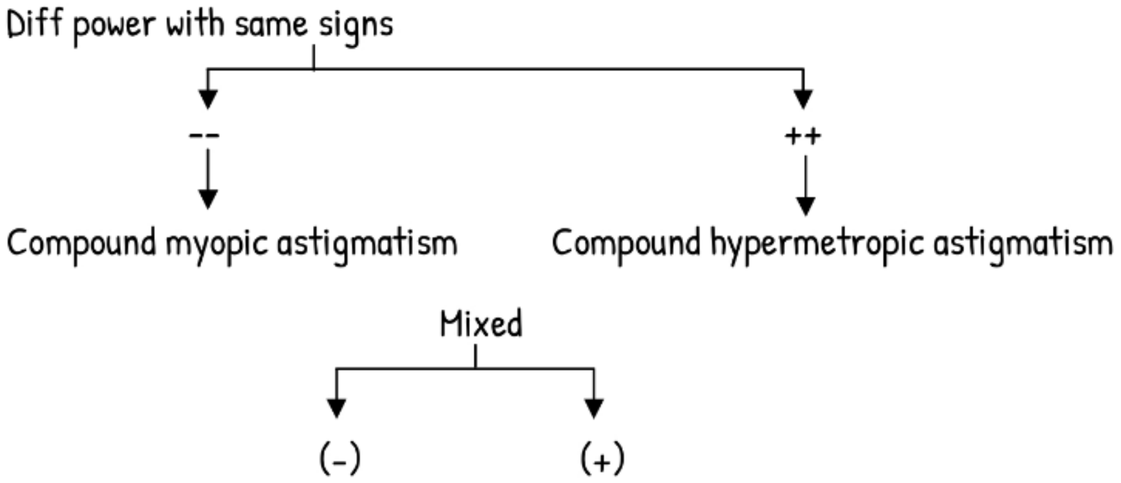


- More the minus sign, more is power -5 > -3
- Lesser the plus sign, more is power +3 > +5



COMPOUND ASTIGMATISM 10:03

- Diff power with same signs

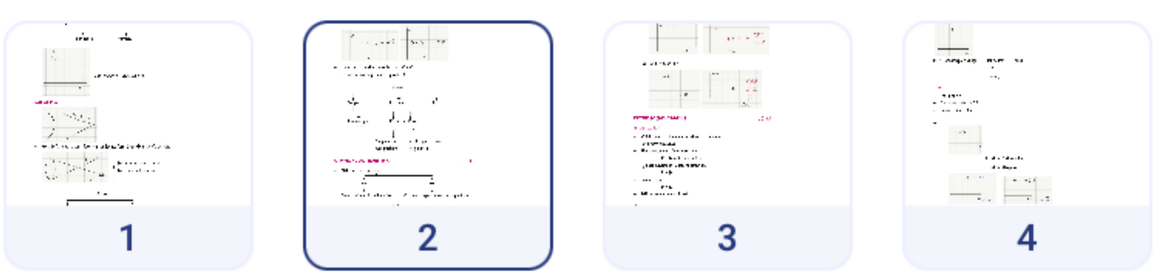


Q) Which of the following is an example of compound myopic, against the rule Astigmatism :

A) -2D Sph - 2 Dcyl at 180 → CMA, WTR
B) -2D Sph - 1 Dcyl at 90 = Ans
C) +2D Sph - 2 Dcyl at 90 → Simple HM ATR
D) -2 Dcyl at 90 → SMA, ATR

Ans : Power of cylinder always act at $\perp^{ar}$ axis

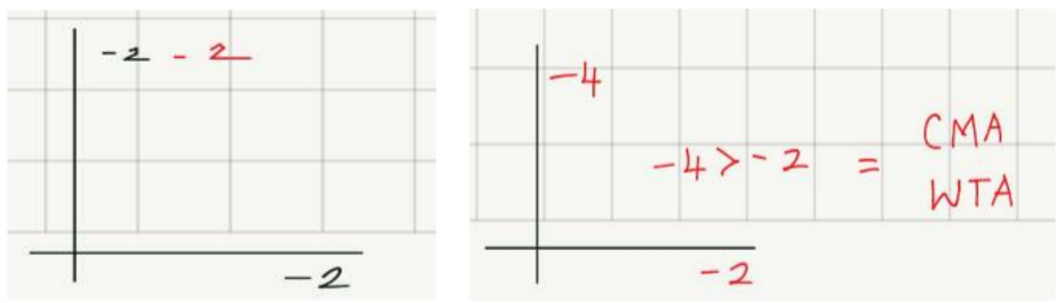
Pinch to zoom



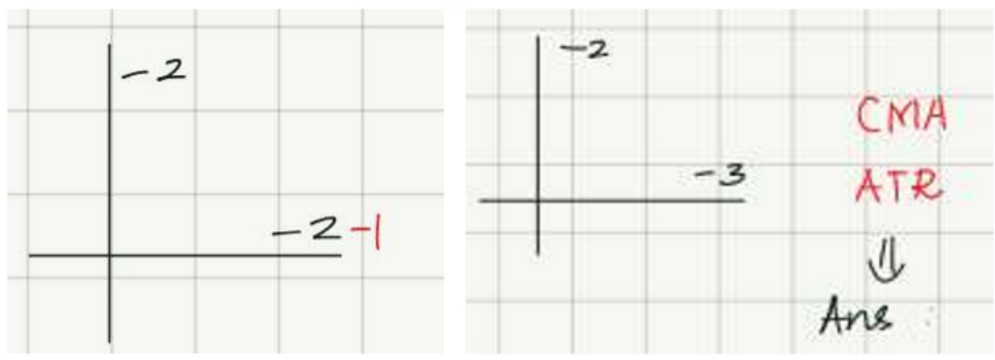
Astigmatism

Topic Notes: 4

a) -2DS - 2DC at 180°



b) -2DS -1DC at 90°



RETINOSCOPIC FINDINGS

16:38

Interpretation

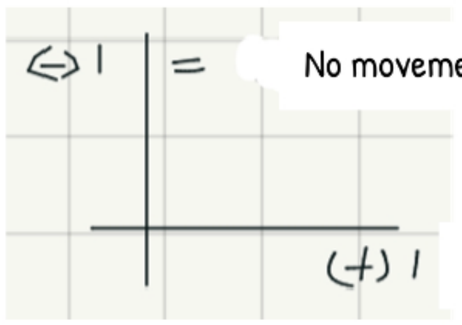
- With help of sell illuminating streak retinoscope
- Dark room procedure
- Along movement : Same direction

  M < ID (or) Emm (or) HRM
- Against movement : Opposite direction

  M > ID
- No movement

  M = ID
- Tell movement along all axis

Q)



No movement

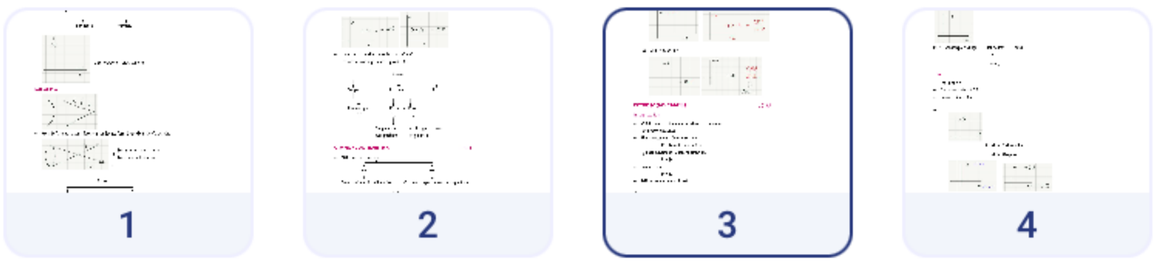
= along movement (HRM)

Q) -3DS - 2DC at 90°

→ CMA → Against both axes

ATR

Pinch to zoom

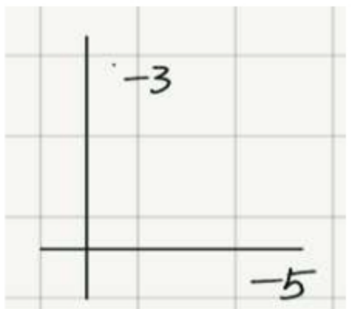


Astigmatism

Topic Notes: **4**

HOW TO CALCULATE REFRACTORY ERROR

22:10



RE = Retinoscopy findings - Dist. factor - Tonus

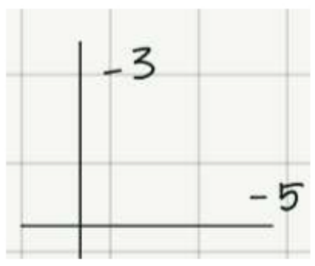
$$\downarrow$$

$$\frac{1}{\text{Dist (m)}}$$

Tonus

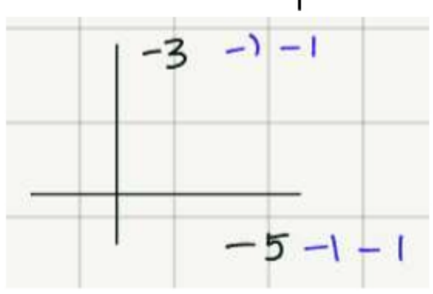
- Atropine = 1
- Cyclopentolate = 0.75
- Homatropine = 0.5

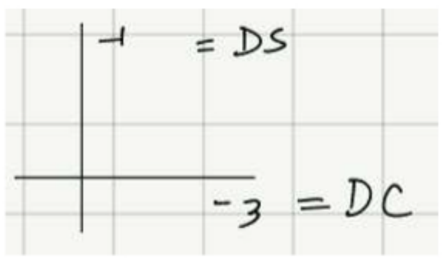
Q)



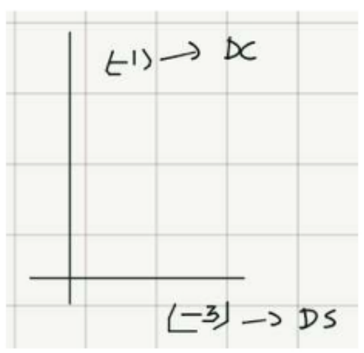
→ -1 for Distance factor

-1 for Atropine





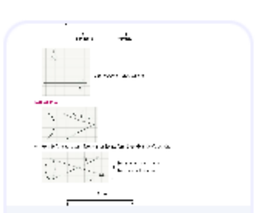
Q)



-3DS / -1 - (-3) at 180°

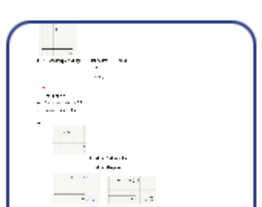
-3DS + 2DC at 180°

Pinch to zoom


1

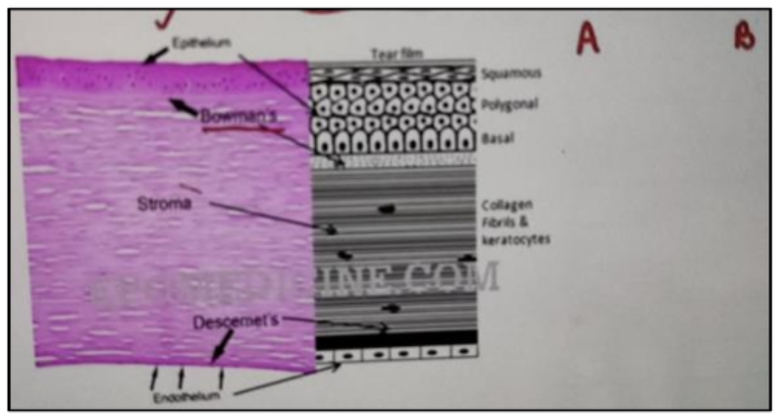

2


3


4

Cornea

Layers of Cornea:



A – Ant epithelium

B – Bowman's memb

C – Connective tissue stroma

D – Descement membrane

E – Endothelium

- Epi = Non – keratinized stratified sq. epi
- Bowman's memb = Acellular = cannot regenerate

  ↓

  Sup. Condensation of stroma
- CT stroma = Thickest memb (>90%)
- Pre Descement memb = DUA's layer, 16 μm thick

  = Toughest layer
- Desce. Memb = Mechanically strong

  = Can regenerate

- Desce. Memb strippings = Complication of cataract
- Descematocoele = Perforation
- Schwalbe's line = Prominent end of desc. Memb of cornea
- Endothelium = Most vital layer [Met, active]

  ↓

  Contains Na – K^+ pump → Relative dehydration

  ↓

  "Transparency of cornea"

- Shape of endo = Hexagonal
- Count of endo cells = 2500 – 3000 / mm^2

If <500 = Corneal decompensation
↓
Can't take for cornea transplantation

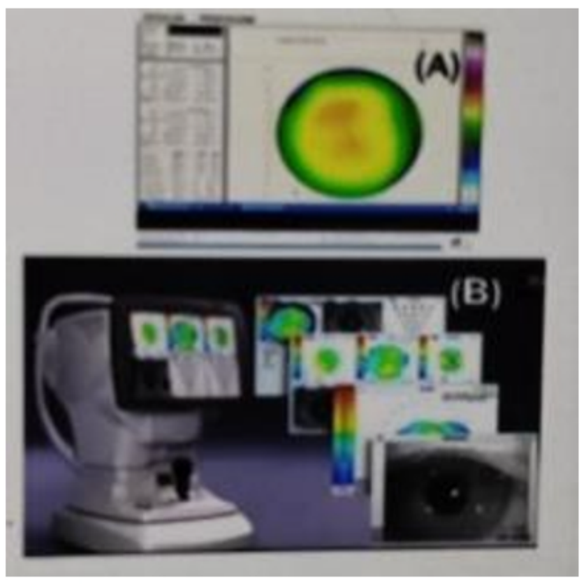
- Specular microscopy = prerequisite for corneal transplantation
  = Measure no. of cells (endothelium)



PACHYMETER
↓
Corneal thickness

Corneal Topography & PENTACAM

- A non – invasive medical imaging technique for mapping the surface curvature of the cornea.
- The corneal topography and color coded maps derived from quantitative analysis of numerous surface points.
- Physicians interpret the color coded images to diagnose & treat patients with eye refracting issues.



Causes of Corneal opacity & Appearance

Causes of corneal opacity	**Corneal appearance**
Edema	Blue "cobblestoned" appearance
Inflammatory cell infiltration	Yellow, green or tan corneal stromal opacity

Lipid / mineral deposition	Silvery white, crystalline, sparkly opacities; sometimes coalescing creamy or shiny opacities
Fibrosis	Grayish white, sometimes feathery or wispy opacity
Melanosis	Dark brown to black, variable density; often with blood vessels
Vascularization	Variably perfused blood vessels (Acute red eye) extending from corneoscleral limbus

Congenital cloudy cornea (MD

"STUMPED"

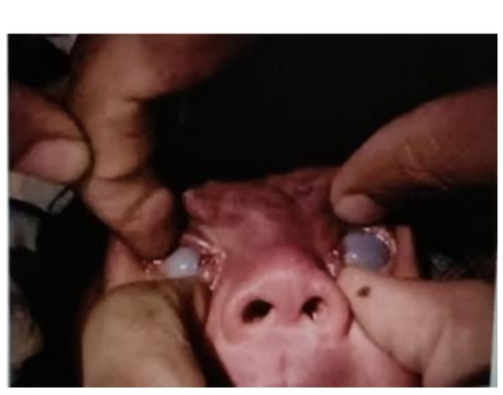
Sclerocornea
Tears in Descement's membrane
Uterine infections

Metabolic conditions

Peter's anomaly

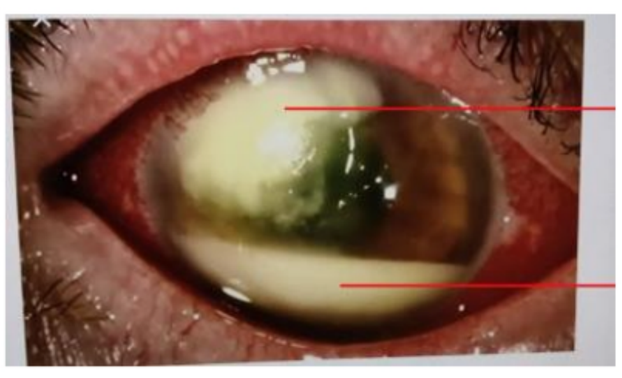
Endothelial dystrophy

Dermoid



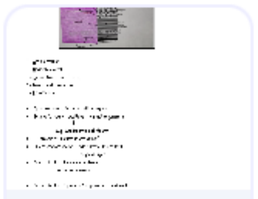
BACTERIAL CORNEAL ULCERS

13:11

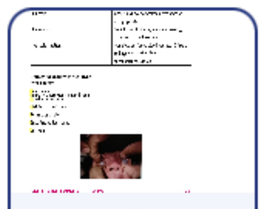


- Acute red eye
- Sudden painful
- Diminution of vision

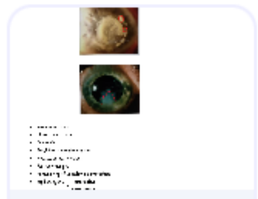
Pinch to zoom

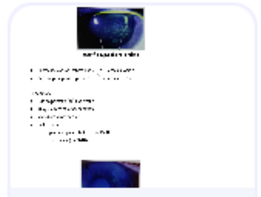












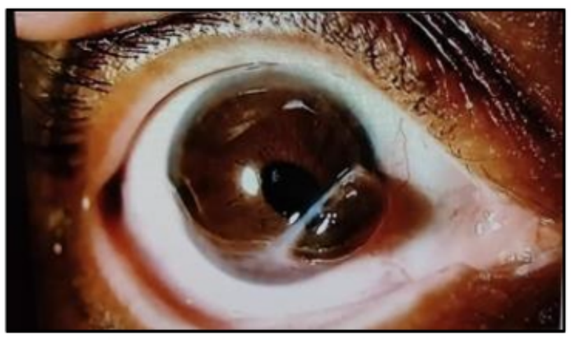




- Vascularization (+)
- Single ulcer
- No Hyphae
- Hypopyon — Sterile / Mobile
- Most dangerous hypopyon in
  - Pneumococcus = "ulcus serpens"
  - Pseudomonas (or)

Hypopyon cornea ulcer

Perforations [small]

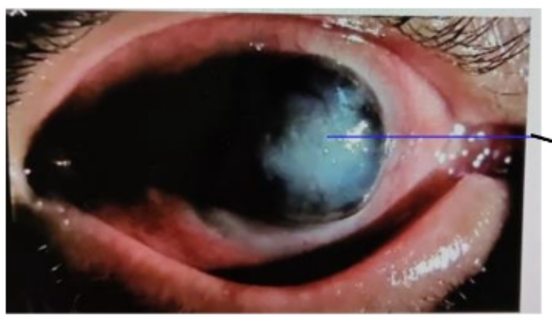


Perforations = small or large

Small

Adherent
Leucoma
↓
Due to iris adhesions,
White opacity present

Iris
prolapse



Perforation [Large]

Anterior staphyloma (due to large perforation]

Treatment

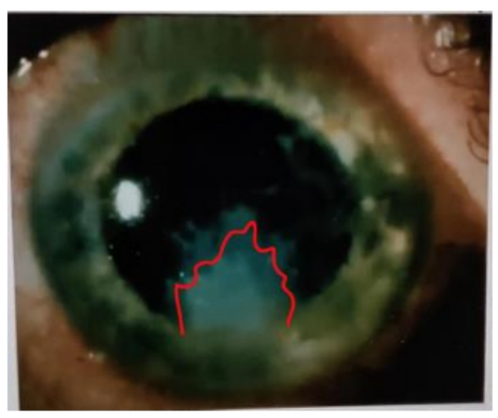
- Causative = Antibiotic [Fortified] broad spectrum
- Supportive = Atropine

Pinch to zoom

FUNGAL CORNEAL ULCER

21:11



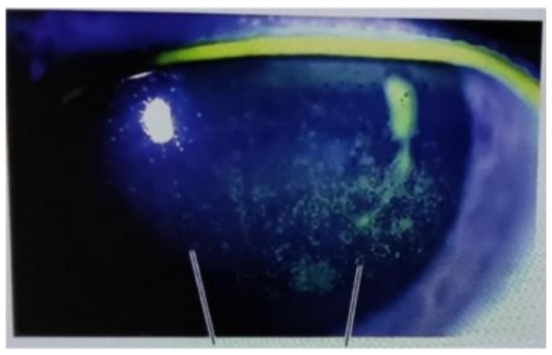


- Vascularisation absent
- Signs >> symptoms
- Dry looking
- Greyish with elevated margins
- Multiple satellite lesions
- Feathery margins
- Immune ring of wesseley is demarcation
- Big hypopyon — Non motile, Non sterile
- Filamentous > Yeast like
  ↓
  Aspergillus
- History of vegetative trauma
- Treat: Antifungals — Filamentous = Natamycin; Yeast like = Nystatin
  +
  Amp B

Pinch to zoom

VIRAL CORNEAL ULCER

26:55

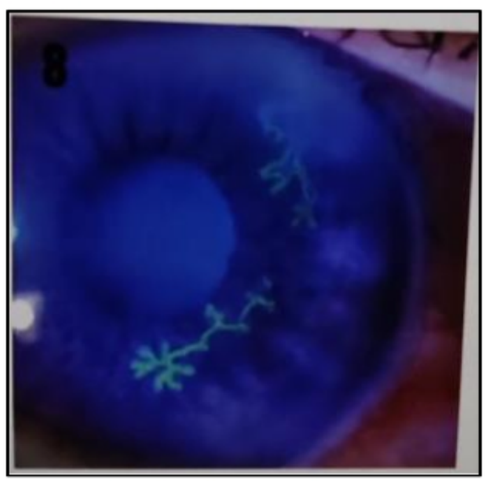


Superficial punctuate keratitis

- Decreased corneal sensations — Herpes simplex
- Keratin precipitates present — Herpes zoster

H. Simplex

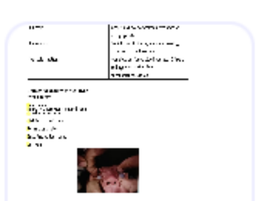
- Can be primary (or) recurrent
- They lie in trigeminal ganglion
- Recurrent more serious
- In 1° lesions
  - Superficial punctate keratitis (SPK)
  - Follicular conjunctivitis



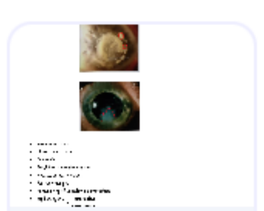
Recurrent lesions

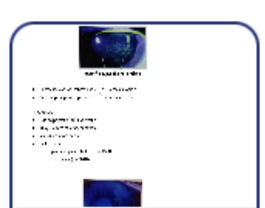
- Dendritic ulcer
- Pathognomic of H, simplex


2

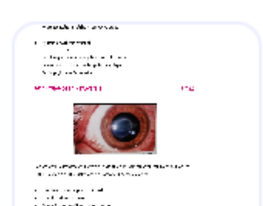

3


4


5

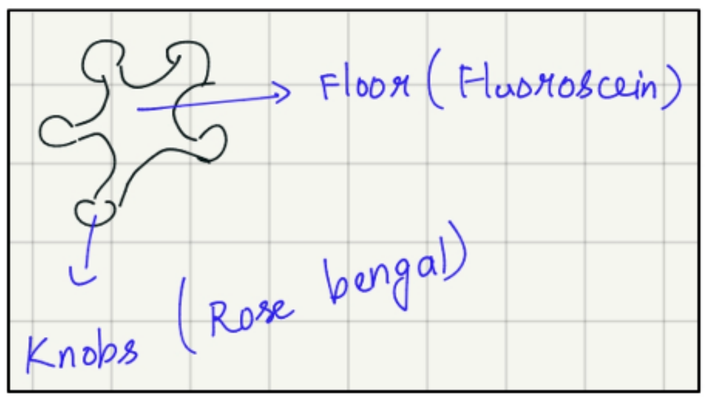

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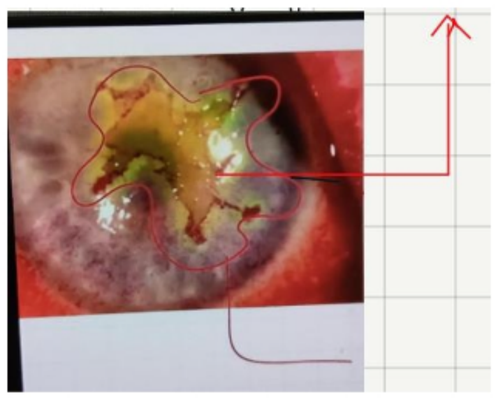

9


10



- Treat: 3% acyclovir eye ointment

Steroids →Can hasten amoeboid, geographical ulcer
Contraindicated



H. ZOSTER

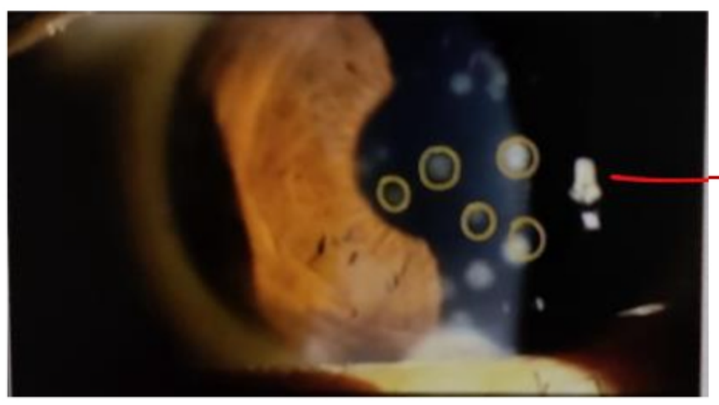
31:26

- Caused by Varicella zoster [Herpes Zoster Ophthalmicus]
- Ophthalmic branch of trigeminal nerve involved
- Strict distribution on one side of face
  Frontal → Lacrimal → Nasociliary

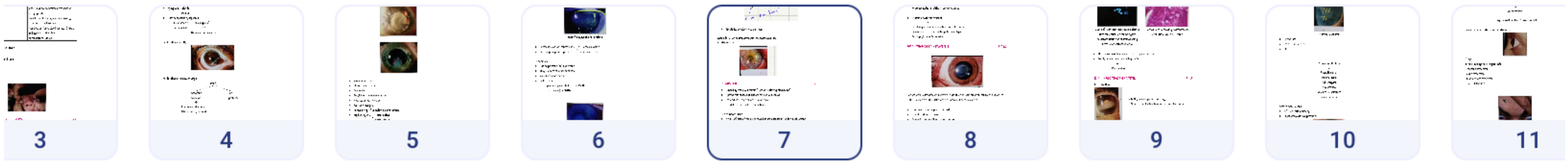
Hutchinson's rule

- If tip (or) side of nose is involved, more chances of ocular involvement

NUMMULAR KERATITIS



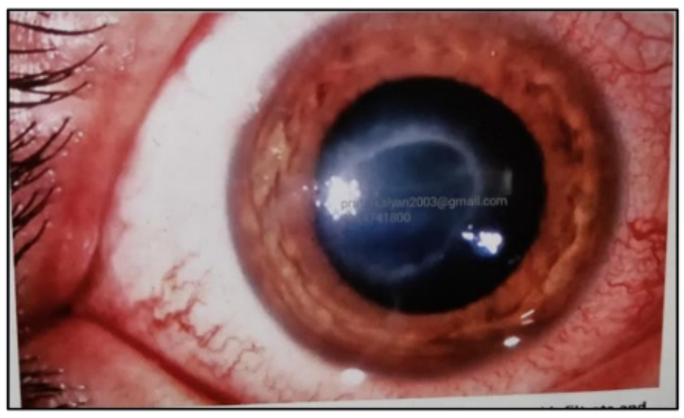
Coin - shaped areas of inflammation in cornea



- Pseudodendritic keratitis (No knobs) can be present
- Sclera keratitis = Least common
- Neurotropic keratitis = V nerve palsy
  Neuroparalytic keratitis = VII nerve palsy

- Systemic features present
  ↓
  So, also give systemic acyclovir must be given
  Systemic steroids = Postherpetic neuralgia
  Amitriptylline = Depression

ACANTHAMOEBA KERATITIS *37:35*



Patient with Acanthamoeba keratitis. Note the ring-like stromal infiltrate and lack of bulbous dendrites. The latter are a symptom of herpes simplex.

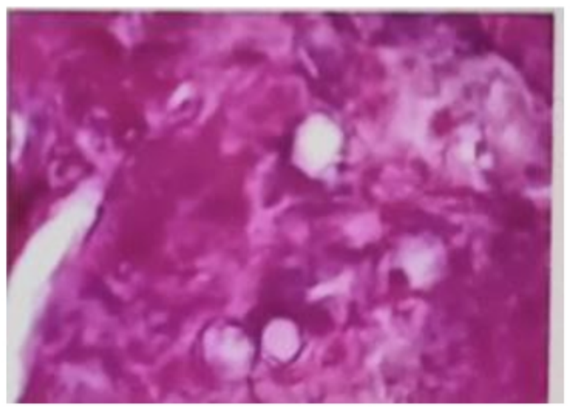
- Free living amoeba present in soil
- H/o of contant lens use
- Pain out of proportion to size of ulcer
- Ring infiltrates
- Radial keratoneuritis (↑)

- Trophozoites = Active stage of Acanthamoeba
  ↓
  Resembles macrophages (D/D: Bact ulcer)
- H/o vegetative trauma (D/D: Fungal ulcer)
- Pseudo dendrites (↑)

CORNEAL BIOPSY



Cysts of Acanthamoeba species stained with the optical whitening agent calcofluor white and examined using ultraviolet epifluorescence



Corneal biopsy showing Acanthamoeba cysts (Periodic Acid Schiff)

- This shows growth on non-nutrient agar with E.Coli
- Treat; Polyhexamethylene biguanide

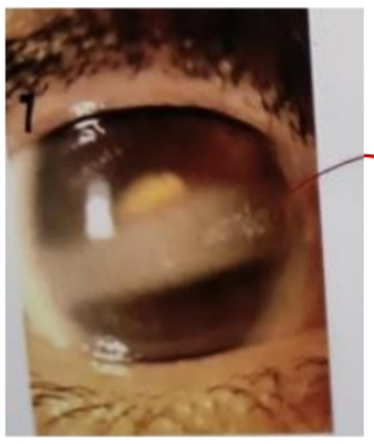
+

Propanidine

NON – INFECTIVE KERATITIS

43:48

Non infective



BSK (Band shape Keratopathy)

Starts from Limbus & makes a band afterwards.

Band shaped keratopathy

↓

Calcium deposition

↓

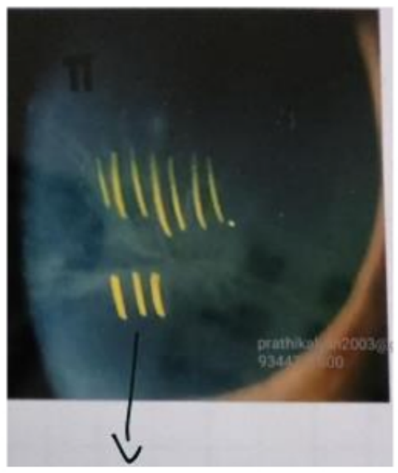
In bowman's memb

Treat: EDTA

Phototherapeutic keratectomuy

Pinch to zoom

CORNEA VERTICILLATA / VORTEX KERATOPATHY



Vertical deposits

- Epithelium
- Whorl like deposits
- Glare

Cornea verticulata
↓
Phenothiazines
Indomethacin
Chloroquine
Amiodarone
Rho kinase inhibitors
Fabry's disease

Kerato conus (AD)

- B/L Non inflammatory
- Progressive conical protusion



Systemic associations of keratoconus

Keratoconus
↓
↑ Axial length
↓
Axial myopia
↓
Irregular Astigmatism (uneven surf.)

Systemic associations of keratoconus



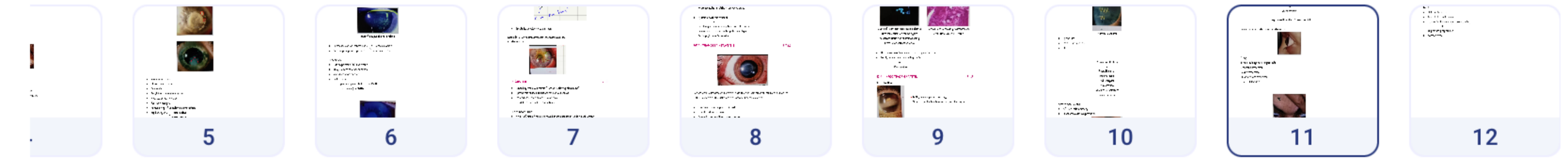
Atopy
Bones (osteogenesis imperfecta)
Crouzon's syndrome
Down's syndrome
Ehler's Danlos syndrome
Fingers (Marfan's)



Munson's sign
↓
Localized bulging of lower lids when patient looks in down gaze.

- Oil droplet reflex: Slit lamp
- Vogt's striae: Vertical striations on slit lamp
- Fleischer's ring: Iron deposits in base of cone

} In kerato conus



Complications of keratoconus

- Acute hydrops

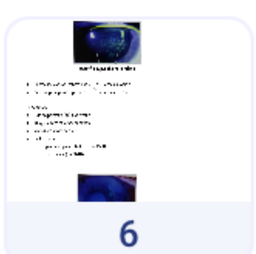
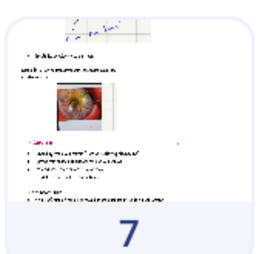
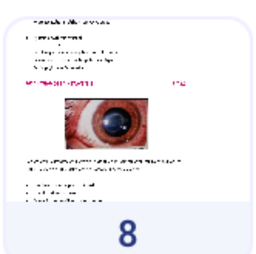
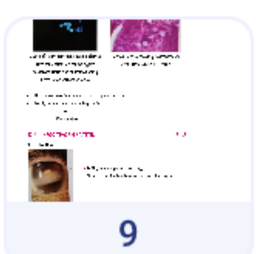
Treat:

- Rigid contact lens
- Topical riboflavin drops
- UV – A light for collagen cross linking

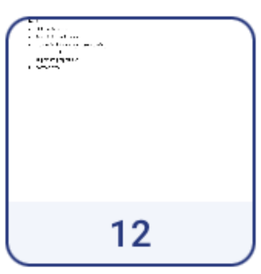
  ↓

  To prevent progression
- Keratoplasty



5

6

7

8

9

10

11

12

Iridocorneal Endothelial Syndrome

- Rare disorders characterized by proliferative and structural abnormalities of corneal endothelium, progressive obs of iridocorneal angle and iris anomalies such as atrophy, hole formation
  ↓
  Can lead to corneal decompensation, glaucoma
- 3 variants
  1. Iris nervus/Cogan – Reese sign
  2. Chandler syndrome = M/C
  3. Essential, Progressive Iris atrophy
- Sporadic
- No association to ocular/sys disease
- 20-50 age
- U/L
- F > M
- Glaucoma in half of causes

Etiology

- Viral infection → HSV / HBV → Low grade inflammation in corneal epi
  ↓
  "Proliferative endotheliopathy" → PCR has found increase % of HSV DNA in these patients
- Monolateral acquired disorders
  - One eye affected with virus during Postnatal age
  - Other eye protected by immune

PATHOGENESIS 07:49

Endothelial cells replaced with more epithelial like cell
↓
Mirgate posteriorly, moving beyond schwalbe line onto, trabecular meshwork, also peripheral iris
↓
Contraction of this tissue within angle iris
↓

↓

Peripheral Anterior Synechae (PAS)

- High PAS
  ↓
  2° ACG
  ↓
  Can occur without overt synechae, as corneal endo can functionally close the angle

- Corneal edema in ICE syn
  ↓
  Increase IOP from 2° ACG
  ↓
  Subnormal pump function with altered corneal cells

FEATURES

11:02

- Differing degrees of pain
- Decreased vision
- Abnormal iris
- Corneal edema = Worse in morning
- Corectopia (irregular position of pupil)
- Dark spot in eye

Various degrees of iris atrophy characterize each of the specific clinical entities

	Iris	Pupil	Cornea	Anterior chamber angle
Chandler syndrome	Areas of atrophy (not full - thickness holes)	Corectopia	Early and marked edema, endothelial dystrophy, and ICE cells at confocal microscopy	Peripheral anterior synchae
Progressive iris atrophy	Full thickeness hole(s)	Polycoria	Endothelial dystrophy , ICE cells at confocal microscopy and corneal edema may occur	Peripheral anterior synchae
Cogan - Reese syndrome	Nodules and iris atrophy	Changes uncommon	Endothelial dystrophy, ICE-cells at confocal microscopy, and corneal edema may occur	Peripheral anterior synchae

Iridocorneal Endothelial Syndrome

Topic Notes: 7

Progressive (Essential) Iris Atrophy

- This variation is characterized by severe iris atrophy that results in heterochromial, marked corectopia, ectropion uveae, and psuedocpolycoria (hole formation) that usually occur in the direction toward the quadrant with the most prominent area of peripheral anterior synechia
- There appear to be two forms of atrophic iris holes. With stretch holes, the iris is markedly thinned in the quadrant away from the direction of pupillary distortion, and the holes develop within the area that is being stretched. In other eyes, melting holes develop without associated corectopia or thinning of the iris, which is thought to occur due to ischemia of the iris based on iris angiography
- Iridal hole formation is the hallmark finding of progressive iris atrophy



CHANDLER'S SYNDROME *15:35*

- No iris stromal atrophy
- Mild corectopia
- Corneal edema, Angle findings
- "Beaten Bronze app (or) Hammered silver app"

Iris Nevus Syndrome (cogan-reese syndrome)

- Iris atrophy extent tend to variable
- Less severe
- Tan, Pedunculated nodules on anterior iris surface

↓

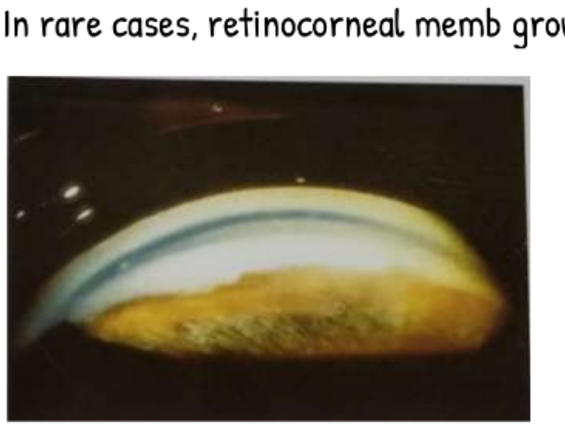
Made of iris stroma pinched off by abnormal cellular membrane



Pinch to zoom

Goniscopic Findings

- Peripheral anterior synechia, usually extending to or beyond the schwalbe line, is another clinical feature common to the ICE syndrome
- In rare cases, retinocorneal memb grow over ant surface



Investigations

- Gonioscopy = To see synechiae
- Ultrasound Biomicroscopy (UBM)
- Specular microscopy

  ↓

  Asymmetric endo cell loss,

  Atypical endo cell morphology

  ↓

  Pathognomic for ICE syn = ICE cells

- Specular microscopy of corneal endothelium in ICE syndrome. Cell borders are obscured, resulting in loss of the normal endothelial mosaic. Note dark areas within endothelial cells. Brighter reflections are believed to be from cell borders. B : Cornea, ICE syndrome. Scanning electorn microscopy demonstrates sharp demarcation between abnormal (ICE) cells with microvilli and relatively unaffected endothelial cells



A B

- Corneal edema can be quantified = Pachymeter
- Evaluation of glaucoma → IOP
  → Angel for PAS
  → Stereo disc photographs

OTHER DISORDERS 22:50

Corneal endothelial disorders

Post Polymorphous Dysntrophy (PPD)

- Rare
- B/L
- Heriditary
- May have glaucoma, changes in angle, iris
- Bilateralism, Heriditary and Post. corneal abnormalities

Fuch's endo dystrophy

- Clinical corneal changes similar to ICE

Iris abnormalities

Axenfeld Rieger Syn

- Similar findings
- Congenital
- B/L

Systemic features

- Peter's anomaly :
- Congenital central corneal leukoma with synechiae extending from the central iris to the periphery of the corneal opacity
- Some patients have keratolenticular adherence, while others have anterior polar cataracts
  Iridoschisis
- Characterized by separation of the superficial layers of the iris stroma, usually in the elderly
- Associated angle closure type glaucoma is common
  Aniridia
- Congenital iris hypoplasia
- Lacks the angle defects

- Nodular lesions of iris
- Nodular neurofibroma
- Melanosis of iris
- Cogan - Reese syndrome
- Diffuse iris nevus
- Latanoprost use
- Malignant melanoma of iris
- Neurofibromatosis
- Pigmentary glaucoma
- DD of dark colored iris with glaucoma (Heterochromia)
- DD of light colored iris with glaucoma (Heterochromia)
- Chronic irdocyclitis
- Fuch's heterochromic iridocyclitis
- Glaucomatocyclitis crises

MANAGEMENT *27:01*

- Topical medicine = for patients with ↑ IOP from SACG
- Aqueous suppressants
  Topical beta blockers
  α - agonist } Used
  CA inhibitor
  Miotics = Less used
- PG analog - ↑ UV outflow = ↓ IOT
- Corneal edema = Topical hypertonic saline solutions can be given
- Trabeculoplasty = Not done
- If not cured with medicine → Surgery
- Trabeculectomy with antifibrotic agents (Mitomycin C (or) 5-FU)or glaucoma drainage is effective
- If surgical success is not obtained with a trabeculectomy or glaucoma drainage device, it may be necessary to treat patients with a ciliary body destruction procedure. Typically this is done with diode laser cyclophotocoagulation (diode CPC), and is reserved for intractable cases of glaucoma
- Corneal decompensation can similarly be treated with surgery when medical management fails. Penerating keratoplasy (PKP) or endothelial keratoplasty (commonly DSEK or DSAEK) can be implemented to replace the abnormal corneal endothelial cells and improve corneal function. At times, both a filtering and corneal transplant procedure are necessary

Iridocorneal Endothelial Syndrome

Topic Notes: 7

Prognosis

- Depends on timing of diagnosis, success (or) failure of treatment
- Glaucoma = More severe in progressive iris atrophy and Coagn Reese Syn

Pinch to zoom

1

2

3

4

5

6

7

Neuro Ophthal

OPTIC NERVE = Continuation of nerve fibre layer of retina

- Nerve fibre layer = Axons of ganglionic cells (III order)

Visual sensations

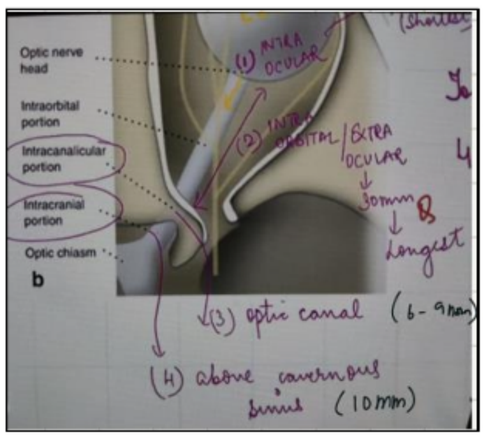
I order neurons = Rods, Cons

II order = Bipolar cells

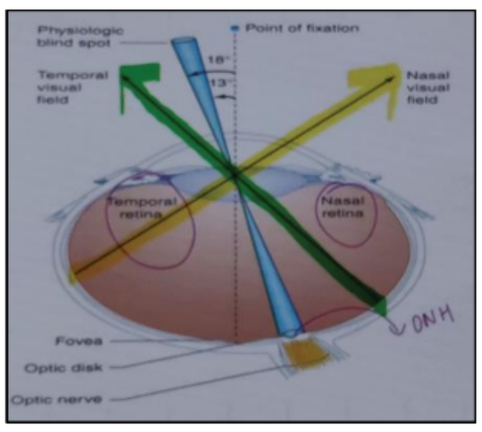
III order = Ganglionic cells [optic nerve]

IV order = Lateral Geniculate body

- Total length of nerve = 47-50 mm
- 4 parts
  - Intra ocular
  - Intra orbital
  - Intra canalicular
  - Intra cranial



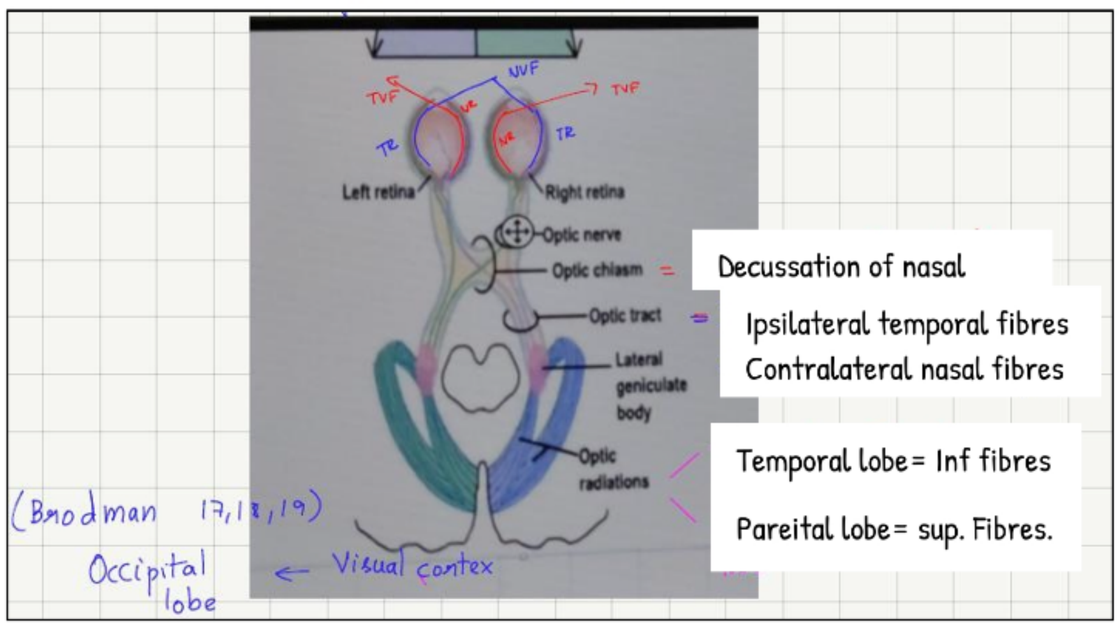
- Temporal retina sees nasal field
- Nasal retina sees temporal field



Pinch to zoom

VISUAL PATHWAY

07:09



Lateral Geniculate Body = 6 layers

- Layers 1, 4, 6 = Innervate contralateral hemi retina
  Layers 2, 3, 5 = Ipsilateral hemiretina

Pathways

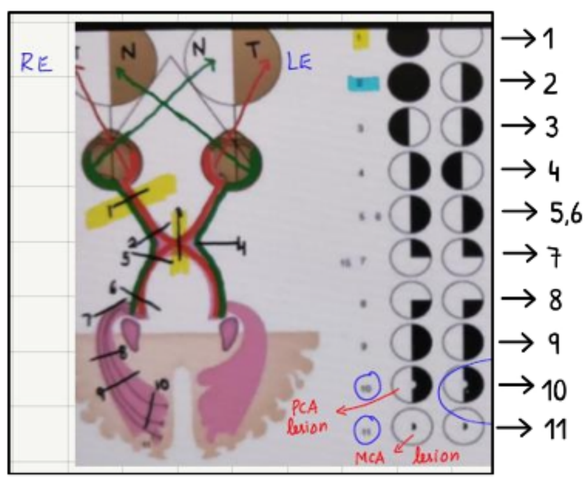
Magrocellular	Parvocellular
• Layers 1, 2	Layers 3 to 6
• In movement, depth, flickering	In finer details, colour, texture, contrast

Occipital lobe

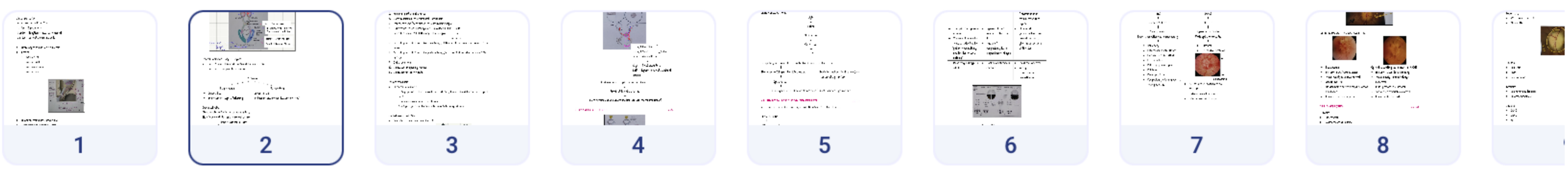
Blood supply → Posterior cerebral artery

Tip of cortex → Posterior cerebral artery,
Middle cerebral artery

Double blood supply



Pinch to zoom



Lesions of the visual pathway of the level of:

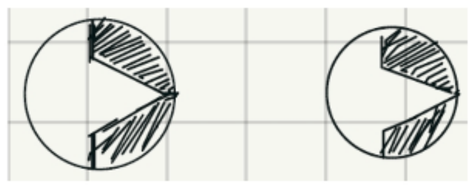
1. Optic nerve ⇒Total blindness
2. Proximal part of optic nerve
3. Central chiasma; ➜ Bitemporal Hemianopia
4. Lateral chiasma (both sides); ➜ Binasal Hemianopia
5. Optic tract; ➜ C/L Homonymous Hemianopia ➜ M/C VFD
6. Geniculate body; ➜ C/L Homony . Hemianopia ↓ Incongrous
7. Part of optic radiations in temporal lobe; (Inf fibres) ➜ Sup. Quadrant Anopia / Pie in sky
8. Part of optic radiations in the parietal lobe; (Sup fibres) ➜ Inf. Quad Anopia / Pie in floor
9. Optic radiations;
10. Visual cortex sparing macula
11. Visual cortex, only Macula

Lesions at chiasm

- Bilateral Hemianopia
  - If they spread up from below for eg: Pituitary tumors, the defect worse in upper field
  - If tumor spreads down from above eg:
    Craniopharyngioma, the lesion is worse in lower quadrants.

Partial lesions of LGB

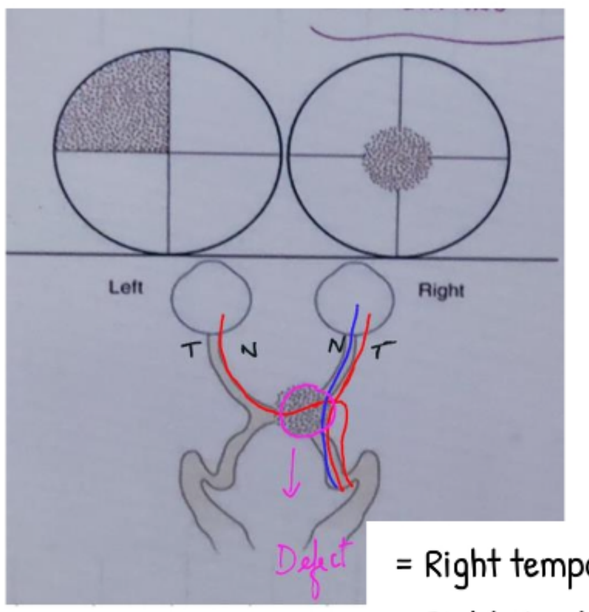
- Key hole / Tongue shaped defect ➜



- In visual cortex lesions = Congrous

JUNCTIONAL SCOTOMA OF TRAQUAIR

28:52



= Right temporal
= Right Nasal
= Left Infero = Nasal
} Affected

↓

Right = Total visual loss

Left = Supero temporal Quadrant anopia

Lesion at junc. of optic nerve and chaisma

↓

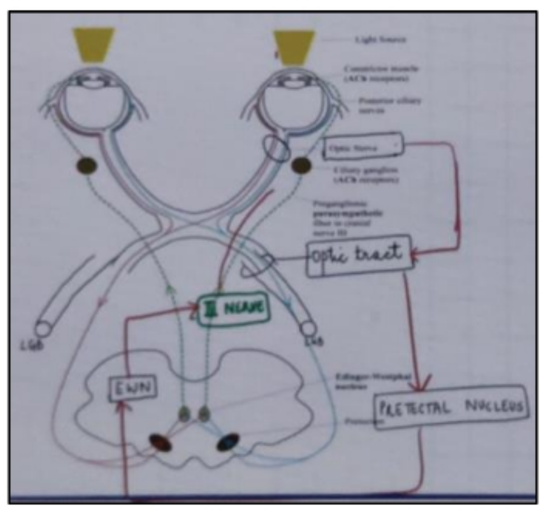
Proximal to optic chiasma

↓

Due to ant knee of von willebrand [RT, RN left inferobasal fibres]

PUPILLARY REFLEXES

32:40



Light

↓

Retina

↓

Optic nerve

↓
Optic tract

Light Reflex Pathway:

Light
↓
Retina
↓
Optic nerve
↓
Optic tract
↓
LGB

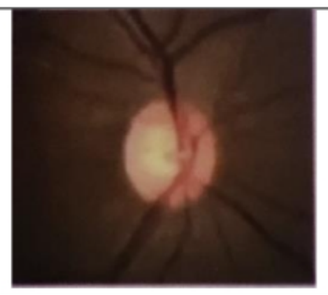
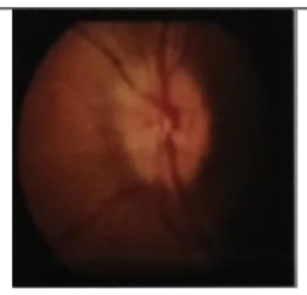
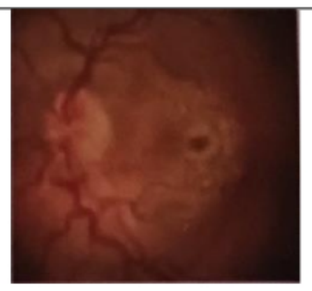
In pupillary reflexes, fibres of optic tract goes to pretectal nucleus
↓
Then goes to Edinger - Westphal Nucleus = Basis for indirect light reflex (or) consenual light reflex
↓
Optic nerve
↓
Ciliary ganglion ➔ Muscles of both eyes (Direct, Indirect Light reflex)

PATHWAY OF ACCOMODATION REFLEX 36:33

- Same as light reflex, but it goes to LGB instead of pretectal nucleus

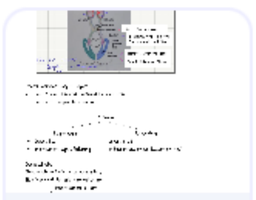
Optic neuritis
↓
M/C Multiple sclerosis

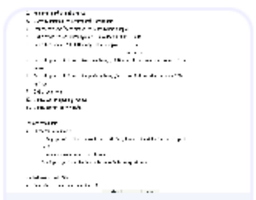
Normal fundus

Ophthalmoscopical classification		
Retrobulbar neuritis	Papillitis	Neuroretinitis
		

Pinch to zoom


1

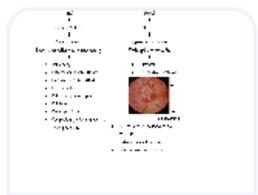

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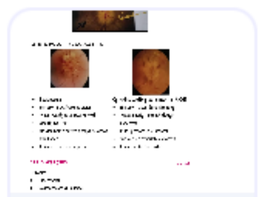

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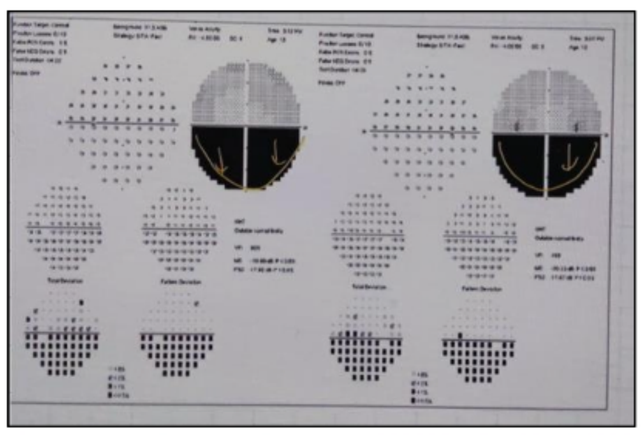

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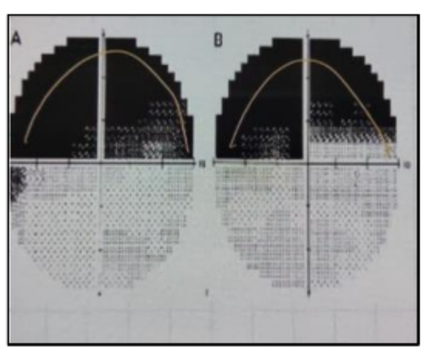
• Optic nerve affected behind the eyeball	• Optic nerve head affected	• Concomitant swelling of optic nerve head (papillitis) and macula (inflammation of retinal nerve fibre layer)
• The optic disc appears normal • The condition may be truly described as the "patient sees nothing and the doctor sees nothing"	• Hyperaemia and oedema of the optic disc • May be a/w peripapillary flame – shaped haemorrhages	• Macular star (exudates that form around the macula give the appearance of the star)
• Most frequent type in adults	• Most common type in children	• Least common type • Rarely a manifestation of demyelination



Inferior altitudinal Hemianopia

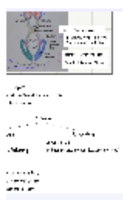
↓

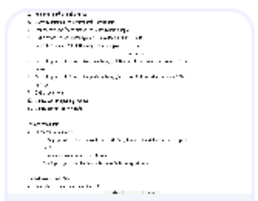
Ant. Ischemic optic neuropathy



Sup. Altitudinal Hemianopia

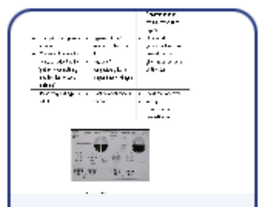
Pinch to zoom

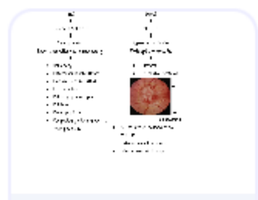

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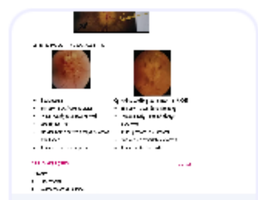

3


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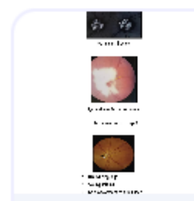

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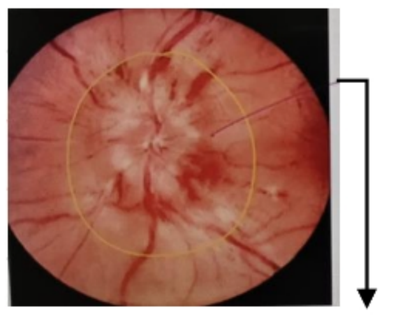

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Ant Ischemic optic neuropathy

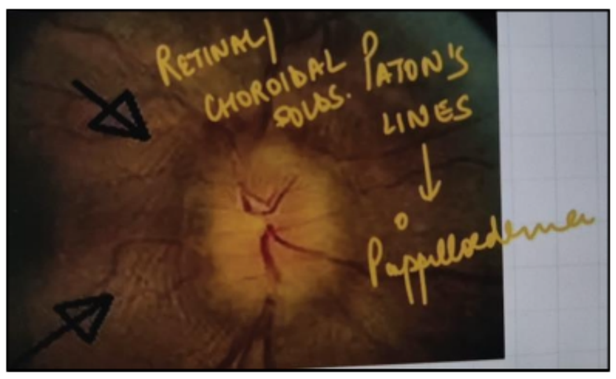
Arteritic	Non - arteritic
(5%)	(95%)
↓	↓
Giant cell Arteritis	DM, HTN
↓	↓
Pale optic disc	Hyperemic optic disc
Labor's hereditary optic neuropathy	**Toxic optic Neuropathy**
↓	↓
• Heriditary • Mitochondrial inheritance • Maternally transmitted • M/c in males • Primary optic atrophy • Painless • Pseudopapillitis • Peripapillary micrangiopathic telangiectasias	• Bilateral • B/L central scotoma



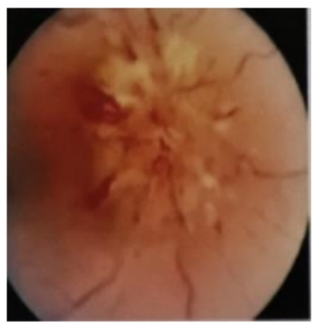
Papilloedema

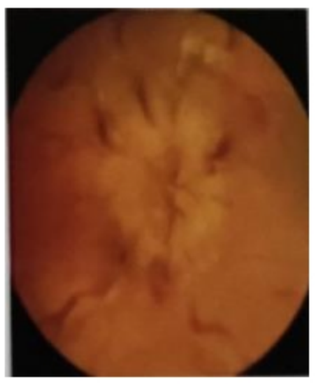
- B/L passive OD oedema 2° to ↑ I.C.P (Intra - Cranial pressure)
- Enlargement of blind spot

Pinch to zoom



PAPILLEDEMA VS OTHER DISC SWELLING





- **Papilledema**
- History -TVO, blurred vision
- Visual Acuity is usually normal
- Usually No RAPD
- No visual field defect except enlarged blind spot
- Can cause optic disc pallor

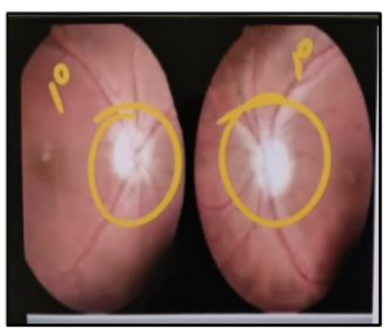
Optic disc swelling (optic neuritis, AION)

- History - visual loss, dimming
- Visual acuity - almost always abnormal
- RAPD present if unilateral
- Visual field definitely abnormal
- Causes optic disc pallor

OPTIC ATROPHY *50:32*

Primary

- Chalky white
- No antecedent OD edema



Causes:

- LHON
- TON = CH_3OH, C_2H_5DH, Chloroquine, Digoxin, Isoniazid, Ethambutol Deficiency of Vit B_1, B_2, B_{12}, Alcohol [CN], Amiodarone

Treatment: Inj IM of Vit B_{12} 1000 µg weekly x 10 weeks

- Trauma
- Tumors

Secondary
- 2° to previous attack
- Dirty white



Causes:
- Papillitis
- AION
- Papilloedema

Tertiary
- Due to retinal deposits
- Pale yellow waxy OD

Causes
- CRAO
- CRVO
- RP

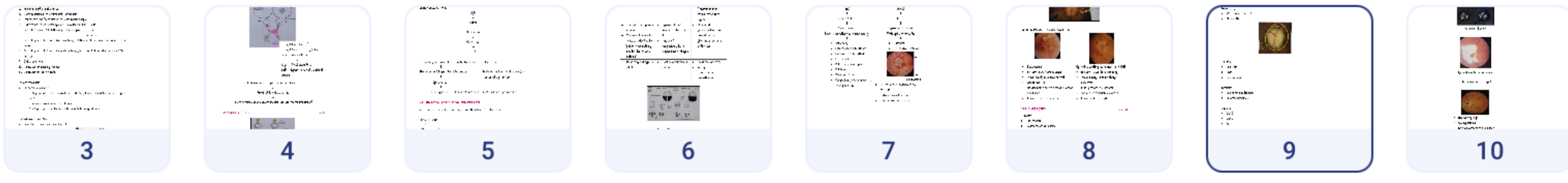
OPTIC DISK ANOMALIES *55:21*

OD anomalies



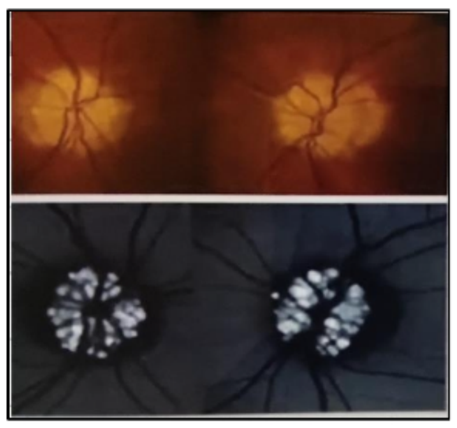
Inferior crescent → Coloboma

Pinch to zoom

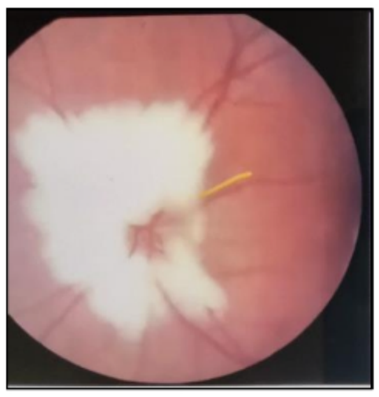


Neuro Ophthal

Topic Notes: **10**



Optic disc drusens



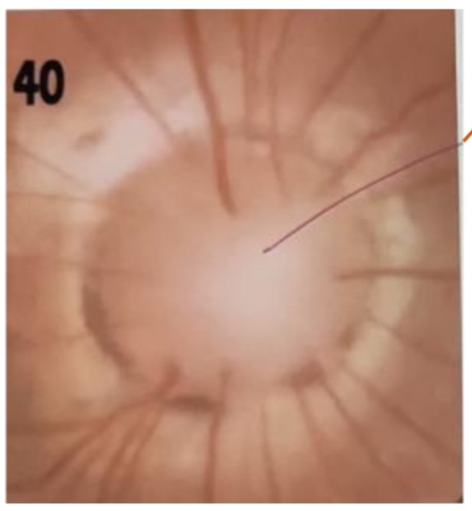
Myelinated optic nerve fibres

↓

Enlargement of blind spot



- Double ring sign
- OD hypoplasia
- No enlargement of blind spot



Morning glory syndrome

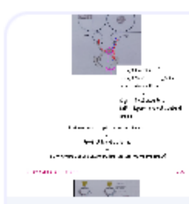
(Scleral defect)

↓

Absence of Lamina Cribrosa

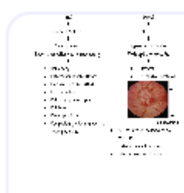
Pinch to zoom

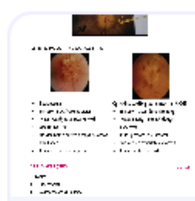

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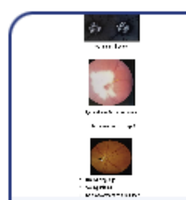

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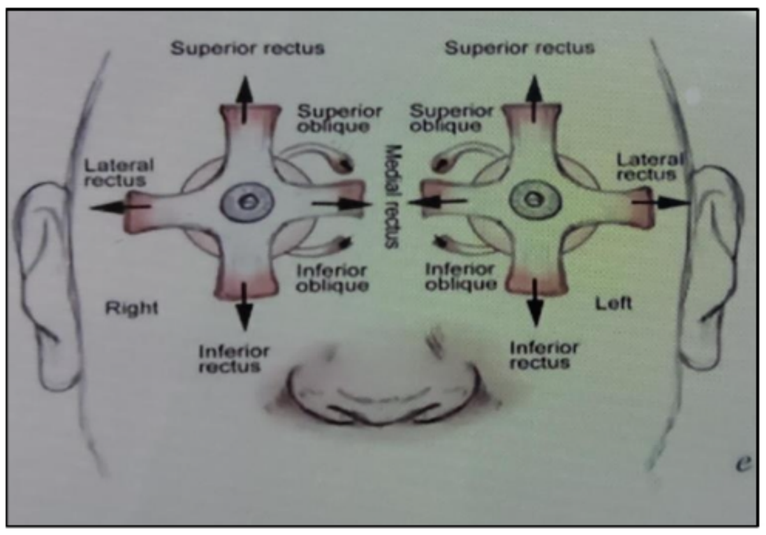

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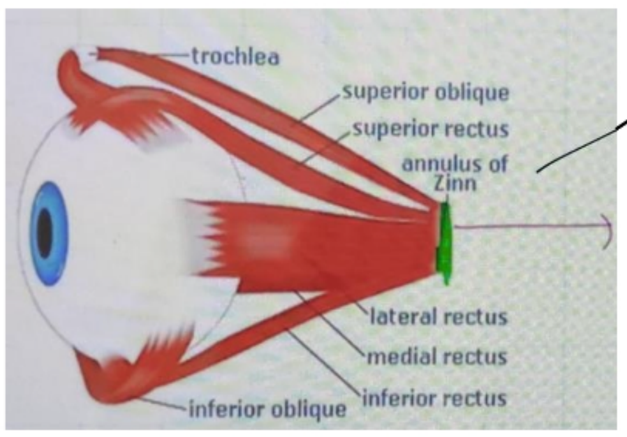
Squint



Extra ocular muscles

Rectus
- Horizontal
  - Medial rectus
  - Lateral rectus
- Vertical
  - Sup. Rectus
  - Inferior rectus

Oblique
- Superior oblique
- Inf oblique

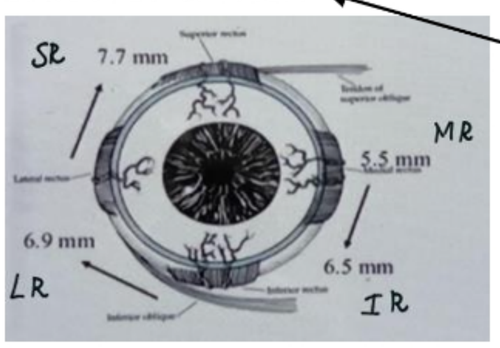


Inf. oblique does not take origin here

All rectus EDM's take origin from common tendinous ring

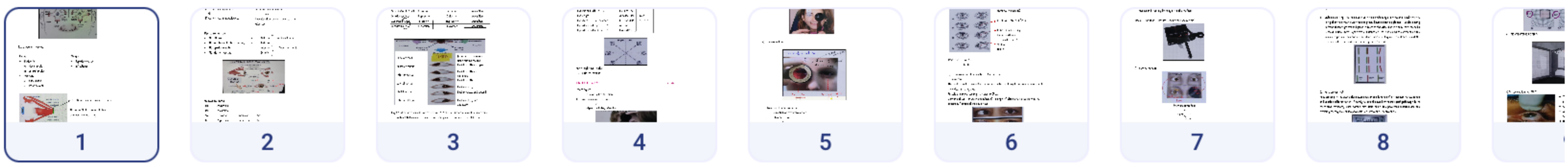
- Sup. Oblique takes origin (two heads) — One from body of sphenoid; Other from tendon of sup. Rectus

SPIRAL OF TILLAUX



Insertion of rectus EOM's at particular distance from Lembus

Pinch to zoom



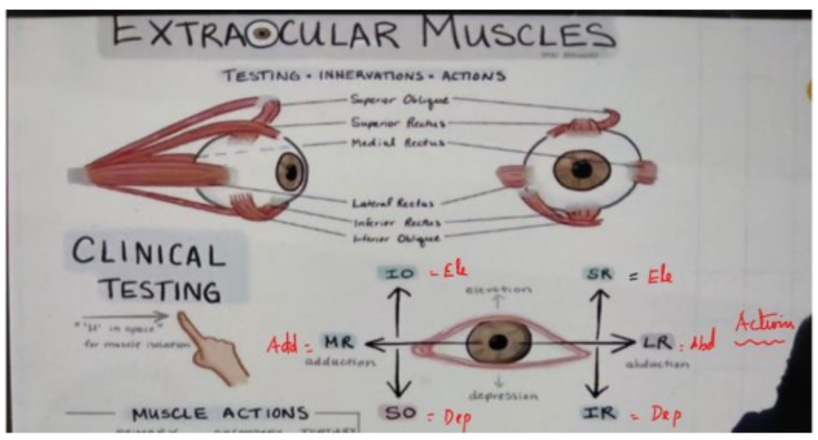
1° Action

Rectus
↓
Elevation and Depression
↓
Elevation max in abducted eye

Oblique
↓
Intorsion and extorsion
(and)
Max elevation, depression occurs in adducted

Tips to remember

- All obliques - Abductor } Rectus adducts
- All recti (except lateral rectus) - Adductor
- All superior muscles - Intortor } Superior intorts
- All inferior muscles - Extortor



MUSCLE ACTIONS

LR	Abduction	-	-
MR	Adduction	-	-
SR	Elevation	Intorsion	Add
IR	Depression	Extorsion	Add
IO	Extorsion	Elevation	Abd
SO	Intorsion	Depression	abd

INNERVATIONS

- CN3 - Oculometer nerve
- CN4 - trochlear nerve
- CN6 - abducens nerve

- Nerve supply by 3rd nerve except SO_4, LR_6

Muscle	Primary function	Secondary function	Tertiary function
Medical rectus	Adduction	X	X
Lateral rectus	Abduction	X	X
Superior rectus 23°	Elevation	Intorsion	Abduction
Inferior rectus	Depression	Extorsion	Abduction
Superior oblique	Intorsion	Depression	Adduction
Inferior oblique	Extorsion	Elevation	Adduction

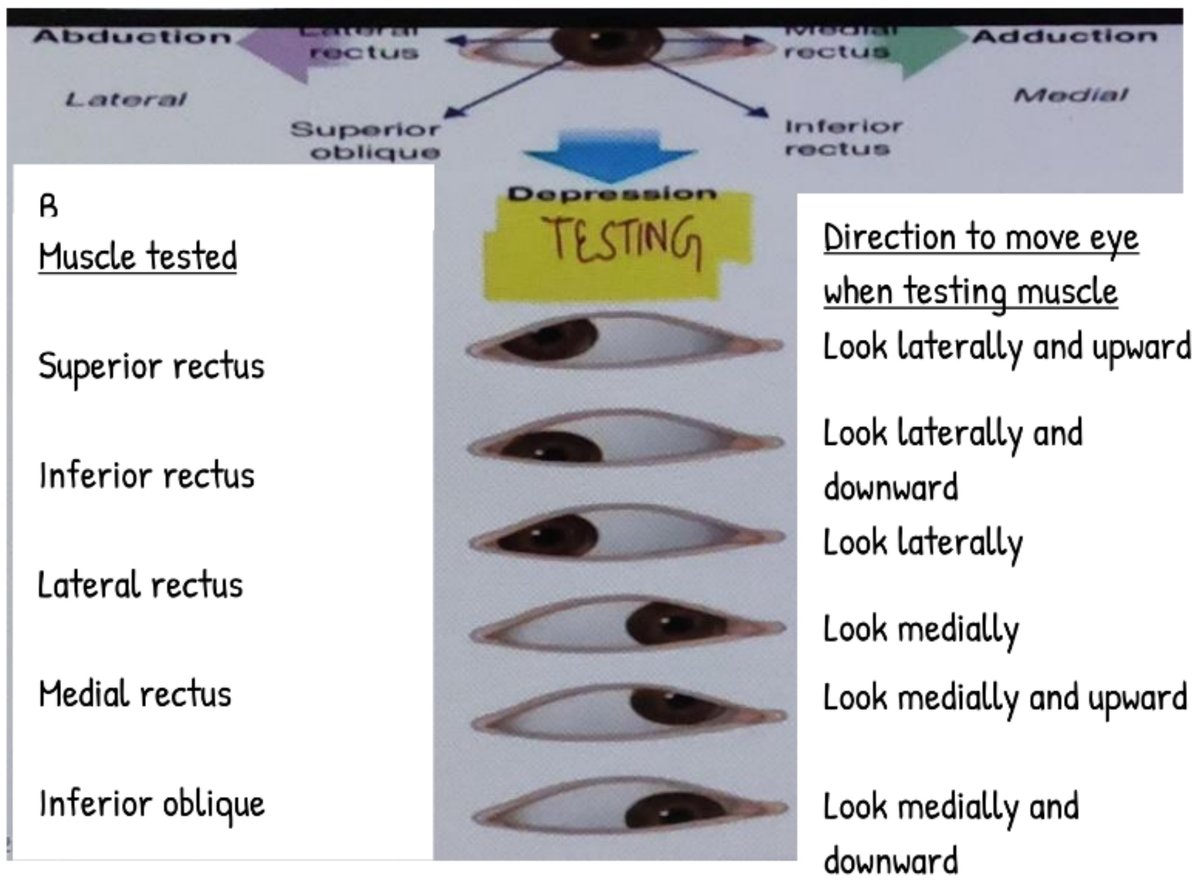


Fig. 8.91 Actions of muscles of the eyeball. A. Action of individual muscles (anatomical action). B. Movement of eye when testing specific muscle (clinical testing).

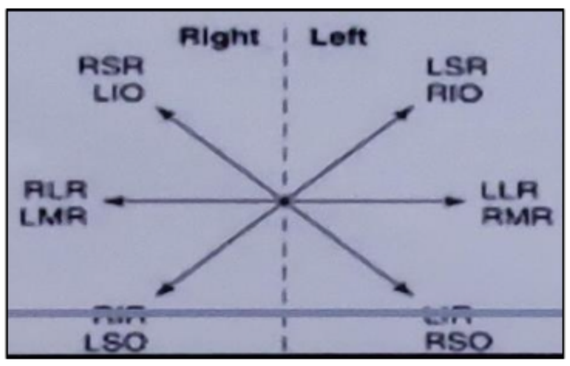


9 positions of gaze

6 Cardinal positions

↳ Can test all EOM

Eyes up and right =	3° position	RSA and LIO	
Eyes up and left =	3°	LSR and RIO	
Eyes right	2° position	ALA and LMR	Yoke
Eyes left		LLA and RMR	muscles
Eyes down and right =	3°	AIA and LSO	
Eyes down and left =	3°	LIA and RSO	



RSR = Right sup. Rectus

LIO - Left inf. oblique

LATENT SQUINT

19:40

Latent squint

↳ demo by break fusion

1) Cover - uncover test done

↓

Help of occ luder, prism bar



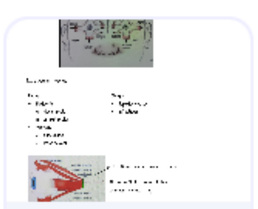
2) Prism - bar cover test

L > prism of ↑ strength (Apex towards deviation)

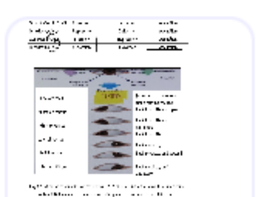
↓

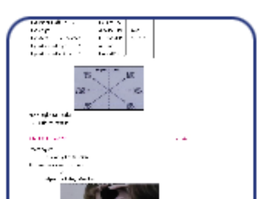
Till no movement on cover - uncover test

Pinch to zoom

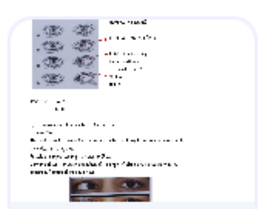

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2

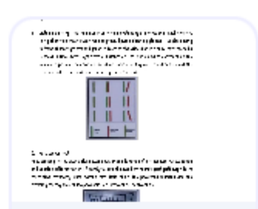

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4


5


6

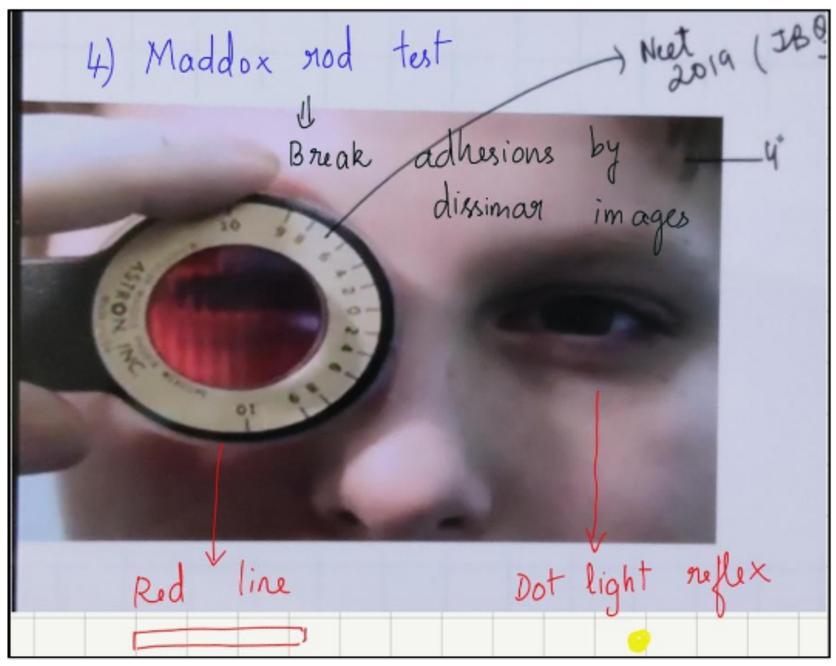

7


8

3) Alternate cover test



4) Maddox rod test



Treatment of latent squint

C = Correction of refractive error

O = Orthoptic exercises

P = Prisms (glasses)

S = Surgery (4-5 yrs of age)

EVALUATION OF COMITANT SQUINT *24:05*

↓

Amt. of squint is same in all gazes

↓

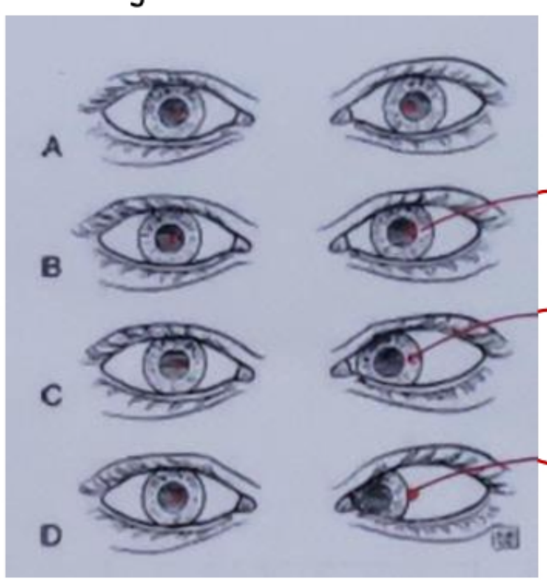
1° deviation = 2° deviation

1) Visual acuity and Refraction

[↓ dilation (fundus)]

2) Hirschberg corneal reflex test (HCRT)

Hirschberg corneal reflex test (HCRT)



NORMAL (No squint)

PUPILLARY BORDER (15°)

Centre b/w Pupillary border and Limbus (45-15°) = 30°

Limbus (45°)

1mm = 7° = 7x2 PD
14 PD.

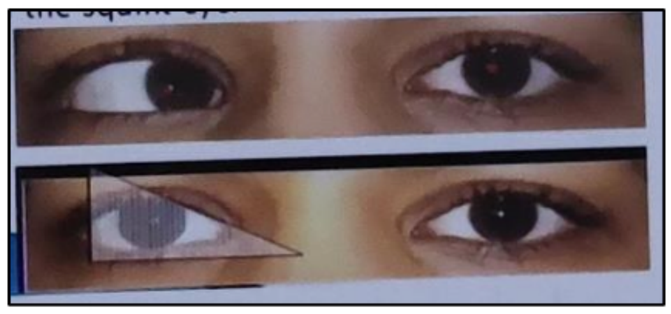
3) Krimsky corneal reflex test (HCRT + Prism)

Krimsky Test

This test is used to centralize the corneal reflection in squinting eye as compared to the reflex in fixing eye.

Results are expressed in prism diopter (PD).

Convenient test for quick evaluation of the angle of strabismus, especially in the abnormal fixation of the squint eye.

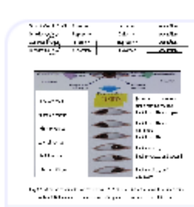


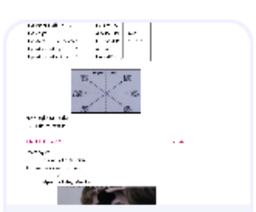
4) WHAT IS A SYNOPTOPHORE?? → Exercises → Measuring angle of squint



Pinch to zoom

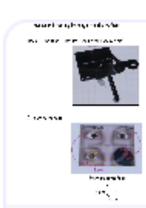

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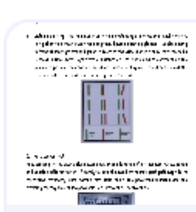

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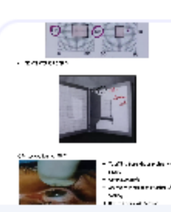

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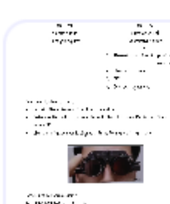

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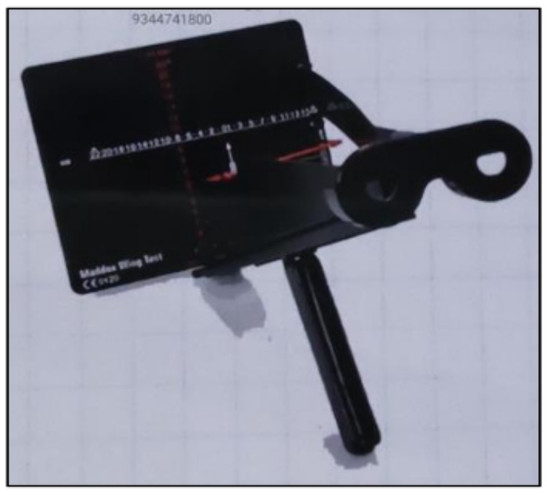

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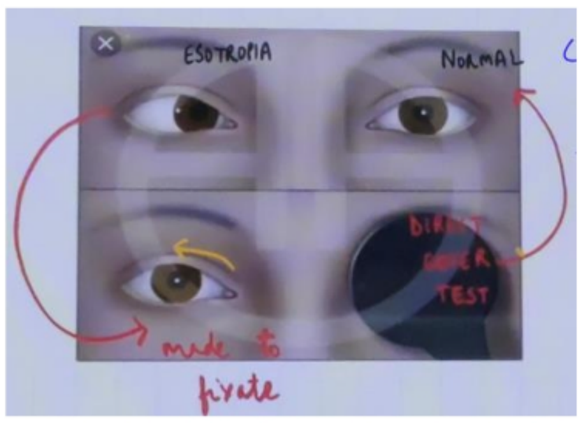

10

- It is an instrument which compensates for the angle of squint and allows the stimuli to be presented to both eyes simultaneously.
- It is an ophthalmic instrument which is used for diagnosing the imbalance of the eye muscle and treating them by orthoptic methods.

Maddox using test - Measures squint for near (33 cm)



6) Direct cover test



Alternate cover test

↓

Squint — U/L
V/L
Alternate

PBCT = Prism bar Cover test



Strength of prism where movement becomes nil = Amt of squint

Pinch to zoom

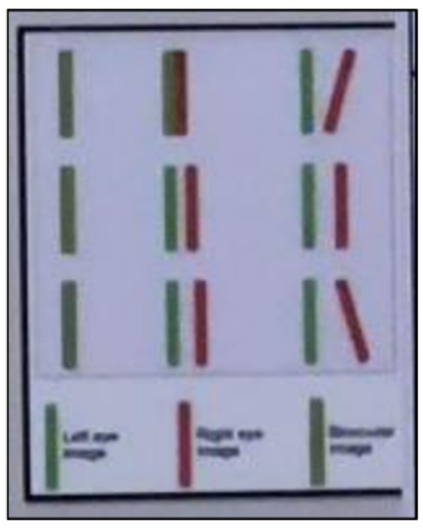


EVALUATION OF INCOMITANT SQINT

30:25

Paralytic | Restrictive | A-V pattern

1. Diplopia charting. It is indicated in patients complaining of confusion or double vision. In it patient is asked to wear red and green diplopia charting glasses. Red glass being in front of the right eye and green in front of the left. Then in a semi-dark room, he is shown a fine linear light from a distance of 4 ft. and asked to comment on the images in primary position and in other positions of gaze. Patient tells about the position and the separation of two images in different fields

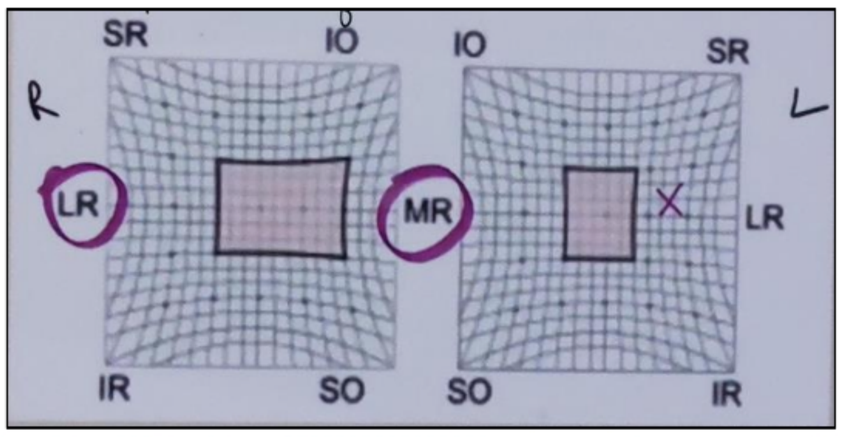


2. Hess screen test

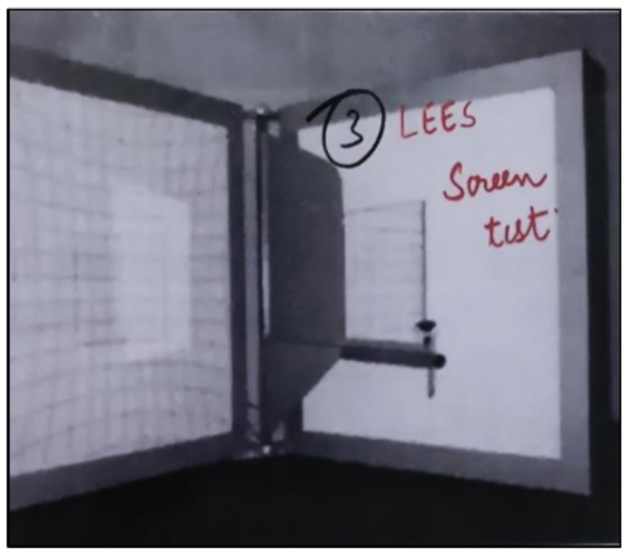
Hess screen plot the dissociated ocular position as a function of extraocular muscle action and enables differentiation of paralytic squint caused by neurological pathology from restrictive myopathy Hess screen test tells about the paralysed muscles and the pathological sequelae of the paralysis, viz., overaction, contracture



Interpretation of hess chart:



- RIGHT LATERAL RECTUS



4) Forced duction test (FDT)



→ To diff b/w Paralytic or restrictive square
→ Corenal Anaesth.
→ Ask the pt in direction of action of testing EDM.
→ Hold at limbus with forceps

Passively morning eye in direction of action of EOM.

No resistance	Resistance +nt
FDT - ve	FDT + ve
No restriction	Restriction +nt
[Paralytic squint]	[Restrictive squint]

↓

1) Thyroiditis = Inf rectus paralysis ↴ So cant elevate
2) Blow out fractures
3) DRS
4) So sheath syndrome

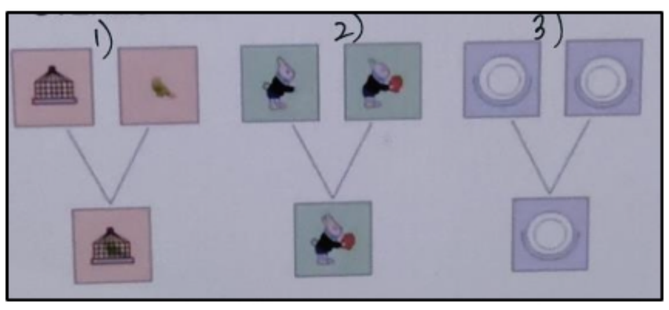
Maddox double rod test

- Quantitative determination of cyclodeviation
- Red and white maddox rods are placed in the trial frame. Red before RE and white before LE.
- Direction of glass rods is aligned with the 90° mark of trial frame



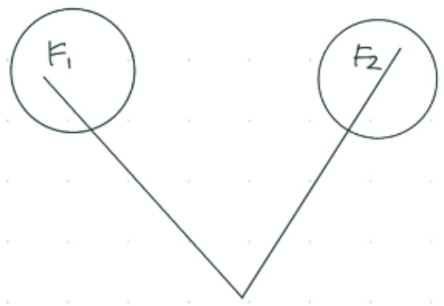
Grades of Binocular vision

1) SIMULTANEOUS PERCEPTION
2) FUSION
3) STEREOPSIS



Normal Retinal Correspondence (NRC)

- Every point on right retina is correspondently seen on same point on left retina



Simultaneous perception

↓

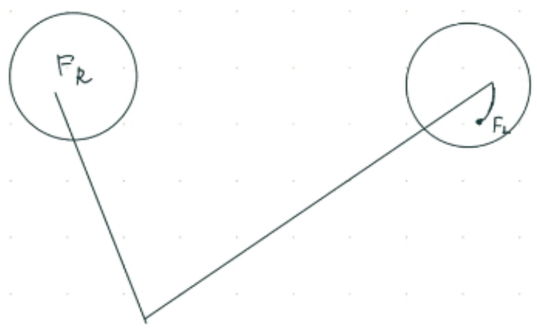
Fusion = One image seen

Abnormal retinal correspondence (ARC) → Squint

- Fovea of right eye corresponds with extra foveal point on left eye

↓

Crude binocular single vision



Tests of suspension / sensory anomalies

↓

Binocular single vision

- Worth 4 dot test
- Bagolini striated glass test = Most physiological

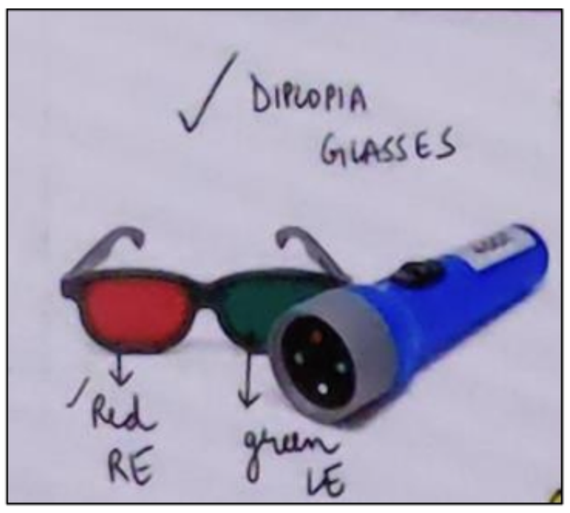
Worth 4 dot test

Diplopia glasses used → Red on RE

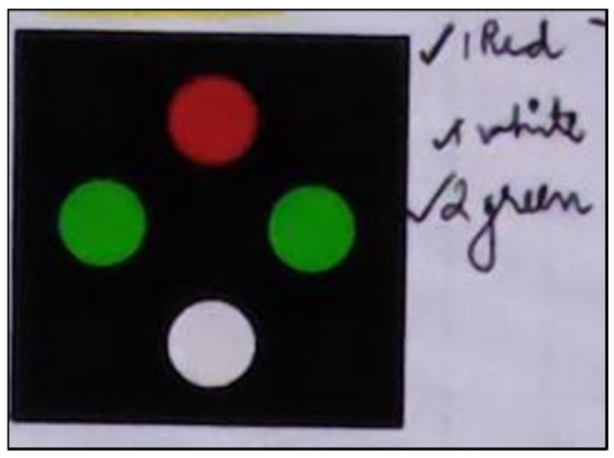
Green on LE

1) Normal will see 1 red, 2 green, 1 white
2) 4 points with squint = ARC
3) RE suppression = 3 green
4) LE suppression = 2 red
5) 3 green, 2 red = Alternating suppression
6) 5 lights (3G + 2R) = Diplopia

WORTH 4 DOT TEST - BSV — NRC, ARC



1) NORMAL



NORMAL BSV

(ēmit squint)

Bagolini test

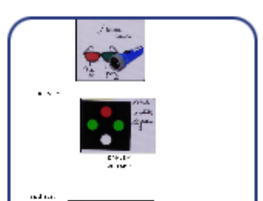


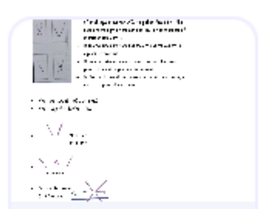

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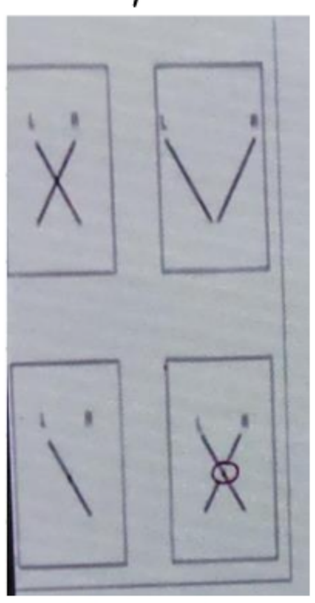

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- These lenses have fine striations oriented at 135° before right eye and 45° before left eye

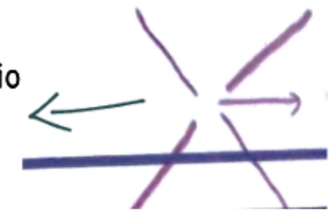


- If the two streaks intersect at their centres in the form of an oblique cross (an 'X'), the patient has BSV II the eyes are straight or harmonious ARC in the presence of manifest strabismus.
- If the two lines are seen but they do not form a cross, diplopia is present.
- If only one streak is seen, there is no simultaneous perception and suppression is present
- In theory, if a small gap is seen in one of the streaks, a central suppression scotoma

- X without squint = BSV with NRC
- X with squint = BSV with ARC

- 
  No fusion
  DIPLOPIA

- 
  Supression

- Central depressio
  (or) Scotoma 

TESTS FOR STEREOPSIS *42:15*

Qualitative tests

- Lang's 2 pencil test
- Synaptophore

Quantitative tests

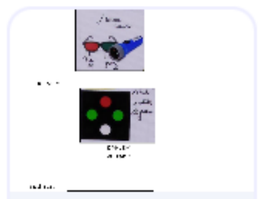
- Random dot test
- TNO test

Pinch to zoom

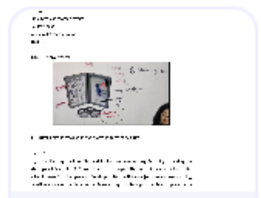

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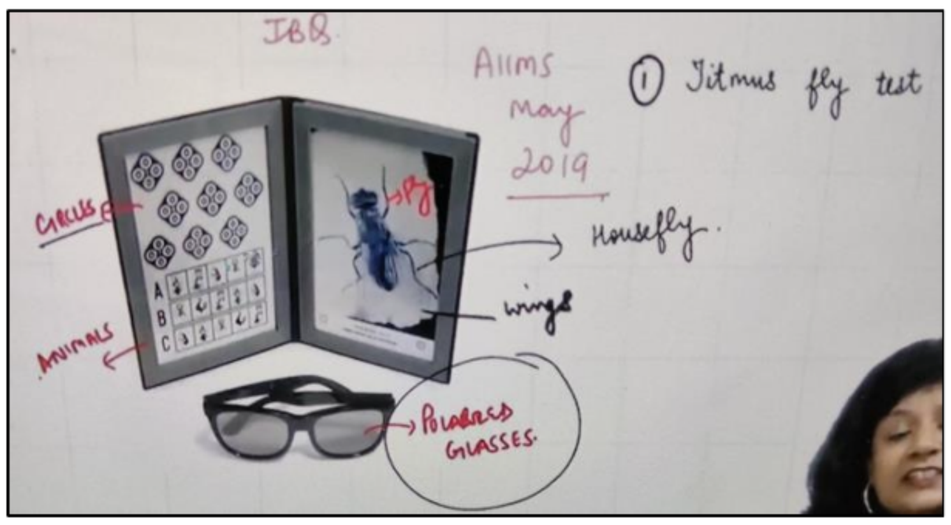

16


17

- Lang's stereo test

Polarized glasses used
↓
Also in titmus stereo fly test
Polaroid test
Random dot stereograms
TNO test

Titmus stero fly test



- Titmus test is made up of two plates in form of booklet

Step - 1
Fly test- The right side of the test booklet contains a large housefly to test gross stereopsis (threshold 3000 sec of arc). It is especially useful in young children The subject is asked to pick up one of the wings of the fly, If the subject sees stereoscopically, he will reach above the plate. In the absence of gross stereopsis the fly will appear as an ordinary flat photograph.

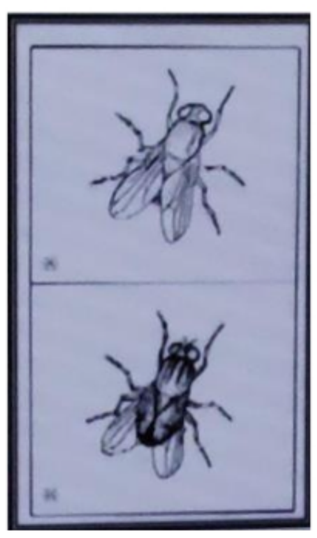
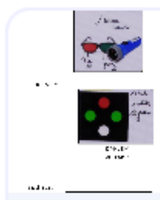


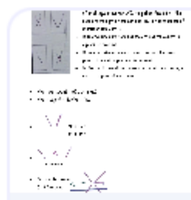
Fig. Titmus test using fly for gross stereopsis - A - no stereopsis B - Steropsis present

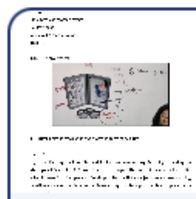
Pinch to zoom


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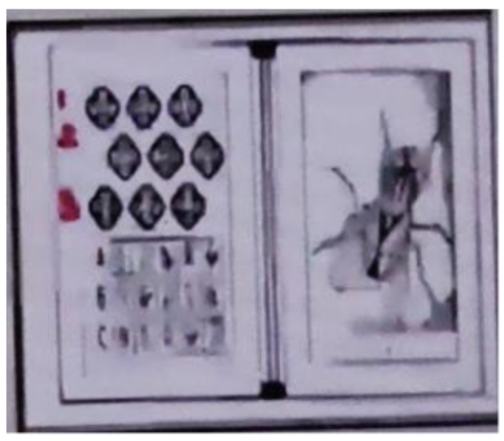

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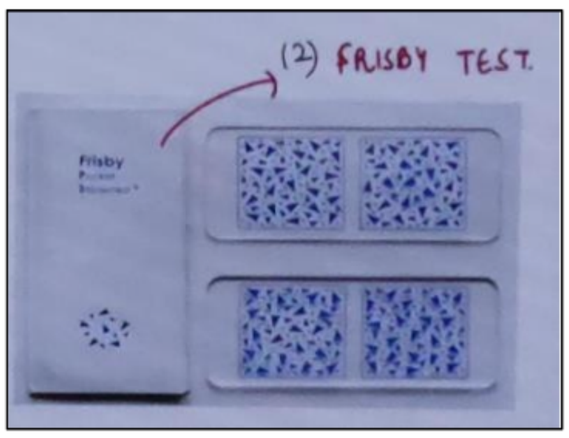
Animal lest- It is performed if the gross stereopsis is present. This test consists of three rows of five animals. One animal from each row is imaged disparately (thresholds, 10, 200 and 400 see of arc, respectively) And, in each row. one of the animals correspondingly imaged in two eyes is printed heavily black (serves as a misleading clue). The subject is asked which one of the animals stands out. A subject without stereopsis will name the animal printed heavily (misleading clue), while in the presence of stereopsis, he will name the disparately imaged animal



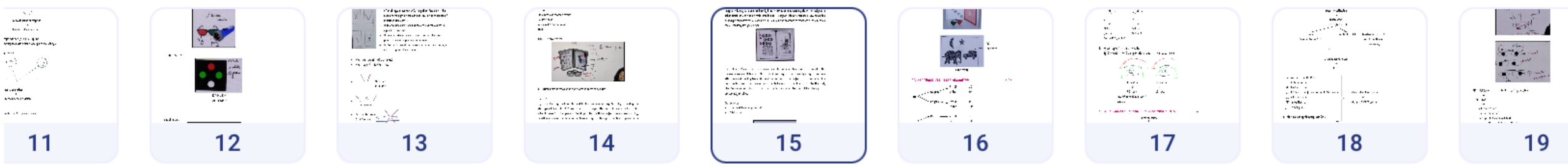
Circle test - It consists of nine squares, each containing four circles arranged in the form of a lozenge. Only one of the circles in each square is disparately imaged at random with threshold ranging from 800 to 40 sec of arc. If the subject has passed other two tests, he is asked to push down the circle that stands out, beginning with the first set, when he makes mistakes or finds no circle to push down, the limit of his stereopsis is presumably reached.

Other tests

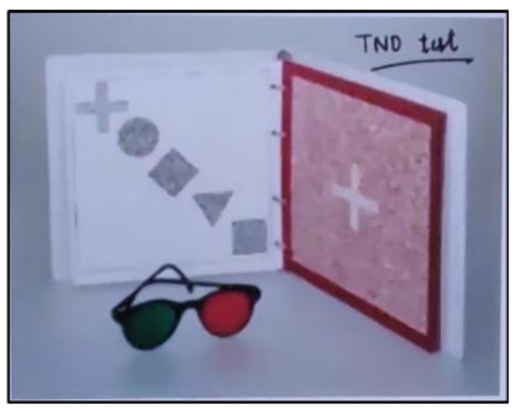
- Random dot stereogram test
- Frisloy test

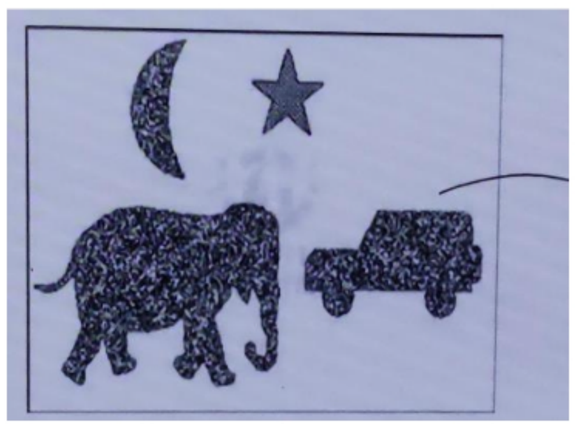


FRISBY TEST



(3) TNO TEST





(4)
Lang test

LANG TEST

PARKS' THREE STEP TEST ALGORITHM

46:01

RHT	Rt gaze	Rt tilt	LIO
		Lt tilt	RIR
	Lt gaze	Rt tilt	RSO
		Lt tilt	LSR
LHT	Rt gaze	Rt tilt	RSR
		lt tilt	LSO
	Lt gaze	Rt tilt	LIR
		Lt tilt	RIO

Steps:

1) Start with hypertropia [Which eye shows this]

   Eg: RE hypertropia (or) LE hypotropia

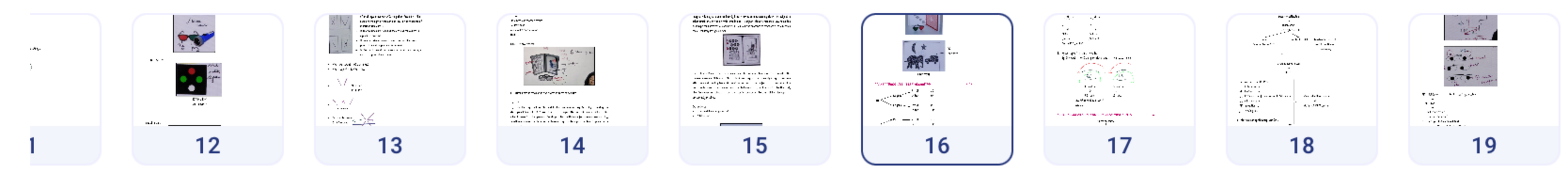
   ↓ ↓

   Depressor palsy — Elevator palsy

   Can be RIR — LSR

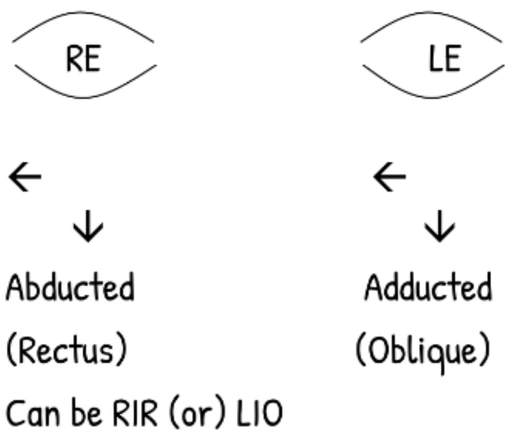
   RSO — LIO

Pinch to zoom



2) Hypertropia ↑ in which gaze

Eg: ↑ in right gaze



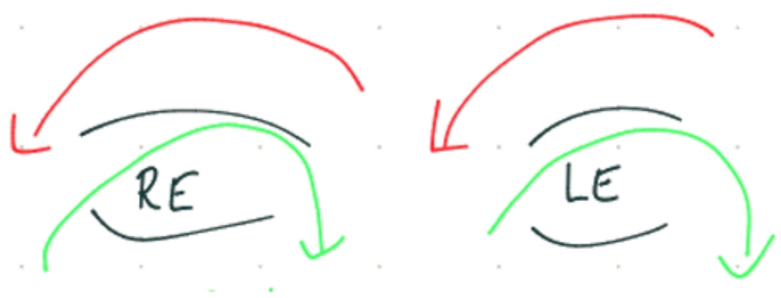
Abducted (Rectus)

Adducted (Oblique)

Can be RIR (or) LIO

3) Hypertropia ↑ in which head tilt

Eg: (R) Head tilt (or) Compensatory head tilt towards left side



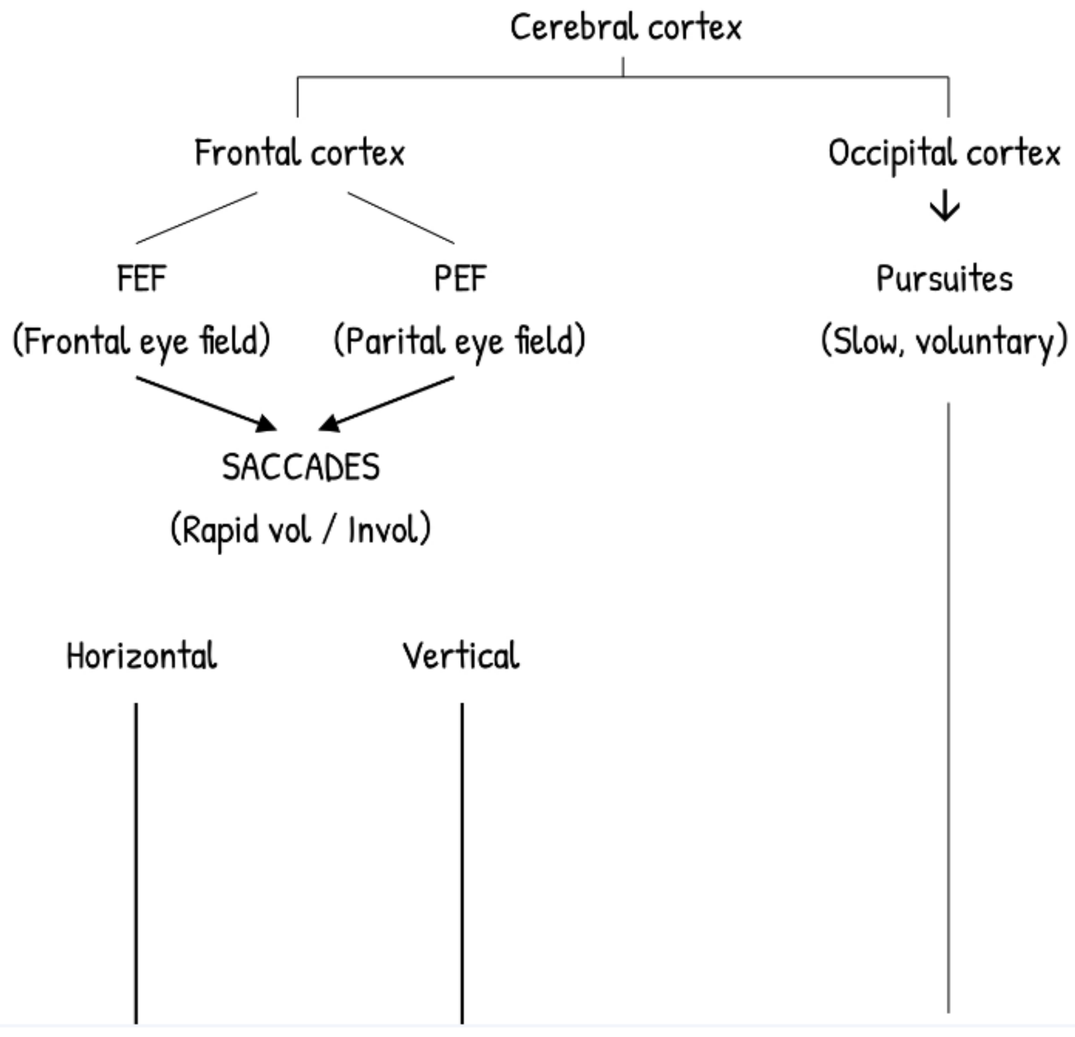
Intorsion → RE - sup

Extorsion → LE - sup

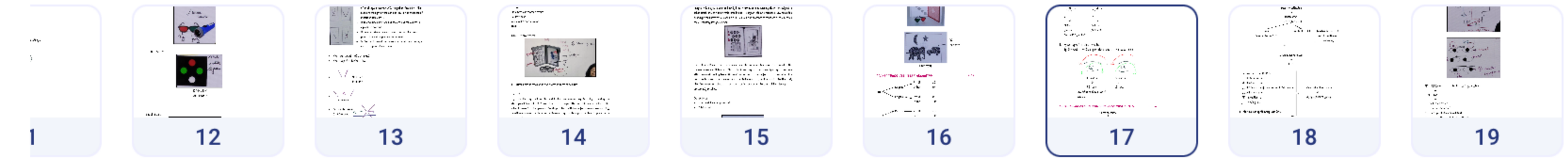
So, RIR cannot be present

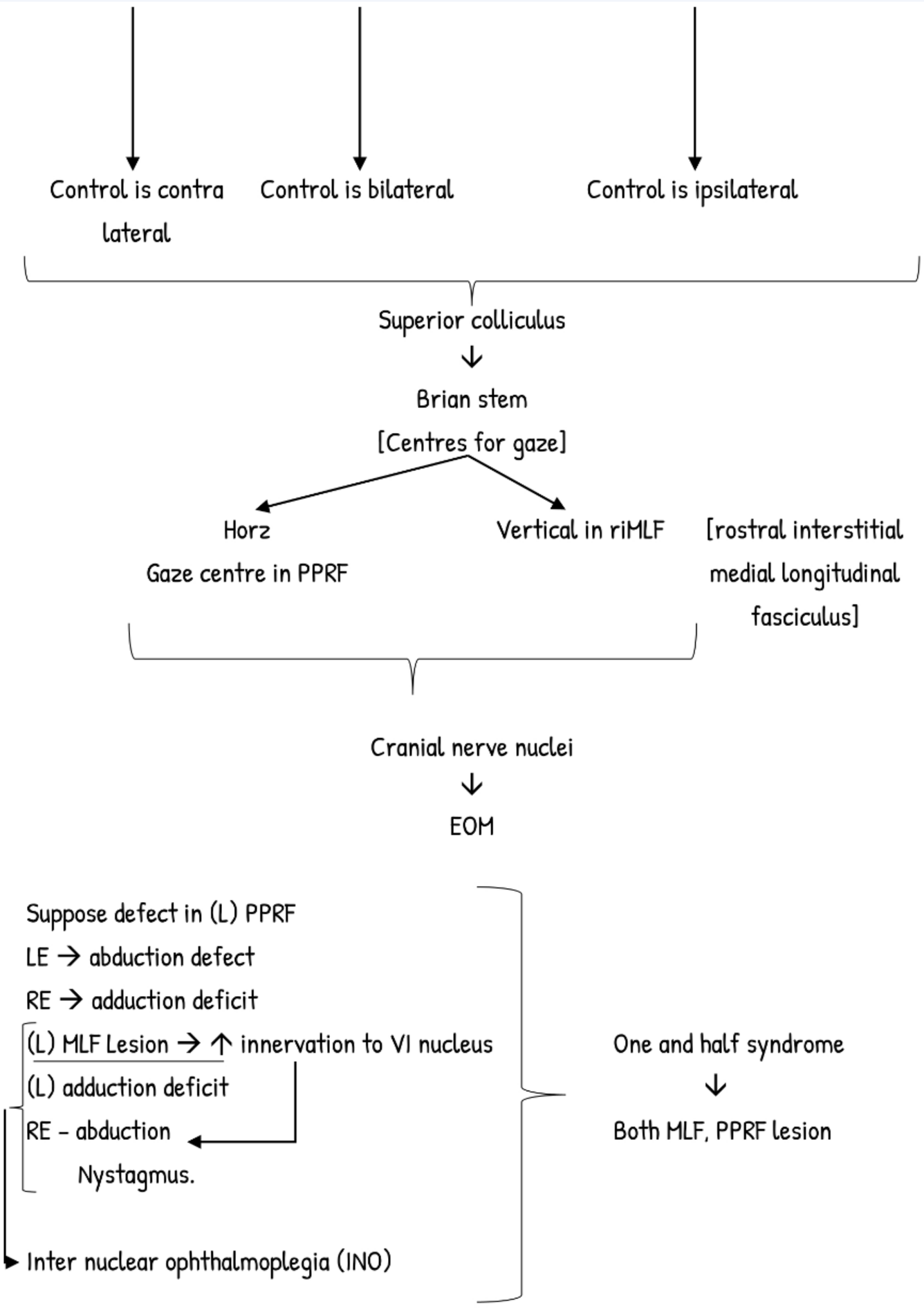
So, LIO

SUPRA NUCLEAR CONTROL OF OCULAR MOVEMENTS 53:34



Pinch to zoom





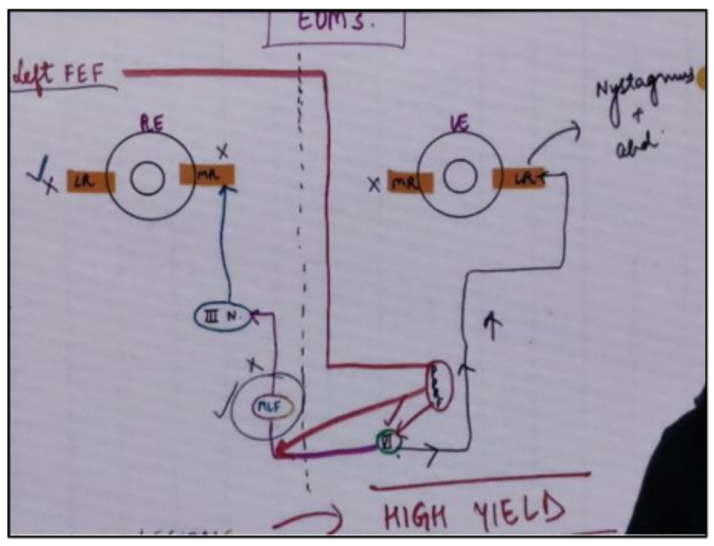
Lesions

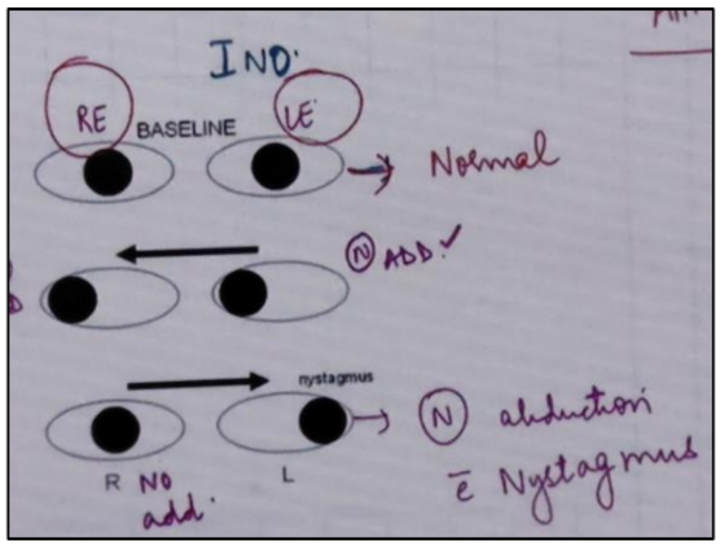
1) PPRF → I/L Horz. Gaze palsy (HGP)
2) MLF → INO
3) PPRF + MLF → one and half syndrome
4) VI nucleus → I/L HGP
5) FEF defect → C/L HGP

Pinch to zoom

Squint

Topic Notes: 19





RE = MLF lesion (or) Left gaze palsy

↓

RE - INO

↓

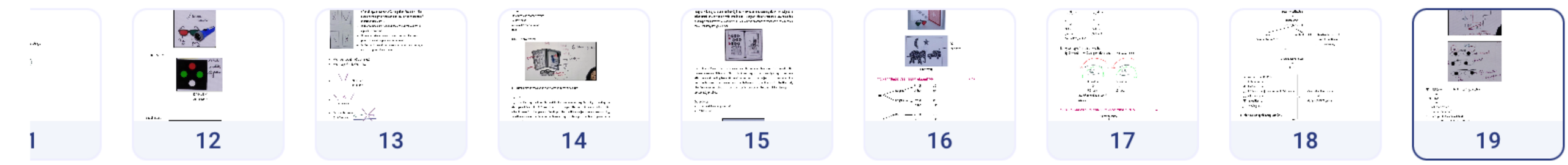
Adduction deficit

(Normal abduction)

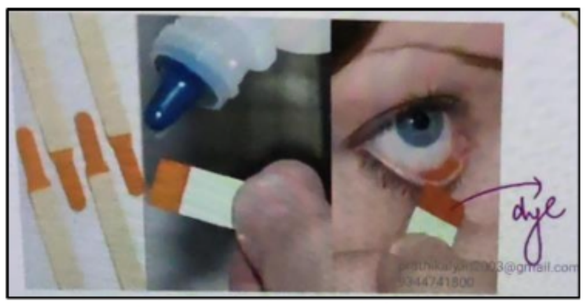
Affected eye → Adduction deficit

Other eye → Normal Abduction with Nystagmus

Pinch to zoom



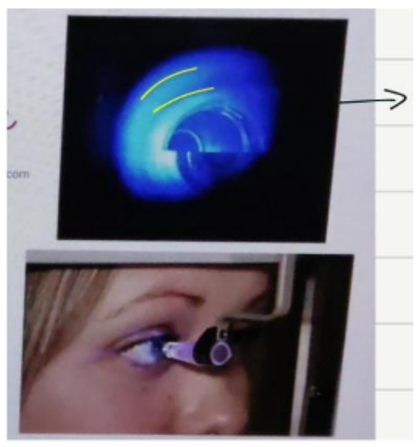
Important Tests



1) Fluoroscein strip test

↓

Cobalt blue filter



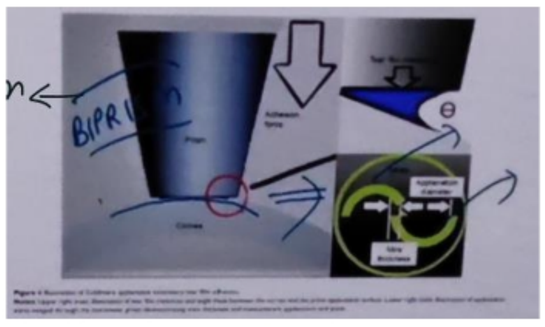
GAT

GAT

- Mires seen

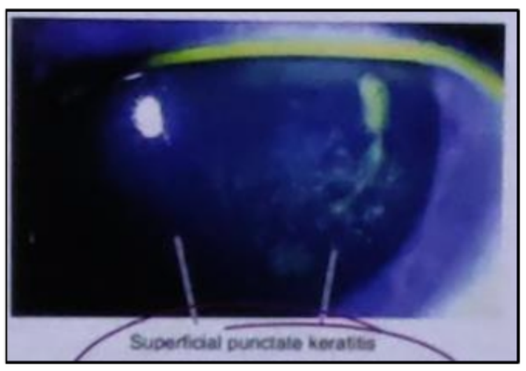
1)

Biprism



Circle of contact divided into mires

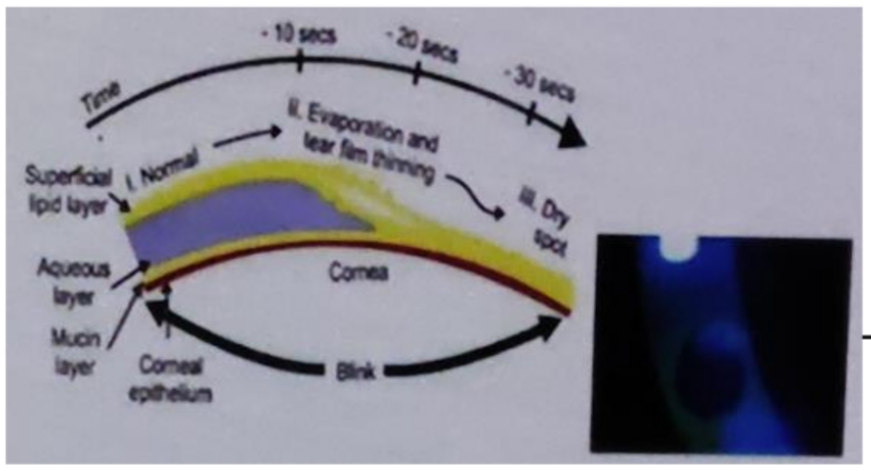
2)



↓

Can also be used for staining of corneal ulcers like dendritic, bacterial, Nummular, Multiple satellite ulcers (Fungal)

3) Tear break up time test (TBUT)



→Dry Spot

- Tear film break up time = used for mucin component
- Time b/w complete blink and appearance of first dry spot on cornea = Tear film break up time
- To test stability of tear film. [Stability due to mucin component]
- Tear film
  - M = Mucin → goblet cells, glands of Men
  - A = Aqueous → Lacrimal glands
  - L = Lipid → Meibomian, Zeis, Moll gland

- Normal time: 15-35s
- Time < 10s → unstable film

SCHIRMER I TEST

06:47



Whatman - 41
Filter papr

- For lacrimal (aqueous) component ie, How much wetting takes place
- Whatman - 41 filter paper used

↓

5mm x 35 mm

↓

Apply at junction of medial 2/3 and Lateral 1/3 of lower fornix

↓

Wait for 10 min

↓

See how much wetting takes place

- >15 = Normal
  15 – 10 = Mild
  10-5 = Moderate
  <5 = Severe
  } Kerato conjunctivitis

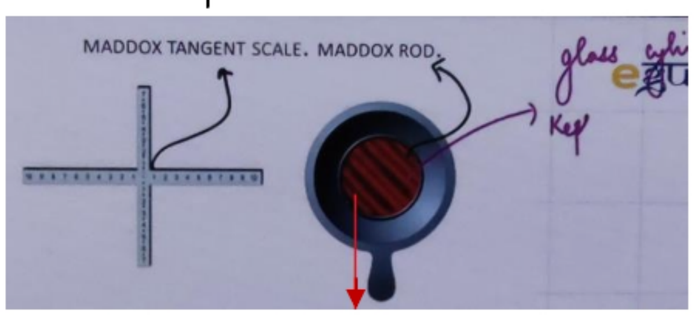
MADDOX – ROD TEST

08:57



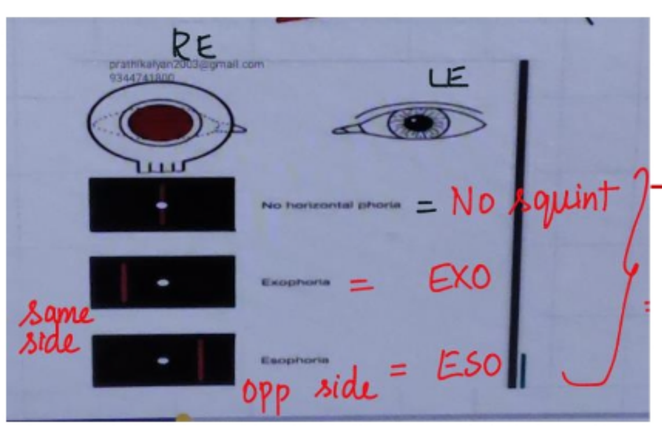
III) Maddox I

- Maddox rod converts point source of light into a red line
  ↓
  This is perpendicular to striations
  ↓
  Place Maddox rod parallel to axis of deviation



These striations are glass cylinders = kept parallel to each other → converts point source of light into a light

Diplopia — Crossed = EXO
Uncrossed = ESO



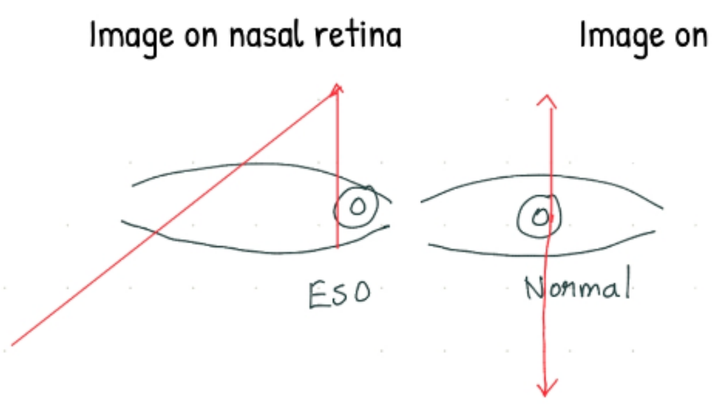
→ Reversed because patient will see opp of this

Pinch to zoom



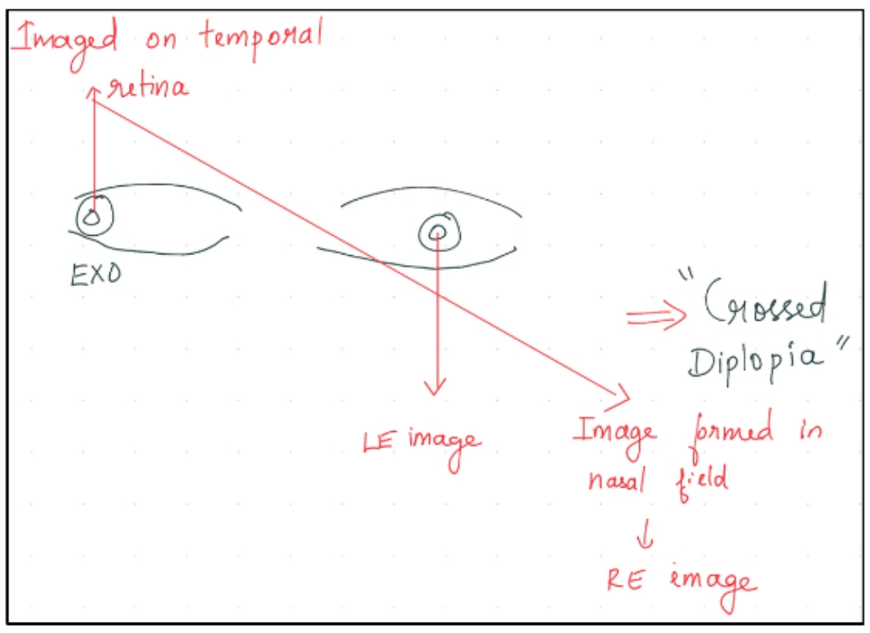
Important Tests

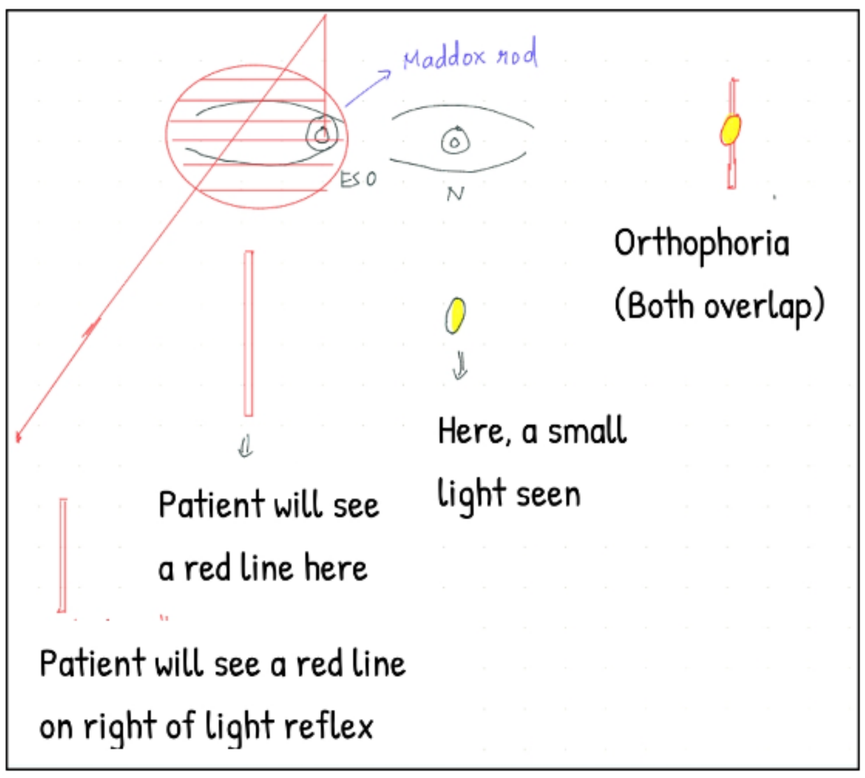
Topic Notes: 10



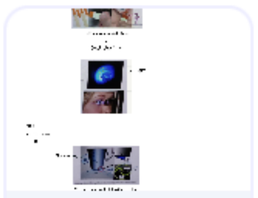
Imaged formed on temporal field
↓
Image on Right eye

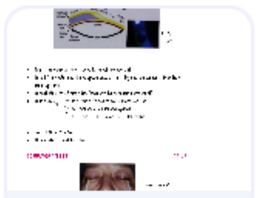
Image
↓
Image on Left eye
→ "Uncrossed Diplopia"

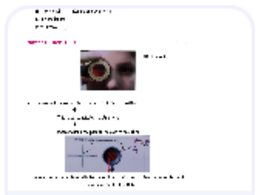


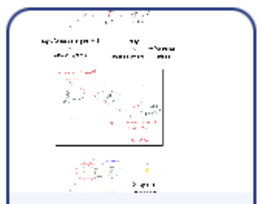


Pinch to zoom

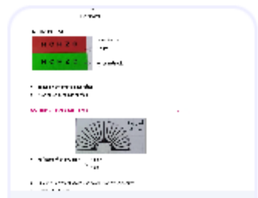

1


2

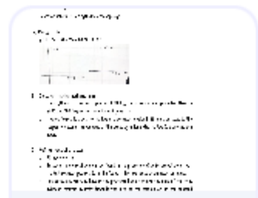

3

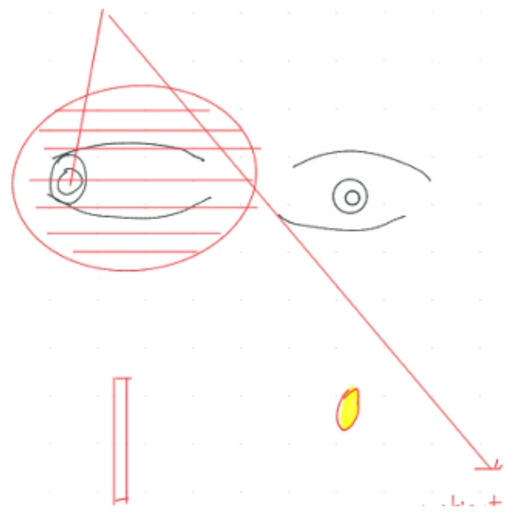

4


5


6


7


8



Patient will see a

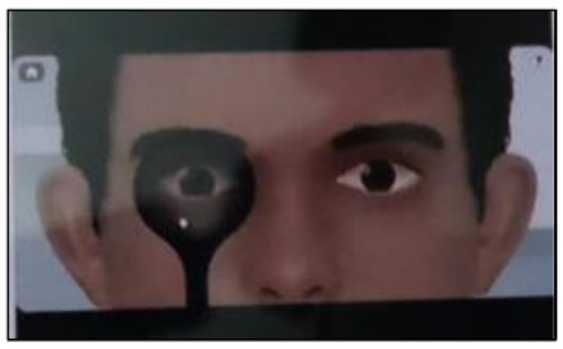
Red line left of dot light reflex

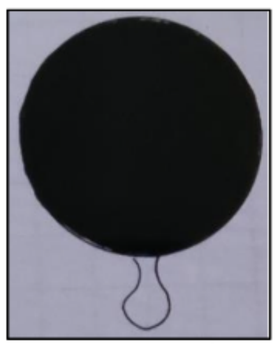
COVER – UNCOVER TEST

20:37

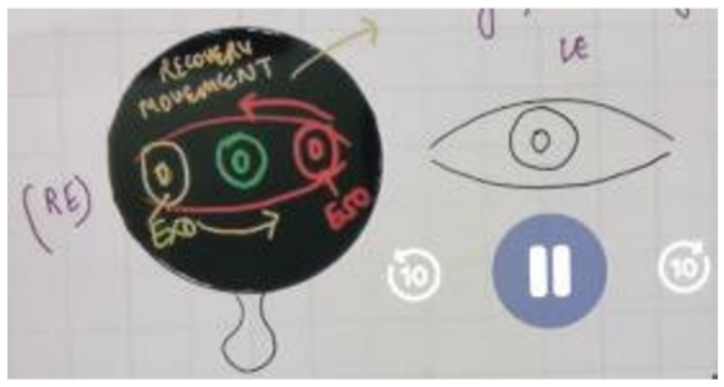
- Occluder used is transparent.

Cover - Uncover Test → Occluder (opaque)





Test → Occluder (opaque) Breaking fusion by cover → uncover



↓

S.P

↓

Fusion

Recovery movement → op. direction

Inward → EXO ⟹ Latent

Outward → ESO ⟹ Squint

DUCHROME TEST

24:13

- For refinement of sphere
- Emetropia → Person can see Red = Green background

  Myopic → If red seen more → overcorrection → green clear

Pinch to zoom



Hypermetropic → If green seen more
↓
Over correction
↓
Red clearer

DUCHROME TEST

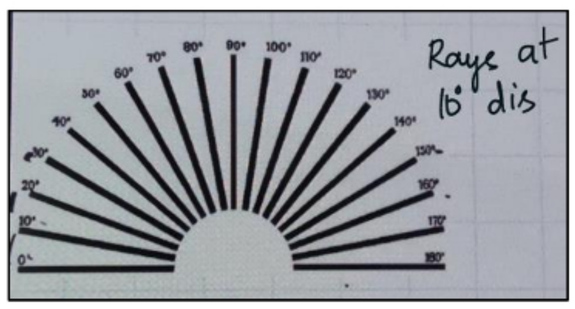


Emmetropia
Myopic
Hypermetropia

- Based on chromatic aberration
- Even color blind can do this

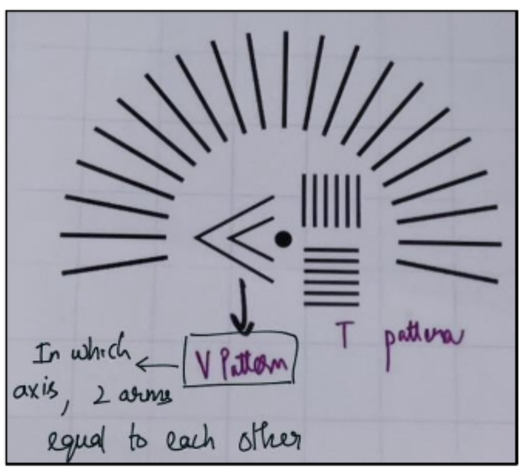
ASTIGMATISM FAN TEST

26:53



- Refinement of cylinder — Power
  Axis

- Should ask patient which line he can see most clearly
- Order: check axis
  ↓
  Check power



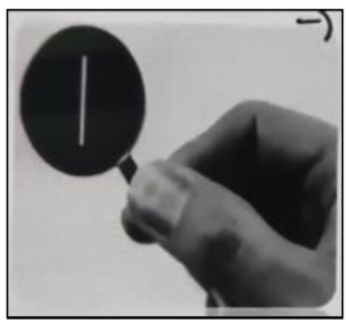
Pinch to zoom

Important Tests

Topic Notes: 10

Stenopic Slit Test

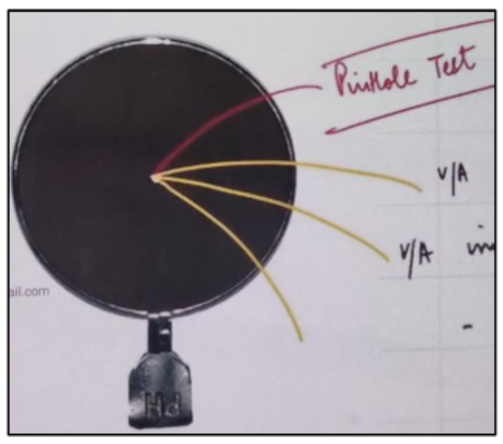
Stenopic Slit → Fincham's test



- MFT
- BCVA
- Corneal opacity — central / Para central
- Power / axis of astigusatigus

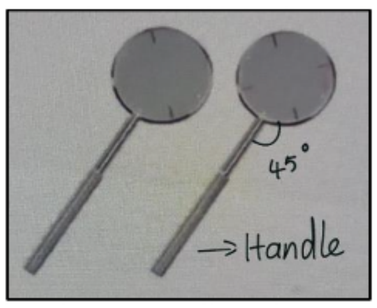
- For cataract, ACG

Pin hole test

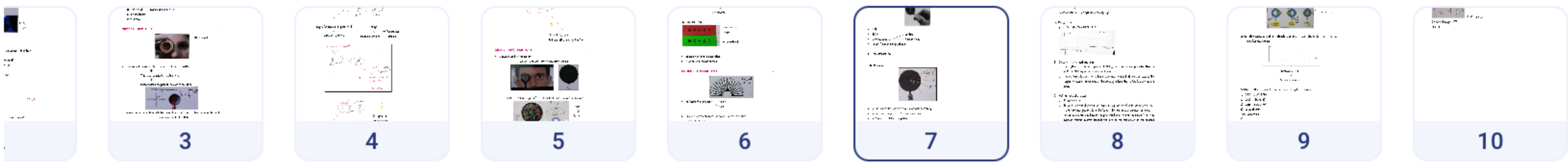


- Visual acuity does not improve → organic pathology
- Visual acuity improves → Refractory error
- V/A worsens → Macular pathology

Jackson cross cylinders



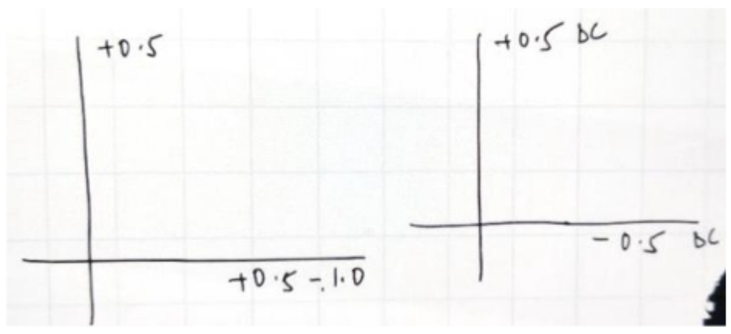
- For refinement of astigmatism — Power / Axis



- Has 2 cylinders (Equal power, Opp sign)
  ↓
  To create this, we create a comb. of sphere and cylinder
  ↓
  Power of sphere = 1/2 cylinder with opp sign

Eg: M/c ± 0.5 DC

± 0.25 DC 0.5 DS - 1.0 DC at 90°

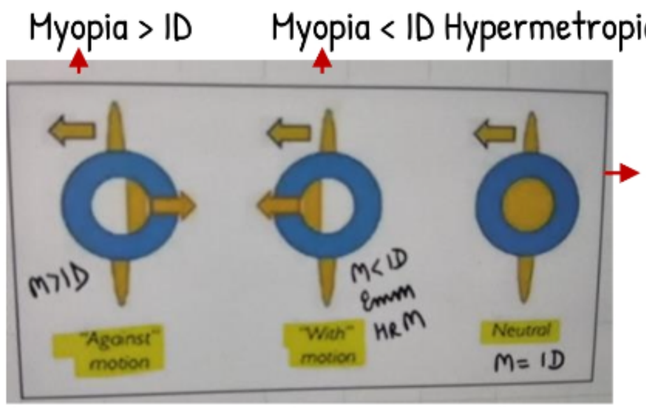


1. Discovering the astigmatism
   - If no cylinder correction is present initially, the cross cylinder placed arbitrarily at 90 and 180 degree to check for astigmatism.
   - If a preferred flip position is found, a cylinder is added with axis parallel to the respective plus or minus axis of the cross cylinder until the two flip choices are equal.

2. Refinement of the axis
   - Always done first.
   - Because the correct axis can be found in the presence of an incorrect power but the full cylinder power will not be found in the presence of an incorrect axis.
   - The cross cylinders is held in the preferred position and the axis of the trial cylinder rotated slightly towards the axis of the same sign on the crossed cylinder
   - The process is repeated until the trial cylinder is in the correct axis for the eye.

3. Refinement of cylinder power
   - Cross cylinder is placed with its axis parallel to the axis of the cylinder in the trial frame, first with same sign and then opposite sign.
   - VA is not change in either of the position the power of the cylinder in the trial frame is correct.

Retinoscopy



Q. On retinoscopy, patient has refractory error of - 3DS - 2DC at 90° from 1 metre, the reflex would move?



Both axes M > ID

↓

So against motion

Q. Which of the following is compound myopic against the rule

a) - 2 DS - 2 DC at 180°

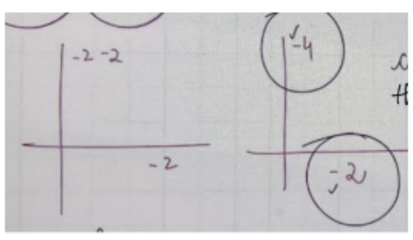
b) - 2 DS - 1 DC at 90°

c) - 2 DS + 2 DC at 90°

d) + 2 DC at 180°

Ans: Calculation

a)



Compound myopic with the rule

-4 > -2 → Not ans

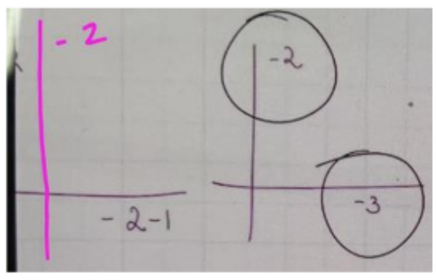
Power:- (-) > (0) > (+)

∴ More myopia, more is power

Less Hypermetropia, more is power

Pinch to zoom

b)



→ b) is answer

Compound myopic ATR

-3 > -2