Ophthalmology
Handwritten Note

Name: _________________________________________

Subject: ____________________________ Ophthalmology

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MBBS Help
http://mbbshelp.com
Junc of cornea & sclera → LIMBUS

Bulbar

Tenon's capsule + conjunctive

Sclera + episclera

Tensile + palpebral

Fornix

Uvea

Suspensory ligament

Ant. segment

Aq. humour

Ant. chamber

Pars plicata (Rough)

Pars plana (Smooth)

Vitreous humour

Ant. point

Post. segment

Choroid

Retina

Optic disc

Lamina cribrosa

Vitreous is a gel.

So formed due to ciliary processes.
TRABECULAR OUTFLOW

TRABECULAR NETWORK

Q. Total no. of ciliary process → 70-75.

Q. Angle is all around 360°, corresponding to NODAL POINT.

Parallel light rays falling on the cornea & lens, image is for rays are focused on nodal point.

It is the 1st focal point situated just behind the lens.

Bending of light is more on cornea as compared to lens.

1. Curvature of cornea more is the curvature, more is the refractive power.

2. Difference of refractive index between air & water.
Q. What is the most imp. factor to focus light rays on retina?
ans. curvature of cornea [anti surface].

Q. Why is the vision less when water is present in eye?
ans. becoz media is water + water
   lens bending of light
   don of refraction.

Cornea & lens are avascular as they need to be transparent.
They receive nutrition from aqueous humour.

OPTIC DISC
- The part where all the nerves aggregate.
- Sclera here is sleeve like ⇒ Lamina cribrosa.

IOP - 10-21 mm Hg
**RETINA**

- **Nasal Part**
- **Olive Senate**
- **Peripheral**
  - **Mid-Peripheral**
  - **Central**
    - **Macula** (5-5.5 mm)

**Central Vision** → **macular fundus** → tested by **Snellen's Chart**

**Peripheral Vision** → **peripheral retina** → tested by **Perimetry**

Scotoma - an area in the visual field where the patient is not able to see.

**Blind Spot**

- Physiological Scotoma corresponding to optic disc
- Temporal to macula

**Isopter** - Different axis on which we test peripheral vision on perimetry.
MACULA

D = 5-5.5 mm

*Most sensitive part of Retina.

↓

FOVEA.

(Foveola is given in often become cones are found max. there)

Thinnest part of Retina ⇒ **Ocra Serrata**

Distance Betw. Optic Disc & Macula = 2 DD

= 3 mm.

Most resistant layer of retina ⇒ Ganglion cell layer

Most radio sensitive layer ⇒ Rod & cone

ORBIT

Optic Nerve

Capacity of Orbit = 30 cc

Shape of orbit = Quadrilateral or Pyramidal

Length of Optic Nerve = 35 cm - 5.5 cm. [5 cm]
Axial Length of eyeball = 24 mm. [Antero-posterior diameter].

**USG**

A Scan

for measuring antero-posterior diameter

Depth of Ant. Chamber = 2.4mm - 2.5mm.

B Scan

for post. segment of eye

2.5

Anisometropia

any difference of refractive power between the 2 eyes of >2.5 diopters

Infant is hypermetropic.

2.5-3 diopters due to small eye.
HYPERMETROPIA

Total refractive power of eye is less than required.

- Small eye
- Light rays are focussed behind the retina
- To correct the error ⇒ Convex lens used.

MYOPIA

Total refractive power is more than required

- Large eye
- Light rays are focussed in front of retina.
- To correct the error ⇒ Concave lens used.
ASTIGMATISM

Difference of refractive power between 2 principal axes

REFRACTION

Total refractive power of eye = 58-60 D.
or

Reduced eye

Reduced eye:
Simplified optical system of eye

Refractive power of cornea → 43-45 D Q

Lens → 16-17 D Q.

Refractive index of cornea → 1.37 Q.

Lens → 1.39 Q.

Maximum refractive index @ Centre → 1.4-1.41

max.
**RETINOSCOPY**
- Objective method of refraction.

**FUNDOSCOPY**
- For means retina fundus is synonymous.

**PAPILLA**
- For optic disc.

**OPHTHALMOSCOPE**

**DIRECT**
- Magnification = 15 times
- Image → Virtual
  - Erect

**INDIRECT**
- 5 times
- Real
  - Inverted

**Area/Field**
- 2 DD

**Used for**
- Central Retina

**Distant Direct Ophthalmoscopy**
- For viewing media
  - all the sth. is come in the way of light
  - Distance for DDO = 25 cm
C Lenticular opacity is best seen by DDO
= Post: Subcapsular Cataract

CORNEA
Shape - aspheric
curvature is gradually
Diameter - 11-11.75 mm
Megalocornea >13 mm [ adult ]
Microcornea <10 mm

LENS
Shape - Biconvex
Diameter - 9-10 mm [97]
Microphakia - small lens
<9 mm
Microspherophakia - small spherical lens
Aphakia - absence of lens
Pseudophakia - artificial IOL
DISEASES OF LENS

Power - 16-17D

Refractive index - 1.39

Equator [Plane where anterior pole surface meet]

Capsule [very elastic]

Lens fibres

Cortex [peripheral part]

Post. pole

Nucleus (centre)

Ant. epithelial cells

Forms lens fibres

Q. C is the thinnest part of lens

→ Capsule at posterior pole [Thickens 4 μm]

Q. C are the youngest fibers - Cortex

Q. All what time produced lens fibres are formed -> throughout life

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Physiology

- Avascular
- Dehydrated [LEMS maintain this by Pump Leak mechanism]

\[ \text{Pump Leak Mech} \]

Q1° Metabolism = Anaerobic [80% of glucose metabolized anaerobically]

\[ \text{LENS derives its nutrition from Aqueous Humour only.} \]
- Lens is derived from Surface Ectoderm.

HM3 & HM4 are insoluble high molecular wt proteins found in cataractous lens.
**EMBRYONIC DEVELOPMENT**

**SURFACE ECTODERM**

1. Epithelial lining of cornea + conjunctiva
2.  
3. Lens Q.
4. 

**NEUROECTODERM**

1. Retina
2. Optic nerve nerve
3. Epithelial lining of iris + ciliary body Q
4. Smooth M/s of iris → 1. Iris sphincter Q, 2. Dilator pupillae
5. 2° & 3° vitreous Q.
6. adult suspensory ligament

**NEURAL CREST**

1. Sclera except temporal part
2. Choroid
3. Conveal stroma Q
4. Conveal endothelium Q
5. Ciliary M/s Q
6. Trabecular meshwork
Mesoderm

1. Temporal part of sclera
2. EOM.
4. 1st vitreous Q. L vitreous during embryonic period

Cataract

Any opacity in lens or its capsule that hinders its optical homogeneity

Classification

\[ \text{Congenital/Developmental} \]

Congenital Cataract

Etiology -
1. TORCHS Infection
2. Radiation exposure in 1st trimester
3. Teratogenic Drugs eg. Thalidomide
4. Malnutrition
5. Anoxia
Types

1) **BLUE DOT Cataract** -
   Opacities are seen as Blueish Dots.

2) **Cataracta Purvulenta** -
   Opacities are powdery.

3) **Lamellar/Zonular Cataract** -
   Single lamella is cataractous.
   Additional spoke-like opacities over the cataractous lamella - **RIDERS**
   Vit D deficiency cause Lamellar Cataract.
   Rubella infection also cause.

4) **Ant. Polar Cataract**

5) **Post. Polar Cataract**

6) **Total Congenital Cataract**

Q. Mic type of congenital cataract - **Blue-Dot**

Q. Mic type , causing diminution of vision - **Lamellar**
LONG. RUBELLA SYNDROME

CHD ————

Cataract ————
Heart Defects ————
Deafness

M/c Type:
1) Nuclear Pearly
2) Lamellar.

* Ocular Features of Rubella:
1) Micro-ophthalmos
   - Any axial length of eyeball < 21 mm or 1 year of age < 19 mm.

2) Rubella Keratitis

3) Angle anomaly leading to Glaucoma

4) Nuclear Pearly Cataract

5) Salt & Pepper Fundus
   - Pigmentary disturbance of retina due to diffuse chorioretinitis.

D/D of Salt & Pepper Fundus
1) Rubella
2) Syphilis
3) Retinitis Pigmentosa sine pigmento
4. Myotonic Dystrophy
   
   Type of cataract → Christmas tree

5. Leber's Amaurosis

Amaurosis: Total loss of vision.
Amblyopia: Partial loss of vision
Amaurosis Fugax: Transient loss of vision

Acquired Cataract

Classification
Anatomically

Age to maturity
Etiology
A cataract will 

1) Villon most = post sub-capsular.

as it is near to the nodal point.

* A/c to Maturity

1) Immature

2) Mature

3) Hypermature
   - degenerative changes into
   - wrinkling of capsule occurs
   - liquefaction of cortex

* Etiological Classification

1) Senile → M/c
2) Metabolic
3) Complicated
4) Toxic
5) Traumatic
6) Radiational
**Senile Cataract**

- **Cortical**
  - Etiology: Hydration

- **Nuclear**
  - Etiology: Nuclear Sclerosis
    - Insoluble protein deposition
    - Pigment deposition
    - Melanin, Uricchrome

**C/F**

1. **Stage of Lamellar separation**

2. **Stage of Incipient Cataract** (Immature cataract)
   - Little hydration

3. **Stage of Intumescent Cataract** (Max. hydration)

4. **Mature Cataract**

5. **Hypermature/Morgagnian Cataract**
   - H/c complication
   - Subluxation of Lens (Partial dislocation)

   - Phacoptytic Glaucoma
Phacolytic Glaucoma

Leakage of lens protein in the aqueous

→ Block TMW

→ Leading to Glaucoma

Radial Spoke → Seen in Cortical Cataract
also Known as Cuneiform Cataract

Cupuliform Cataract → Post Subcapsular Cataract

II nd Sight of Old Age:
- Improvement in near Vision.
- Occurs due to nuclear sclerosis in early stage
ACCOMODATION

Curvature $\uparrow \Rightarrow$ More refractive power.

Relaxation of Zonules

$\text{Contraction of Ciliary M/s}$

AGE RELATED CHANGES

$\Rightarrow$ Weekening of Ciliary M/s

$\Rightarrow$ Less elasticity of lens.

$\downarrow$

PRESBYOPIA - error of accommodation.

Sets at the age of 40 yr. [$\Rightarrow$ 40yr]

Presbyopic glasses [Near Glasses]

Convex lens.
**METABOLIC CATARACT**

1. **DIABETES**
   - Cause - Accumulation of Sorbitol
     - Hyperosmotic nature
     - Imbebe $H_2O$
     - **CATARACT**

   Enzyme responsible for sorbitol pathway:
   - NADPH dependent aldose reductase

   Type of cataract => Snow flake or Snow storm cataract

   More common in **Type-I DM**

2. **GALACTOSEMIA**
   - Reversible cataract

   Galactokinase deficiency

   Lamellar cataract

   Lamellar cataract

   Cataract
III CHALCOSIS

Cu containing F.B.

\[ \Downarrow \]

SUNFLOWER CATARACT.

\( \text{Cu} \) deposited on Descemet's membrane

Reversible

FLEISCHER'S RING

- Seen in pts. of Keratoconus
- Occurs due to Fe deposition
- Deposition on Epithelium

IV LOWE'S SYNDROME / OCULO-CEREBRO RENAL SYNDROME

Ocular features

1) Microphakia
2) Metabolic Cataract
3) Posterior Lenticonus

\( \text{Aff} \) \text{syndrome} \quad \text{Ant.} \quad \text{Post.}

Familial Haemorrhage Nephritis
Oil-globule reflex is more common in 0.

1. Alport's Syndrome
2. Waardenburg Syndrome
   a) Telearcanthus - medial canthi are far apart
   b) Poliosis - greying of eyelashes
   c) Heterochromia Iridis (HI) - difference of iris colour between 2 eyes
   d) Anterior Lenticonus

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Telearcanthus: soft tissue problem.

Interpupillary Distance

Hypertelorism: bone defect

Interpupillary Distance
**COMPLICATED Cataract**

Cataract is occurring as a complication of ant + post segment disease.

1. Polychromatic Lushture.
2. Bread lump appearance of opacities.
3. M/c type ➞ Posterior subcapsular

**TOXIC Cataract**

Due to Drugs:
1. Steroids
2. Phenothiazines
3. Long acting Miotics
4. Aminocaproate
5. Busulphan
6. Gold
7. CQ

M/c comp of steroids in eye ➞ Glaucoma

(OAG - open ➔ blockage in TMW)

Steroid ➔ Systemic ➔ Cataract (PSC)

Topical ➔ Glaucoma
TRAUMATIC CATARACT

Trauma

Perforating

Blunt

(O) (concussion injury)

Resette shaped or Sunflower cataract

Vossius Ring

Berline Oedema or Commotio Retinae

Angle recession glaucoma

Due to tear in ciliary body

Damage to TMW

Glaucoma

Impriant of IMA pigment in shape of Pupil on the ant.

Capsule of lens

Ant. capsule of lens

Vossius ring

Ant. capsule

Glaucoma - Part H/O attack of Haemorrhage acute congestive Glaucoma
RADIATIONAL Cataract

1) All electromagnetic radiation can cause cataract
   - CT Scan ✓
   - MRI ×

2) M/c type of radiational cataract → Post-subcapsular

PSC

1) M/c type of complicated cataract
2) " " " radiational "
3) Steroid cause
4) E type of cataract is vision most
5) E type of cataract is best seen by DDO

Most: M disco resistant in eye → Sclera
Most: M disco sensitive → Lens
Retina < most radio resistant → Ganglion cell layer
   " sensitive → Rod, cone

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C/F of Cataract:

1. Blurring of Vision

2. Diminution of Vision
   - Vision < 6/6
   - Denominator is normal
   - All letters form an angle of 5 minutes at nodal point
   - Margin of every letter subtend an angle of 1 minute

3. Glare
4. Polyopia
   - >2 images
   - Incipient Cataract (V) Hyper
   - Intumescent Cataract

5. Coloured Haloes

   Causy: Breaking of White Light

   Cataract  Acute Congestive Glaucoma  Mucopurulent Conjunctivitises

   IOP ~ 60 mm Hg  ↓  ↓
   Corneal oedema  Causes defraction  of light  lead to coloured Haloes
Fincham's Test -

- Test to differentiate between coloured halos of cataract and acute congestive glaucoma.
- Pacing a stenopic slit in front of eyes.

- If halos break → Cataract
- If not break → Acute congestive glaucoma

T/T

SURGICAL

1. I.C.C.E. [Intra capsular Cataract Extraction]
   - Removal of lens including capsule.
   - Methods:
     a) Forceps Extraction

     By Arruga’s forceps.

     b) Chyo extraction

     - 40°C temp.
     - Lens stick to the probe can be taken out.

     c) Wire vecto method.

     d) Indian Smith Method

     Pressure and counter pressure method.
Only Indication ⇒ Subluxation of lens
Best Method ⇒ Cryoextract
CF in children

Hyaloid capsular ligament

Strong adhesion

Anterior Hyaloid Membrane

When taken off can pull out vitreous

Retena along to it

Hence ECCE CF in children

ECCE + PCIOEL Implantation

Ant. capsule

- Capsule Bag

Post. capsule

IOL implantation

HAPTICS

OPTICS
IOL is formed of PMMA (Poly Methyl Metha Acrylate)

METHOD

Full thickness scleral incision

↓

Ant. capsulotomy

↓

H₂O injected under the margin

↓

Hydrousection

↓

Removal of nucleus by pressure, counter pressure

↓

Clean the bag & irrigation

↓

Aspiration

↓

IOL implantation

↓

Suture the sclera by radial sutures

[equal length, equidistant]

↓

Less astigmatism post-op

SICS (Small Incision Cataract Surgery)

↓

Small incision

↓

Suturesless Surgery
Manual
5-5.5mm

↓
Partial thickness incision
↓
scleral tunnel formation
↓
capsulotomy

Continuous curvilinear capsulorhexis
[the type done in SICS]
↓
Hydrodissection
↓
Remove nucleus
↓
Clean the bag
↓
IOL implanted
↓
No sutures required

Phacoemulsification
2.75 - 3.2 mm, Q

↓
Incision on cornea
[clear corneal incision]
↓
CCC
↓
Hydrodissection
↓
[for confirmation rotate the lens]

Phaco probe
-frequency - (40 kHz) Q
[break nucleus into bits]

↓
apirate simultaneously
↓
Clean bag
↓
Foldable IOL used

[Acrylic] → [Silicon] → Hydrogen
↓
M/h ly used.
IV. MICS [Minimal Incision Cataract Surgery]  
By Phacoemulsification - length of incision 1.8 - 2.4 mm

V. PHACONIT
Incision length - 0.9 mm.
↓
Rollable IOL [Acrylic]

VI. FEHTOLASER Most Recent
Infrared.
$\lambda = 1052 \text{ nm}.$
Pulse Duration - $10^{-15} \text{ sec} \ Q.$

**BIOMETRY**
Method of Calculating Power of IOL

/ Axial length by USG.

/ Keratometry

\[ \frac{1}{K_1} \quad \frac{1}{K_2} \]

SRK Formula: \[ \text{Power} = A - 2.5L - 0.9K. \]
Where \( A \) = constant
\( L \) = Length axial
\( K \) = Keratometry, \( K \)
Yoveal Reflex Formation / Fixation Reflex / Macula Maturation.

Form by 5-6 months of age

Operate as soon as possible

To prevent amblyopia

Also nystagmus develops.

T/t of choice in cong cataract: Lensctomy + Vitrectomy (Phaco + ECCE)

After Cataract / 2° Cataract / Post. Capsular Opacification

Diffuse Opacification.

Migrated angle epithelial cell. [ELSCHNIG PEARLS]

Fibrocellular Ring [SOEMMERING RING]

Vision not affected
Management: Post-Capsulotomy through Nd:YAG Laser

**SUBLAXATION OF LENS**

Congenital \(\Rightarrow\) Ectopia Lentis

- **Simple Ectopia Lentis**
  - only ektopia lenta
  - Pupil is displaced in opp. direction
  - + Ectopia Lentis

- **Ectopia Lentis et pupillae**

  - **Marfan's Syndrome**
    - Homocystinuria
      - Infero-nasal
    - Supero-temporal ectopia

  - **Weill-Marchesani**
    - Downward & forward

  - **Ehlers-Danlos**
    - Ocular features of Marfan's
      - Axial Myopia
      - Megalocornea
      - Supero-Temporal Ectopia Lentis
      - Lattice Degeneration
      - Retinal Detachment

  - **Hereditary**
    - Ectopia Lentis
    - Blue Sclera (thin sclera)
LASERS IN EYE

Photo-Diruptive
1) Nd:YAG
   * Indications -
   a) After cataract
   b) Peripheral iridectomy (PI)

2) FEMTOLASER
   Cataract surgery
   Refractive surgery

Photo-Coagulative
1) Argon
2) Diode
3) Double frequency Nd:YAG

Photo-ablative
1) Excimer
   Argon fluoride
   Xenon difluoride
   Used in eye

Indications
a) Vascular pathologies of retina
b) Trabeculoplasty

Keratomileusis

Changing curvature of cornea.
Age > 18 yrs

WAVELENGTHS
1) Nd:YAG - 1064 nm (Pulse Duration - 10^{-9}s)
2) Excimer - 193 nm
3) Argon - 514 nm
4) Diode - 780 - 850 nm
5) Double frequency Nd:YAG - 532 nm
6) Femtolasers - 1052 nm (Pulse Duration - 10^{-15}s)
Femtolasik

LASIK

- To raise a flap containing epithelium, a little bit of stroma (cornea) by femtolasik.

SMILE Procedure (Small Incision Lenticule Extraction)

- No need to raise a flap.
- Focus on stroma, cut small part of stroma.
- Make incision (small) to remove the lenticule (stroma).

Scleral Fixated IOL (when posterior capsule not intact)
GLAUCOMA

*FORMATION OF AQUEOUS HUMOUR -

1. Pigmented epithelium
2. Non-pigmented epithelium
   Na⁺-K⁺-ATPase
3. Stromal
4. Blood vessels

CILIARY PROCESS

Non-pigmented epithelium is the site of aqueous formation.

Process

1) Secretion [Max. aqueous is formed by this]
2) Diffusion
3) Ultrafiltration

Rate of formation of aq. humour = 2-3 μl/min.

Hypersecretory Glaucoma ⇒ When more formation of AH.

Due to Epidemic Dcropsy [Toxin - Sanguinarine]
OUTFLOW OF AQUEOUS

CONVENTIONAL [90%]

PC → Pupil → 

Ac → Angle (Cornea–DeBaire's & Schwalbe's line)

TMW ↓ Schlemm's Canal ↓ Episceral Vein

UVEO- SCLERAL [10%]

Directly come uveal tract → sclera

TYPES

ANGLE CLOSURE

Open Angle

More common

Blocked, Trabecular

Blockage

Def. - Glaucoma is multifactorial optic neuropathy associated with risk factors like increase IOP, +ve family history.

Obstruction at the pupil or actual obliteration of L.
**Classification**

Congenital/Developmental

- Acquired
  - DAG
    - 1st
  - ACG
    - 2nd

- 1st Congenital Glaucoma
  - Due to enlargement of eyeball

  **Etiology**
  - 1) Iriebeccular Dysgenesis
  - 2) Abnormal Iris Insertion ⇒ Flat Iris/Plateau Iris
  - 3) Barkan's Membrane at the angle

  **C/F**
  - 1) Watery eye
  - 2) Photophobia - intolerance to light
  - 3) Blepharospasm

  **O/E**
  - 1) Large cornea
  - 2) White cornea due to corneal edema

  - 3) Haab's Streece-break in Descemet's Membrane

  - 4) Iridoedema - tremoloumen in IHC is due to loss of support from lens
5. Flattening of lens
6. Break in suspensory ligament $\Rightarrow$ Subluxation of lens

DD - Megalocornea

7. Angle anomaly may be +nt
8. Cupping of disc

T/t of Choice
9. GIONIOTOMY
   Cutting through the angle [Trabecular meshwork].

Trabeculotomy is - cornea when hazy. Gioniotomy can't be done.
Cut in TMw & sclerotic canal

CUPPING OF DISC

10. Optic Disc has central pale area $\Rightarrow$ CUP AREA
    The area beside the CUP is Neuro-Retinal Rim.

- Neuro-Retinal area
- Non-neuronal area

$\text{C:D ratio} \leq 0.3$

When C:D ratio $\leq 0.3$ CUPPING.

Cupping $\Rightarrow$ neuronal area is getting damaged
Non-neuronal area is increasing.

In case of glaucoma cupping is vertically oval due to damage to anterior juxta.
BJERRUM'S AREA
Area in the visual field where 1st scotoma appears corresponding to arcuate field.

Physiological Glaucoma Cupping
1. Horizontally round cup
2. Bilateral symmetrical

2° CONGENITAL GLAUCOMA

ECTROPION UVEAE
Irregular pigment exudation from pigmented border

2. Neovascular Oculodermal Melanocytoma
Subepithelial conjunctival melanosis
Annotated to angle anomaly
3. Nano-ophthalmos
   Very small eye
   Lens size may be normal
   No other structural abnormality.
   [In Micro-ophthalmos → structural abnormality are seen]
   
   → Angle may get obliterated.

4. Phacomatoses

   NF1
   Von- Recklinghausen Disease
   ↓
   Angioma
   of face on
   Triad
   in Brain
   Angle Glaucoma

1° Open Angle Glaucoma.

RF:
1) Age > 40 yr
2) +ve Family History
3) High Myopia (≥6 D)
4) DM.

Pathogenesis:
   Blockage in TMW
IOP Changes

1. Normal Diurnal Variation ≈ 5 mmHg
   - 5-8 mmHg - Suspicious
   - >8 mmHg - Glaucomatous

IOP More in Morning as normal level are high in morning.

* NTG (Normal Tension Glaucoma) -
  Normal IOP
  Fundus Changes +
  Field Defects +

* Ocular HTN -
  IOP ↑
  Fundus (N)
  No Visual Field Defects

IOP varies according to Central Corneal Thickness (CCT)

In thick cornea → Overestimate IOP.
In thin cornea → Underestimate IOP.
TONOMETRY

INDENTATION

SCHIOTZ

Fixed force

area x IOP

1. MAKLAKOV T.
2. BARRAQUER T.

APPLANATION

Variable force

area is fixed

force x IOP.

1. GOLDMANN
2. PERKINS
3. DRAEGER. For infants

for irregular corneal

4. TONOOPEN
5. MAC KAY MARG

Non-contact

6. PULSAIR
4. AIR-PUPPET T.

forkey measurement

5. REBOUND

Q. C is more Reliable? => Applanation.

Because reading of schiotz depend on scleral rigidity of bulb.

In myopia, scleral rigidity is less.

Q. Non-contact Applanation

Air-Puppet

Pulsair

Q. For key measurement => Rebound Tonometer.
C. Tonometer used for scarred / irregular cornea
   1. Tonopen
   2. Mac Kay Mark

For Infant
   1. Tonopen
   2. Perken

Pascal’s Dynamic Contour Tonometer
- It is more reliable than Goldmann
- Biceoz reading doesn’t depend on CCT

Tonomography
- measuring facility of aqueous outflow
- used for research purpose

II) Fundus Changes

1. C/D > 0.3
2. Difference of C/D b/w 2 eyes > 0.2
3. Notching of Neuro-retinal Rim
4. Thinning of Neuro-retinal Rim
5. Laminar Dot Sign

6. Change in blood vessels
   a) Nasal shifting of blood vessel

   [Diagram of blood vessels with nasal shifting]
b) Bayonett ting sign
sharp tinking in double bending of
blood vessel.

Ideal Method → Slit lamp Bimicroscopy

Putting lens in front of eye then looking
through slit lamp.

Contact

Non-Contact

Goldmann

Three - mmer

Convex

Concave

HRUBY LENS

-58.6 D

+60

+78

+90 Best among

this

(Ⅲ) VISUAL FIELD DEFECT

Extent → Temporal 100° or 90°
Inferiorly 70°
Nasally 65°
Superiorly 50°

Blind spot located between 10°-20° sector
VFD in 1º OAG

Early

1) Earliest VFD
2) Central or Paracentral Scotoma
   (in Bjerrum's area)

3) Siedel's Scotoma
   Paracentral Scotoma + Blind spot

Late

4) Arcuate Scotoma
5) Double arcuate Scotoma
   when inf. field is also involved
6) ROENNES NASAL STEP
7) Central & Temporal Island of Vision is left behind
8) Last → Temporal Island of Vision

Baring of Blind Spot:
- Isopter contraction
PERIMETRY

KINETIC

- Central (30°)
  - BJERRUM'S SCREEN
- Peripheral
  - LISTER'S

STATIC/AUTOMATED

- Central (30°)
- Peripheral

AUTOMATED PERIMETRY

- HUMPHREY Field analyzer
- OCTOPUS

1° ANGLE CLOSURE GLAUCOMA

R/E:
1. Small eye
2. Hypermetropia
3. Shallow AC.
4. Narrow angle
5. Mc - Q

Max. closure of angle occurs when pupil is MID-DILATED.
CIE

I. PRODROMAL
   Asymptomatic

II. STAGE OF CONSTANT INSTABILITY
   Some part of angle block & reopens by itself

III. ACUTE CONGESTIVE GLAUCOMA
   All 360° angle is closed.
   IOP ~ 60 mm Hg
   Pain ↑↑, associated with nausea, vomiting
   Redness, photophobia, blepharospasm.

Cornel edema
↓
Coloured Haze

Shallow AC
Vertically oval
Mid-dilated

Angle closed

← Repeated attack
Cupping of disc seen

IV. CHRONIC CONGESTIVE GLAUCOMA
   IOP change
   Fundus change
   Field defects
   For Inv. to see angle ⇒ we need contracted Pupil
V. **ABSOULTE GLAUCOMA**

- Painful Blind Eye.
- IOP ↑↑
- Stony Hard Eye
- 100% Cupping

**TOC of Absolute Glaucoma**

- **Cyclocryotherapy**

  Damage few ciliary process

  If excessive damage occurs by over treatment

  ⇒ **PHTHISIS BULBI occur**

**OTHER MODALITIES OF T/T**

a) Absolute Alcohol Injection - suppresses ciliary ganglion.

b) Evisceration

**Definitive T/T of ACG**

- Peripheral Sclerotomy by Nd YAG.

  + Prophylaxis PI should be done in other eye.

- D4G does not need any prophylaxis T/T.

**Doc for Angle Closure Glaucoma ⇒ PILOCARPINE.**

**Doc for Acute Congestive Glaucoma ⇒ MANNITOL or ACETAZOLAMIDE.**

followed by pilocarpine
2° Glaucoma

1) LENS INDUCED GLAUCOMA

a) Phacolytic Glaucoma
   - It is the leakage of lens protein blocking the TMw.
   - It is seen in Morgagnian Cataract

b) Phacotoxic Glaucoma
   - T→T due to trauma
   - Any trauma causes capsular rupture
   - Lens protein blocking TM
   - 2° OAG.

2) Phacoanaphylactic Glaucoma
   - Lens protein
   - Immune reaction
   - Release of macrophages
   - Engulf lens protein
   - Blocks the TMw.
   - 2° OAG.

Q. Type of antigen is Lens Protein - Sequestered antigen

3) Phacomorphic Glaucoma
   - Due to morphology of lens
   - When intumescent cataract swells up, too much
   - Papillary Block
   - 2° ACG
27 PIGMENTARY GILAUOMA

1. Trans-illumination Defect
   less pigment hence more light pass. through

2. Keratocyte precipitate

Release of pigments
   ↓
   Blocking TM

KP → Spindle shaped
   Krukenberg spindles

3) PSEUDEXFOLIATION SYNDROME / GILAUOMA CAPSULARE

Dandruff like material is released from lens capsule x suspensory ligament
   ↓
   Released into aqueous
   ↓
   Blocking TM.

Not true exfoliation = proteinaceous secretion.

H/c 2° Glaucoma
4) MALIGNANT GLAUCOMA / CILIARY BLOCK GLAUCOMA

Aqueous formed collect in vitreous cavity
↓ Lens + Iris pushed forward
↓ Very shallow AC

Cause: It occurs after any intraocular sx
→ Surgery chances of malignant glaucoma more
  Trabeculectomy

Mx
1) **Atropine** - 1st line T/t.
   Strongest cycloplegic.
   Dilatation also opens the block.

2) Nd:YAG anterior hyaloidotomy
   Aqueous starts leaking anteriorly
   block opens.

3) **Pars Plana Vitrectomy**
   Cutting out aqueous from vitreous
Inverse Glaucoma

Glaucomas' t/ltd by Mydriatic

Eq. 1 > Malignant Glaucoma

27 Sphero phakia

Spherical lens blocks the pupil

a t/ltd by Mydriatic

Neovascular Glaucoma

Cause: Hypoxia in retina

neovascularisation.

If hypoxia is not t/ltd.

Ant segment also hypoxie

Rubeosis Iridis

New blood levels are more leaky & have fibrous tissue also.

So, initially it is OAG.

Later associated fibrous tissue contract

leading to angle closure

ACG
TOC

1) Pan retinal Photocoagulation

2) Anti- Glaucoma Drugs

GLAUCOMA ASSOCIATED WITH UVEITIS

When aqueous cells block TMW => OAG.

Glaucamacyclitic crisis / Hypertensive Uveitis / Pasnek - Schlossman Syndrome.

In Uveitis, pupil is miotic. \[ AC \] pupil - mid-dilated or Dilated.

This helps in diagnosis of this syndrome

TOC

1) Anti - Glaucoma Drugs

2) Atropene for Uveitis

When pressure is controlled => go to Steroids
7) **Steroid Induced Glaucoma**

Hic ocular complication of topical steroid.

Deposition of mucopolysaccharides in time.

↓

OAG.

8) **ICE Syndrome** [Irido-Corneo-Endothelial Syndrome]

Endothelial never regenerates (N)

In this syndrome, endothelium starts proliferating

↓

Block's angle

**Proliferative endotheliopathy + 2° Glaucoma**

- **Progressive Irid atrophy**
  - **Iris atrophy**

- CHANDLERS SYNDROME
  - Conjugal edema

- **COGAN REESE SYNDROME**
  - Nodule x Neovet on Iris
**Rx of Glaucoma**

- **Medical**
- **Laser**
- **Sx**

- **Topical**
- **Systemic**

### Topical Drugs

1. **β Blocker**
   - **MOA**: ↓ formation
   - **Eq**: TIMOLOL
     - BETAXOLOL
     - LEVOBUNALOL

   **Q**: c/1 in β blocker = asthma
   - Selective β blocker = Betaxolol
   - β block called ONLD obstruction = Timolol

2. **α Agonist**
   - **MOA**: Dual action
   - **Eq**:
     - EPINEPHRINE / ADRENALINE
     - DIPIVEFRINE
     - BRIMONIDINE
     - APRACLONIDINE

  ↓ formation → ↑ drainage
  
  Uveoscleral outflow

Preferred
α agonist C/I - HTN
Heart Disease

Selective α agonist - Brimonidine
Apraclonidine

< Antiglaucoma Drug cause abunessness = Brimonidine

< C/I in Infants = Brimonidine

conjunctival pigmentation → by adrenaline

Miotics

MOA - ↑ conventional outflow [ trabecular] Q.

2> Miosis in ACC opens up angle.

Eg - Pilocarpine ↓ uveoscleral outflow.

↑ c/I in pts of uveitis beboz miosis aggravate inflammation

↑ capillary permeability

Prostaglandin analogue [PGF2α agonist]

MOA - ↑ uveoscleral outflow.

Eg - Latanoprost

Bimatoprost

Travoprost

< Drug cause heterochromia iride - Latanoprost

Beau it cause irid Pigmentation

Website: http://mbbshelp.com
WhatsApp: http://mbbshelp.com/whatsapp
- Antiglaucoma drug ↑ B outflow = Bimatoprost
  c/I in uveitis as they are mediators of inflammation.

57 CARBONIC ANHYDRASE INHIBITOR
  MoA: ↓ formation of aqueous humour
  Topical CA inhibitor = DORZOLAMIDE
  BRINZOLAMIDE
  c/I in sulpha allergies

SYSTEMIC DRUGS

Carboxylic Anhydrase
Inhibitor
  c/I in sulpha allergies

Hyperosmotic
Agents
Mannitol
Glycerol
Isosorbide
Urea
LASER

OAG

Trabeculoplasty by photocoagulative laser.

apply laser on pigmented TMW

Sx

1) GONIOTOMY
Cut in TMW ⇒ Toe of Congenital Glaucoma

2) TRABECULOTOMY
Cong. Glaucoma
When cornea is not clear.
Cut in TMW + Schlemm's Canal.
It is done along with Trabeculectomy.

3) TRABECULECTOMY
Cutting TM Direct connect.
Resection of TM
making a flap between AC & P subconjunctival space
Direct connection.

Steps:
- Constructed Pupil
- Cut conjunctiva, make a flap.
- Reset tenon's capsule.
- On sclera, V shaped partial cut.
- Incising
- On limbus, cut a block of TM
- Do iridectomy
- Put flap on loosely
- Suture it so that aqueous flow.

BLEB - Conjunctival flap is raised due to aqueous flow underneath.
Presence of bleb indicates success of process.
**Precaution for Closure of Fistula**

- Anti-Mitotic Drugs
  - Mitomycin C
  - 5FU

**Aqueous Drainage Implants**

1. **MOLTENO IMPLANT (older)**
   - It causes hypotony (IOP < 10 mmHg)
   - Made up of polypropylene

2. **AGV (Ahmed Glaucoma Valve)**
   - Made up of silicon

3. **EXPRESS IMPLANT**
   - Made up of stainless steel
**CORNEA**

**STRUCTURE OF CORNEA**

- Descent's
- Bowman's mem.
- Epithelium
- Bowmen's layer
- Sclera
- Endothelium
- Stroma
- Limbus
- Stem cell

6th layer - Desc's layer
[Thicker]

**Physiology**

1) Avascular

2) 1st metabolism → AEROBIC

3) O₂ from air

4) Nutrition from aqueous humour

5) Dehydrated

Endothelium act as barrier

Pump function:
- Na⁺ \( \rightarrow \) A⁺ ATPase pump
- Continuously pumps out water
No. of endothelial cells:
- Adult: 2500 - 3000 cell/mm²
- Children: 3500 - 5500 cell/mm²

Poly megathism
Whenever endothelial cell damage compensatory change occurs in size, size enlarge.

Pleomorphism
Morphological change in shape when endothelial cells get damaged.

When total no. of cells < 500 cell/mm² → Further no compensation.

↓
Pump function ↓
Hydration ↓

Initially stromal edema
Later epithelial "

Bullied fluid

Bullous Keratopathy
It is a sign of corneal decompensation.
Metabolically, Most Active Layer = ENDOTHELium

Layer in involved in Bullous Keratopathy = EPITHELium.

Are layers of cornea & do not regenerate

1) ENDOTHELium
2) BOWMAN'S MEMBRANE

Factors Responsible To Maintain Transparency

1) Regular arrangement of epithelium
2) " " of stromal lamella

\[ \text{Distance between lamella} < \frac{1}{2} (\lambda \text{of light}). \]

3) Dehydration

\[ \text{Barrier} \]

4) Avascularity

ULCER

Breach in the continuity of epithelium

Organisms can penetrate intact epithelium

NNLDH

N - N. Neisseria Gonorrhoea
N - " Meningitis
L - Listeria
D - Diphtheria
H - Haemophilus
INV. RELATED TO CORNEA

1. Keratometry — measure curvature of cornea
   Scanning central part

2. Corneal Topography
   — curvature of cornea measurement
   Scan whole cornea

3. Phacometry
   — thickness measurement
   \( N \) 0.5-0.6 mm (centre)
   at limbus - 1 mm.

4. Specular microscopy
   Examine endothelial cells [Both No. \& Morphology]

5. Corneal Sensation
   ASTHESIOMETER — hair like project \& touch corneal surface.

6. Microbiological
   Staining
   Culture
KERATITIS

- Pain
- Redness
- Photophobia
- Blepharospasm
- D/c

REDNESS

- Conjunctional congestion
- Only
- Congestion

BACTERIAL KERATITIS

Presents only above features

O/E → Fluorescein stained +ve ulcer

Pus in AC [Hypopyon] → Sterile
Fate of Ulcer

- Localized
  - Ulcer heals with conjunctival adherence
  - Opacity

- Perforating
  - Causes corneal thinning leading to perforation
  - When incision adhered & heal perforation
  - Leukoma adherence

- Sloughing
  - Virulent organism
  - Neutrosis
  - Replaced by inflammatory exudate
  - [Pseudocornea]

Hypopyon Corneal Ulcer:
- Pneumococcus
- Ulcus Serpens

Rx
- 17 Antibiotics
  - Broad spectrum
  - Culture sensitivity

27. Fortified antibiotic drops
   - Cefazoline → 50 mg/ml
   - Gentamycin → 15 mg/ml

57. Antibiotic ointment applied - HS

47. Atropine
   - Since keratitis may cause uveitis.
5) Oral Anti-inflammatory

6) Oral Vit A/Vit E

For any infective corneal ulcer

\[ \text{NO steroid} \]
\[ \text{NO Bandage} \]
\[ \text{Flaring} \]

\[ \text{Rx of Non-Healing Ulcer} \]

1) **Debridement**
   Remove necrotic tissue from periphery using sterilized cotton bud

2) **Chemical Cauterization**
   TCA (trichloroacetic acid)
   \[ \text{Local antiseptic effect} \]

3) **Conjunctival Flap**
   Make a flap of conjunctiva to cover the ulcer
   **Gunderson's Conjunctival Flap**

\[ \text{Rx of Impending Perforation} \]

17) **Anti-Glaucoma Drugs**
   \[ \downarrow \text{IOP} \]

17) Cyanoacrylate glue application on thin area
3) Bandage Contact Lens
   Soft lens
   High water content
   More $H_2O \rightarrow$ More $O_2$ transfer ability

   CONTACT LENS
   Soft \(\rightarrow\) Semi-Soft \(\rightarrow\) Rigid Gas Permeable

Fungal Keratitis / Keratomycosis [AIIMS]

Cause - Trauma by vegetative matter
Common in farmers
Signs are more than symptoms compared to bacteria

M/c Fungus $\Rightarrow$ a) Aspergillus Fumigatus Q
   b) Fusarium Q

M/c Fungus infecting kids $\Rightarrow$ Candida Albicans

O/F:
5 Features
1. Ulcer is dry $\times$ rough.
2. Projecting end $\Rightarrow$ HYphae

satellite nodule $\rightarrow$ Dry Rough.
   satellite hyphopyon.

3) Unsterile Hyphopyon.
4) Satellite nodule Q
Inv.

Staining

1) KOH Smear
2) Gomori's Methamine
   Silver Stain.

Keratitis caused by NOCARDIA
   ASTEROIDES, is a filamentous
   bacteria closely resembles
   FUNGAL CORNEAL ULCER.

Rx

DOC → NATAMYCIN

Other → Nystatin eye ointment

Flucanazole → Most effective against Candida

Viral Keratitis

It is more common = Herpes Simplex M/c
   than Herpes Zoster.

Pathognomonic feature
   ↓ corneal sensation.

Causes of ↓ corneal sensation

1) Leprosy
2) DM
3) Absolute Glaucoma
4) Phtiasis Bulbi
5) any chr. degenerative disease
   of cornea
6) Section of trigeminal n/v
**HERPES SIMPLEX KERATITIS**

- **O/E:**

- **Endothelium**
  - Disciform Keratitis
  - E. endothelita in disc shaped manner
  - IV HSN

- **Stroma**
  - Stromal Necrotic Keratitis
  - III HSN

- **Epithelium**
  - Infiltration of inflammatory cells
  - [SPK]

- **Dendritic ulcer**
- Knobbed ends

- Geographical ulcer

**Stromal Necrotic Keratitis & Disciform Keratitis may be a manifestation of HSN PCR**

- **Rx:**
  - Acyclovir Eye Ointment - 5 times/day
  - Acyclovir drops not available
  - Ideal duration - not exceeding 14 days

**HERPES ZOSTER OPHTHALMICUS**

- Skin
- Eye
- Trigeminal neuralgia

**Hutchinson's Rule**
- If tip of nose is involved, eye will be involved
- Indicate involvement of Nasolabial N/V
C/E: 5. Some severe inflammation.

O/E: -

**ENDOTHELIUM**

Disciform Keratitis

**STROMA**

3. Nummular keratitis (circular lesion)

**EPITHELIUM**

1. SPK - infiltration of inflammatory cells
2. Micro dendrite or pseudo dendrite.

5. Uveitis
6. Cranial N/V Palsies

Rx:

1) Topical 5% Acyclovir eye ointment - 5 times/day
2) Oral Acyclovir (800mg) tab - 5 times/day for 19 days.
3) Valacyclovir (1000mg) tab - 3 times/day.

Metaherpetic Keratitis -

Over 4-6 antivirals
Toxicity → TN - Stop antivirals
Start Lubricating eye drops
Acanthamoeba Keratitis

Rare infection
cause:
1) Wearing soft contact lens & tap water
2) Swimming with goggles in soft contact lens user

C/F - Edema
Pain is disproportionately much more
4) due to perineural invasion.

0/E -

Ring Lesion

Pseudo-Dendrites

Reticulate pattern

Inv:

staining
1) Calcofluor white
2) Acridine orange
3) Lactophenol Blue

Culture

Q: QQ Non-nutrient agar + E. coli

Rx:

1) PHMB [Poly Hexa Methylene Biguanide]
2) Proamidine ethionate
3) Neomycin.

DOC \rightarrow PHMB
INTERSTITIAL KERATITIS

Endothelium  Epithelium
N

Stromal involvement

Salmon patch.

Causes:
1) Syphilis
2) Leprosy
3) TB
4) Sarcoidosis
5) COGAN SYNDROME → IK + Deafness

Other causes:
1) Acanthamoeba
2) Herpes Simplex
3) Herpes Zoster

Not a feature of Chlamydia

Salmon Patch → is a feature of Syphilis
KERATOCONUS
- Ectatic Dystrophy of Cornea characterized by corneal protrusion.
  
  Dystrophy is *idiopathic* spontaneous change *no* inflammatory component.

- Genetic Disease: AD
- Slowly Progressive

If whole cornea is protruded out = Keratoglobus → Myopia.

In Keratoconus → Myopia + Irregular Astigmatism.

Pt complains of Diminution of Vision.

O/E:
1) Fleischer's Ring
   Fe Deposition in Epithelium

2) Munsen's Sign
   V shaped deformity of lower lid on downgaze

3) Corneal Topography
   → irregular astigmatism.

4) Retinoscopy
   → scissor's reflex. Q.

5) Prominent corneal n/v
   → it is due to thinning of cornea

6) Vogt's Striae
   Break in Descemet's membrane
   in keratoconus → parallel to steeper axis.
Q: How to differentiate between Haab's and Vogt's Striae?

Haab's - Circular
Vogt's - Vertical

R:
1) Spectacles
in early stage, effective
2) Contact Lens
   Rigid Gas Permeable
   Lens
3) \[ \text{C}_{3}\text{R} \]
   Corneal collagen cross-linking
   + Riboflavin
   Exposure to UV-A rays for 30 minutes
   \(	ext{\rightarrow} \) it arrests progression of disease
4) Keratoplasty (PK)
Keratoplasty
- Corneal Transplantation
- Replacement of Diseased cornea by normal cornea
- Donor cornea from Cadaveric eyes 2 in 6hrs death, may extend to 12hrs.
- Storage Media
  - Short-term for 48 hrs in Moist chamber
  - Intermediate storage for 4 days
  - Long-term storage
    - MK [McCarey Kaufmann media]
    - 30 day organ culture
    - Indefinite time period
    - Cryopreservation

Types
- Penetrating (full thickness)
  - DALK [Deep Anterior Laminar Keratoplasty]
  - DePi
  - SB
  - Endo
- Lamellar (partial thickness)
  - LK
  - DELK [Deep Endothelial Keratoplasty] or DSEK
DSEK - Descemet Stripping Endothelial Keratoplasty

% of endothelial cell loss - 20-25%

* Min. endothelial cells in corneal graft = 1500 cells/mm²

CORNEAL DEGENERATIONS

Ager Related

ARCUS SENILIS

[Diagram of eye with labels: Lucid interval of Vogt, arcus.

Cause: Lipid Deposition.

→ in Stromal Layer

BAND SHAPED KERATOPATHY

It is deposition of calcium in form of a band subepithelial deposition.

Cause

1) Idiopathic – H/c

2) CHU. Uveitis in children suffering from JRA (Juvenile Rheumatoid Arthritis)

3) Phtisis Bulbi

4) Hypercalcemia → also seen in Sarcoidosis
Rx:
- Chelation of EDTA

**CORNEAL OPACITIES**

- Scar formed when stroma is involved

- Nebular
- Macular
- Leukoma

- Faint white
- White
- Dense white

Scattering, Defraction

- Interfere with func. of clear cornea.
- Diminish vision most

- Pannus: Neovascularization on cornea from limbal capillaries
**Corneal Dystrophy**

1. **Epithelial Dystrophy**
   - Presents with recurrent corneal epithelial erosions
   - Rx:
     - Pad/Bandage + antibiotic ointment
     - Keratoplasty

   - Types:
     - Microcystic
     - Finger Print
     - Map Dot
     - Meesman's Dystrophy
     - H/C type, overall
     - Reis-Buckler
   - Main pathology in Bowman's Membrane

2. **Stromal Dystrophy**
   - Presents with diminution of vision
   - Rx: Keratoplasty

   - Types:
     - Macular
       - Overall
       - Least common
     - Granular
     - Lattice
       - a/w amyloidosis
       - Lattice Type II
     - H/C Stromal type
     - AR inheritance
     - a/w mucopolysaccharidosis
3) **Endothelial Dystrophy**

- C/F: Corneal edema
- T/t: 1) Hyper tonic saline eye drops
  2) Keratoplasty

- Fuchs endothelial dystrophy
- Posterior polymorphous dystrophy

- Corneal Guttatae
  - Collagenous protuberance
  - Present on central cornea

- Corneal Guttatae
  - [Hassle-Hanle Bodzei]
SCLERA

SCLERITIS
1) Granulomatous Inflammation of Scleral Coat
2) Development
   1) Neural crest
   2) Temporal part- mesoderm
3) Thinnest part of sclera post to m/s insertion.

Ant. Scleritis
   \[ \text{Neovascularising} \quad \text{Non-neovascularising} \]
   \[ \text{Diffuse} \quad \text{Nodular} \]

Post. Scleritis
   \[ \text{Neovascularising} \quad \text{Surgically Induced} \]
   \[ \text{Non-neovascularising} \]
   \[ \text{Nodular, Diffuse} \]

They are associated with connective tissue disorders
1) RA
2) Polyaerteritis Nodosa
3) SLE.

Rx
1) NSAIDs
   Topical
2) Steroids
3) Immunosuppressive Drugs
in neurotising scleritis.

SCLEROMALACIA PERFORANS
- Neurotising Ant. Scleritis & C tactile inflammation
- Seen in pt of long standing seurotive RA
- c/f yellow necrotic patch on sclera
- Later marked thinning of sclera
- Exposed uveal tissue
Perforation is rare

STAPHYLOMA
Ectatic cond of eyeball or herniation of uveal tissue

Types

1. Ant. Staphyloma
[due to pseudo cresce]
2. Intervalary Staphyloma
3. Filiary Staphyloma
4. Equatorial Staphyloma

M/c type

Post. Staphyloma
- Pathological Myopia
- Post. Scleritis

caused through choroid

1. Cause - Scleritis
2. Perforating injuries
3. Absolute glaucoma
UVEITIS

Inflammation of uveal tissue

CLASSIFICATION

ANATOMICALLY

Anterior uveitis
Iris + Pars plana
[Juvenile form]

Intermediate uveitis
Pars Plana

Posterior uveitis
Chorioiditis

PATHOLOGICALLY

Granulomatous
Non-granulomatous

Nodule formation

Weakest part of Iris: Root, where it's attached to Ciliary body
Any disinsection is called **Iridodialysis**

D shaped Pupil

**ANTERIOR UVEITIS**

0/E

- **5** - those **5** features.
  - Redness - ciliary
  - D/c - Watery / Serous

0/E

- **5** Busaca (at base)
- **6** Aqueous nodule
- **2** Aqueous flare (due to protein leakage)
- **1** Aqueous cell
- **3** Muddy Iris (edematous)
- **6** Koepp's nodule (at pupillary margin)

Website: http://mbbshelp.com
WhatsApp: http://mbbshelp.com/whatsapp
Hallmark feature of Ant. Uveitis is KP

Non-Granulomatous
Fine, gritty

Granulomatous
Large, Greasy
[MOSSON FAT]

KP's are seen on lower cornea due to convec current in aqueous humour.

Pathogenesis
Inflammation causes↑ capillary permeability
leads to leakage of cell & protein.

7) Foreshed shaped pupil
post. Synechiae
on dilatation, this appearance

8) Scleral Pupilae/Ring Synechia
Aq humour start collecting in Pcs.
Synechia forms.
8) Ir"i Bombe
Aqueous humour push
Ir's forward
→
closure angle block
later on.
→
[ACG]

Fibrous tissue forms all over pupil

8) L. occlusio Pupillae

Cyclitic Membrane
Inflammatory membrane
formed behind Iris

Rx
1) Toc of Ant-Uveitis → Topical Steroids.
2) Topical Cycloplegics.

Adv:
- Release relieve spasm give rest to ciliary m/s & Better vasculature
- Relieves pain
- Prevents post synechiae
- Breaks the post synechiae

LUMINATE Programme-
Study to find non-steroidal th of Uveitis.
Drug being studied - Vcelosporin
**INTERMEDIATE UVEITIS**

1. Young 0°
2. O/E - Blurring of vision (U/L)
3. O/E -

![Diagram of eye with annotations]

- Retrolental flare
- Snowballs & white deposits
- Few KPs
- Snow Banking [Pathognomonic feature of pars planitis]

**RX**

Indications-
- If vision goes ≤ 6/6
- Like a/w CME

I → IV step Approach

1. **LOCAL STEROIDS**
   - Subtenon inj of Triamcinolone acetate

2. **SYSTEMIC STEROIDS**

3. **APPLY CRYO corresponding to snow banking**
   - Damaging blood supply of snow banking
IV. Pars Plana Vitrectomy

Bulk of inflammation & hence pt respond to tilt now.

C/E Posterior Uveitis

- Chorioiditis: round yellow patches
- Vitritis

3. Papillitis
- Retinal edema
- Cystoid Macular Edema
- Periphlebitis
  Hallmark feature = venous sheathing

Rx:
1) Local Steroids: Subtenon inject of Triamcinolone Acetate
2) Systemic Steroids

Diseases Associated with Uveitis

1) Arthritis
   - HLA-B27 associated
   - Sero-negative
   - RF +ve
   - Non Granulomatous Anti-Uveitis
1) Ankylosing spondylitis
2) Psoriatic arthritis
3) Reiter's syndrome
   TRIAD
   a) Urethritis
   b) Arthritis
   c) Conjunctivitis.

4) JRA - Early onset Pauciarticular Sero-neg.
   JRA
   Arthritis of <16yr
   Classification
   ↓
   Pauciarticular
   < 5 syns
   ↓
   Early onset
   Associated with Uveitis
   Atypical Uveitis → White Uveitis. [in JRA]
   ↓ 3 features
   No redness
   Child presents with complication:
   ↓
   Complicated cataract
   ↓
   2° Glaucoma
   ↓
   Band shaped keratopathy.
2) Sarcoidosis

**Ocular Features**

a) Sarcoid nodules on **episclera** & **sclera**.

b) Interstitial Keratitis
   - **Cornea**
   - Band shaped Keratopathy

c) Granuloma Granulomatous Pan Uveitis.

d) Venous sheathing of periphlebitis in sarcoidosis
   - Is very thick like candle wax
   - Candle Wax Dripping Sign [Image]

Lamellae sign:
- Pre- Retinal nodules

---

3) Behçet's Ds / Transient Hypopyon Syndrome
   - Obliterating vasculitis due to circulating immune complexes.

[HLA B5]

[HLA B51]

Pt. present = **Recurrent Hypopyon**.

Non- Granulomatous **ant**

Post

4) Eales Ds / Periphlebitis Retinæ
   - Recurrent Vitreous Haemorrhage
   - Young O³
   - HSN React toward Tubercular Ag. [Type IV HSN]
0/E 1) Venous sheathing
   2) Vitreous haemorrhage

Rx
1) Check for active TB
   Start ATT if yes
2) Mx of vitreous haemorrhage
   partial
   Posterior management
   propped up position for drainage
   Blood doesn’t come before macula
   Total
   Pars Plana Vitrectomy

57 HIV

H/oe ocular feature

Microangiopathy

manifests as
a) H'ge
b) Microaneurysm
   c) Cotton wool spots (soft exudates)

Composed of axonal debris

H/oe opportunistic inf
   CMV Retinitis
   Sauce cheese retinopathy
   H'ge neovasc (Image)
Microaneurysms
1) Diabetic Retinopathy

Macroaneurysm $\approx 100 \mu$
HTN Retinopathy

* Other opportunistic Infections
  1) Toxo plasmocytis  
  2) Pneumocytis carini  
  3) Herpes zoster $\rightarrow$ ARN [Acute Retinal Neuritis]

Rx -
1) Anti-HIV Drugs
Pt is on HAART therapy

4) H/c Ocular SLE $\rightarrow$ Immune Recovery Uveitis

Non Granulomatous
Post: Uveitis
(Vitritis)

6) Toxoplasmosis

Ant.  Post

Gr.

Non. Gr.

Gr.

Intense Vitritis

Q & Q Head Light in fog
Appearance $\rightarrow$ Tattoo

Present $\in$ [Punched out Pigmented Lesion] mainly involving Macular area

Rx $\rightarrow$ Clindamycin.
**Syphilis**

- Diffuse chorioretinitis
- Salt & Pepper Fundus

**Rx - Penicillin**

**TB**

- Granulomatous Pan Uveitis
  - M/c Ocular Uveitis
  - M/c Allergic
    - Phlebitenular
    - Keratoconjunctivitis [Type IV HSN]

**Rx - ATT**

**VKH [Vogt-Koyanagi-Harada Syndrome]**

- Granulomatous Pan Uveitis + Systemic Features
  - HLA-DR4
  - 1) Encephalitis
  - 2) Vestibular Dysfunc
  - 3) Tinnitus
  - 4) Alopecia
  - (Sanguinosis)
  - 5) Vitiligo
  - 6) Poliosis
Uveitis + encephalitis ⇒ VKH syndrome.

107 SYMPATHETIC OPHTHALMITIS

Perforating injury in 1 eye causing uveitis in the other eye

↓

causing autoimmune reaction in uveal tissue

↓

Never before 2 weeks.

Max cases manifest betw 2 weeks to 3 months

Granulomatous Panuveitis

1st sign of ⇒ Retrolental flare

1st symptom ⇒ Difficulty in near vision

Dangerous area of Eye ⇒ CILIARY BODY

Bewz, any trauma to ciliary body is a big risk of sympathetic ophthalmitis
117 Fuch's Heterochromic Cyclitis

- Atypical Ant Uveitis
- Non-Gr Ant Uveitis
- U/L → characterized by Heterochromia Iridis

Ruberosis Iridis

No Post-Synechiae

Stellate KP.

No role of Steroids or Cycloplegics.
Pt. presents with complicated cataract
2° Glaucoma.

IOL if C/I in JRA.

127 ONCHOCERCIASIS

River Blindness
Caused by Onchocerca Volvulus
Non-Granulomatous Ant
Post
cause of Blindness - Sclerosing Keratitis
It is included in Vizien 2020.
Rx - Ivermectin.

13) **OPHTHALMIA NODOSUM**
   - Due to intense Granulomatous inflammation
   - Due to Caterpillar Hair in Eye

VISION 2020
WHO programme to control 5 Disease by 2020 - India

1) Cataract
2) Trachoma
3) Onchocerciasis
4) Childhood Blindness
5) Refractive Errors

LEPROSY - Ocular involvement more in Lepromatous leprosy than Tuberculoid leprosy.

Mil pearls - pathognomonic feature.
CONJUNCTIVA

Thin mucous membrane over the ocular surface

CONJUNCTIVITIS

Inflammation of conjunctiva

C/F:-

1. Redness - Conjunctival
2. Discomfort to eye
3. Sensation

D/c - depend on etiology

- Bacterial ⇒ Purulent
- Chlamydial ⇒ Mucopurulent
- Viral ⇒ Watery
- Allergic

Pathology

- Papillary epithelial hyperplasia
- Follicular formation
- Follicles
- Aggregation of lymphoid cells

T/t

- B ⇒ Antibiotic
- C
- V ⇒ Antibiotic to prevent 2nd infection
- A ⇒ antiallergic + steroids (mild)
Membranous Conjunctivitis

All features + Membrane formation

Bleeds on peeling ⇒ cause: Corynebacterium Q. Diptheriae

Pseudomembranous Conjunctivitis

All features + Membrane formation

⇒ doesn't bleed on peeling

cause:
1) Mild diptheriae
2) Severe adenoviral
3) Streptococcus haemolyticus

Angular Conjunctivitis

Conjunctivitis at 2 canthi ⇒ excoration of skin.

causes:
- Moraxella Axenfield Q
- Lacunata
- Catarhalis

2) Staph aureus

Rx: Antibiotic drops

Q: ZnO → inhibits proteolytic enzymes

Haemorrhagic Conjunctivitis

$\text{conjunctivitis} + \text{subconjunctival haemorrhage}$
Causes of Subconjunctival Haemorrhage
1) Haemorrhagic Conjunctivitis
2) Trauma
3) HTN
4) Bleeding Diathesis
5) Whooping Cough

Trachoma
Chronic Conjunctivitis of Children
Age - 1-9 yrs
Cause - Chlamydia A, B, Ba, C, Q
Chlamydia D to K → Adult Inclusion Conjunctivitis
or
Q - Swimming pool conjunctivitis
It is also caused by adenovirus.
c/f - itching, watering

g. sgagashen

1) Follicles on the upper palpebral conjunctiva.
2) Follicles on upper limbus ⇒ Herbert's follicle

f., follicles on lid.
Linear scarring (Ault's line)

Herbert's follicles

3) Ault's line - Linear scarring on upper palpebral conjunctiva
4) Herbert's pit - Scarring on Herbert's follicle (upper limbus).

WHO Classification

F → Follicle
no. ≥5 follicles
upper palpebral conjunctiva.

I → Inflammatory stage
itching, watering

S → Scarring
Ault's line
Herbert's pit
T → Trichiasis
   "medicocr of eyelash"

O → corneal opacity

Complication of Trachoma ⇒ Corneal Ulcer

Pathology

Both follicular & papillary reach

Intracytoplasmic inclusion bodies

HP Bodies

[Halberstedt, Prowański]

Community ophthalmology

→ SAFE Strategy

WHO programme to control Trachoma

S - Surgery ⇒ only trichiasis sx

A - Antibiotics

F - Facial hygiene

E - Environmental cleanliness

Agitro mycin

Topical Tetracycline

Atropine ointment ⇒ also 1%

1g in 30mg kg children.

Prevalence of Trachoma follicles in

Age group: 1-9 yr

If >10% ⇒ follow SAFE Strategy

5-10% ⇒ F & E
<5% - Nothing is done.

- Vision 2020 programme
  DOC for Blanket Therapy ⇒ AZITHROMYCIN.
  for prevention

RX - DOC ⇒ AZITHROMYCIN QD
  other options - 1) Tetracyclin
                  2) Sulphacetamide eyedrops

ALLERGIC CONJUNCTIVITIES

PHLECTENULAR KERATO CONJUNCTIVITIES

Endogenous antigen
  1) Staph aureus
  2) TB

C/F
  Itching
  Waterting

O/E
  Phlegeten at Limbus

Fascicular Ulcer
  later forms ⇒ Ring ulcer

Type IV HSN (P)
Rx
1. OLOPATADINE → Mast cell stabilizer
2. EPINASTIN + Antihistamine
3. Na Cromoglycate → mast cell stabilizer
4. Steroids → Fluomethalone

VERNAL KERATOCONJUNCTIVITIS or SPRING CATARRH

1) Disease of summer
2) Age group → O-> children
3) Exogenous Antigen → Dust, Pollen
4) No follicular reaction

O/E:
- Itching + Ropy Discharge
- Watery

look like:
- Inflamed thread in D/c
- Cobblestone appearance

Type I HSN®
Maxwell-Lyon Sign

The eosinophile in the eye is D/C

Rx - same as phlyctenular
OPHTHALMIA NEONATORUM

NEONATAL CONJUNCTIVITIDES

Defined as conjunctivitis in 1 month of age

Cause:
1) chlamydia → H/c cause → 4-10 days
2) Gonorrhea → 2-4 days
3) chemical conjunctivitis
4) Herpes simplex virus
5) Staph aureus

CREDES METHOD:
1% AgNO₃ in 8 eyes to prevent Gonorrhealconjunctivitis
Not followed now as it causes chemical conjunctivitides

VITAMIN-A DEFICIENCY

XEROPHTHALMIA

Conjunctival xerosis:

TYPES

EPITHELIAL XEROSES

PARENCYMATOUS XEROSIS

Xerophthalmia:

all cause, scarring,
1 conjunctival.

→ Trachoma
→ all types of burn
  (chemical, thermal, electrical,
  Radiational)
→ Steven Johnson Syndrome
Alkali is more dangerous as it can penetrate eye

**XEROPHTHALMIA**

*WHO GRADING*

\[X_N \rightarrow \text{Nyctalopia / Night Blindness}*

\[X_{I_A} \rightarrow \text{Conjunctival Xerosis}*

\[I_B \rightarrow \text{Bitot's Spots}*

\[X_{II} \rightarrow \text{Corneal Xerosis}*

\[X_{III_A} \rightarrow \text{Keratomalacia} < \frac{1}{3} \text{rd of cornea}*

\[B \rightarrow " \quad \frac{1}{3} \text{rd}*

\[X_S \rightarrow \text{Corneal SCarring}*

\[X_F \rightarrow \text{Xerophthalmic Fundus (White Spotted Fundus)}*

Q. earliest feature of vit A Def - Nyctalopia
Q. Bitot's spot more common on side = temporally

* 2° Signs -

\[X_N \rightarrow \text{(Rest are 1° Signs)}*

\[X_S \rightarrow *

\[X_F \rightarrow *
Rx

>1 yr = Inj. vitamin A 1 lakh IV 0, 1, 14 days.

<1 yr = Half the dose

PTERYGIUM

Subconjunctival fibrovascular tissue encroaching the cornea.

Q. Not inflammatory. It is connective tissue disorder.

Q. M/c side → Nasal.

ETIOLOGY

Due to exposure to UVB-rays

E/F-

1) Cosmetic

2) Astigmatism → curvature is affected

3) If encroaches pupil → leads to diminution of vision.

Rx

→ Excision

Recurrence is main challenge
Bare sclera technique → High rate of recurrence

↓

Prevent recurrence

Mitomycin-C

Autografting

(Best method)

Perfect surgery:

[Ptérygium extended resection followed by extended conjunctival transplantation].

Reurrence = 0.

Ptérygium

Glass rod test

Pseudoptérygium

Not passed

Glass rod pass early
DRY EYE

LAYERS OF TEAR

1) Lipid Layer
   By meibomian Gland -> helps to prevent evaporation of tear.

2) Aqueous
   Secreted by Lacrimal & Acc. Lacrimal helps in lubrication

3) Mucin (innermost)
   Helps to spread tear on ocular surface
   from goblet cells Q.
   Max. goblet cells
   Inferonasal conjunctiva

Deficiency of any of the 3 layer = Dry Eye

* KERATOCONJUNCTIVITIES SICCA (KCS)

Deficiency of Aqueous Layer.

KCS + Xerostomia = ↑

↑
1° Sjogren's Syndrome

+ Connective tissue Disorder

↓
2° Sjogren's Syndrome

C/F ->
1) Burning Sensation
2) Gritty sensation
3) Severe -> Precorneal Tear film -> D/V
Inv.

1) **SCHIRMER'S TEST** :-
   Year strip is put under lower lid for 5 mins.
   Any wetting of < 5 mm = severe dry eye

2) **TEAR FILM BREAK UP TIME** :- (But)
   From last blink, how much time is taken
   for 1st dry spot to appear
   Last Blink → Dry spot
   If < 10 sec → Dry eye

3) **ROSE BENGAAL STAIN** :-
   Stains dead cells, nucleus

4) **TEAR OSMOLALITY** :-
   Used in patients of dry eye
   Phenol red dye test: measures the presence of tears. On topical anaesthesia, as the dye changes its colour to red on contact with tears. It doesn’t require pH meter for reading the result.
Rx

**MEDICAL**

↓

Lubricatory Eye Drop

↓

Methyl cellulose derivatives

**SURGICAL**

Lacrimal punctal occlusion.
LACRIMAL DRAINAGE SYSTEM

\[ L \rightarrow UC \rightarrow UP \rightarrow O \rightarrow CC \rightarrow LC \rightarrow LP \]

P = Puncta
c = Canaliculi

\[ NLD \]

Q. Inf. meatus
Q. Anteriorly

Q. On closing eyes → arrangement of puncta

UP is medial to LP.

WATERING

Due to overproduction → overflow

LACRIMATION → EIPHORA

*Whenever drainage system failed < Eiphora Discharge.

Inv -
1) Regurgitation Test - pressing on medial canthus, when water * by
regurgitate, test is +ve.
2) **Syrenging**
   - If regurgitation is from opposite puncta
     - Indicates blockage in common canalicule & forward
   - If regurgitation is from same puncta
     - Puncta itself is blocked
   - Partial obstruction can be opened by syrenging

3) **Dacrocystography**
   - Inject dye in tear
     - Radiography

4) **Dacryoscintillography**
   - Radioactive dye is used.

---

**DACRYOCYSTITIS**

Inflammation of lacrimal sac.

- **Congenital**
- **Acquired**
  - **Acute**
  - **Chronic**
CONGENITAL Dacrystocystitis

Etiology: due to non-canalization of NLD.

c/f - Epiphora
Discharge

Rx - < 6 months → Massaging & antibiotic eye drops (CRIEGER'S MASSAGE)

6-18 months → Best result is by Piloting.

>18 months → Best result is by DCR

Dacryocystorhinostomy

Opening is made in Middle Q. meatus.

Q. DCR → from 4 yr onwards. → 70yr

>70yr → atrophy of nasal mucosa

Q. When does tear production starts?
6 weeks. → (Reflex tear production)
ACQUIRED DACRYOCYSTITIS

ACUTE

- Epiphora
- Discharge
- Acute Inflammation

Rx -
- Control Inflammation + Antibiotics/anti-inflammatory
  \[
  \text{DCR}
  \]

Q. Sequelae → Lacrimal fistula
  \[
  \text{Rx} = \text{Dcr.}
  \]

Q. M/c. etiological agent → Staph. aureus.

CHRONIC

Q. Q > 0°

Q. M/c. etiological agent → Staph. aureus > strepto. pneumoniae

- Epiphora
  \[
  \text{D/S}
  \]

Rx - DCR.

Sequelae → Mucocele formation
  \[
  \text{Innert}
  \]

Pyocoele formation
  \[
  \text{Lacrimal fibrosis}
  \]
Rx of Larema retrom - Dacryocystectomy

Q. M/c ocular feature of MUMPS?
   → Dacryocyst adenitis.

Q. M/c ocular feature of MEASLES?
   → Vit. A Deficiency

Q. SNOW BLINDNESS / PHOTOPHTHALMIA?
   → Injury by UV B rays.
   → Reflection from snow

C/F - corneal epithelial erosion

Rx - Pad, Bandage & Antibiotic ointment

Q. PHOTO - RETINITIS?
   → Injury by Infrared rays
   → Directly looking at Solar eclipse & unaded eye

C/F - Macular Burn

Macular scar
No effective Rx.
CAUSES OF NYCTALOPIA

1. Vit A Deficiency
2. Retinitis Pigmentosa
3. High Myopia (≥ 6D)
4. Late Stage of POAG
5. Oguchi's Disease
   - Congenital stationary retinal degeneration
   - Pale fundus
   - Miogiu's phenomenon
   - Sitting 1 hour in dark
   - No light blindness
   - Fundus is N
   - Occurs due to overstimulation of rods

6. Choroideremia
   - Choroidal dystrophy
7. Urate atrophy
   - Due to def. of Ornithine aminotransferase or transcarbamoylase

Fundus exam →

Rx → Arginine free diet
CAUSES OF HAMARLOPIA (Day Blindness)

17. Central corneal opacity
27. " lenticular "
37. Congenital absence of cones
NEURO-OPHTHALMOLOGY

Intra oribal (Longest Part) (2.5 - 3cm)

Intra-canalicular (shortest) (1mm)

Q. Structures passing through optic canal

Optic n/v
Ophthalmic artery

Sup. Annulus of Zinn
Origin of all 4 recti.

N/vs → L Lateral
F Frontal
T Trochlear
LR → SD 4 → LPS mL
SR → by sup. div. of IIIrd n/v
MR
IR → by Inf. div. of IIIrd n/v
ID

OPTIC NEURITIS

[Optic n/v Disease]

Defn.: Pathological condition of optic n/v where n/v impulse transmission is hampered

C/F:
1) ↓ visual acuity
2) Visual field defect
   L Central Scotoma
3) Afferent Pupillary Defect — 1st Sign
   (something away from △ pupillary reflex)
4) ↓ color brightness
5) ↓ brightness

Website: http://mbbshelp.com
WhatsApp: http://mbbshelp.com/whatsapp
CLASSIFICATION

ANATOMICALLY

ETIOLOGICAL

1) Inflammatory
2) Degenerative
3) Autoimmune
4) Hereditary
5) Ischaemic

PAPILLITIS

RETRO-BULBAR NEURITIS

NEURO-RETINITIS

Blurred disc margin

Fundus - (N) Pathognomonic feature (deposition of hard exudate)

RAPD

Diagnosed by swinging flash light test
Marcus Gunn Pupil

Pain on elevation

sup. Rectus has sensory to myelin sheath of optic n. v

on elevation - MLS stretched

cause pain

NO ATIMS

Most likely A in the pt who presents w/ painful u/e disc loss of vision & hlo of persistence of after image - RETRO-BULBAR NEURITIS
ETIOLOGICAL

1) INFLAMMATORY -
   All causes of post uveitis.

2) DEGENERATIVE -

Multiple Sclerosis

\[ \text{Toxic amblyopia} \]

\[ \text{Cause} \]

1) Tobacco
2) Ethambutol
3) Chloroquine
4) Ethyl alcohol
5) Methyl alcohol

Tobacco

\( b_s - \text{Blind spot} \)

\( b_s - \text{Blind spot} \)

Macula

\[ \text{Centro-caecal Q. Scotoma} \]

Methyl Alcohol

Directly damages ganglion cell hence more dangerous.
Ocular effects of chloroquine

Post.
Subcapsular
Cataract

Optic
neuropathy

Bull's eye
Maculopathy

Vortex
Keratopathy

Other cause of Vortex
Keratopathy

1) Chloroquine
2) Amodarone
3) Tamoxifen
4) Indomethacin
5) Febrile Disease
6) Chlorpromazine = all except.
   [Cat in the dark colour]

37 Autoimmune Optic Neuritis -
   Optic neuritis in all connective tissue disorders

4) Ischaemic ON -
   AION = Ant. Ischaemic Optic Neuritis

Ant.
Ciliary

Hojers

Long Short

Supplies choroid

Ophthalmic Artery
Ciliary Artery

Muscular Branches

Ant. Short (10-20) Long

Minor circle

Major circle

Inner 6th Layer of Retina \(\rightarrow\) supplied by Central Retinal artery

Outer 4 Layer of Retina \(\rightarrow\) supplied by short post-ciliary artery

A. Ant. Ischaemic Optic Neuritis

Due to blockage of short post-ciliary artery

\[\downarrow\]

ARTERITIS

Non-arteritic

Etio. Giant cell arteritis

Etio. \(\times\)

Major R/F = HTN

(Nocturnal Hypotension)
**ARTERITIS**

1) Sudden painful D/L
Visual acuity III

2) **Amaurosis fugaz**
Transient loss of vision

**NON-ARTERITIS**

1) Sudden painless D/L
Visual acuity I

2) **Altitudinal field defect**

- ![Diagram of field defect]

O/E

- Blurred disc margin
- Huge below disc

Rx

- I.V. steroids for 4-5 days
- Oral steroids

5) **HEREDITARY OPTIC NEURITIS/LEBER'S HEREDITARY OPTIC NEUROPATHY**

Mutation in maternal mitochondrial DNA

- YF - R
  - Optic N. followed by O.N. in other eye
  - Optic atrophy → Optic atrophy
  - NO APD
PAPILLOEDEMA

Oedema around disc.

c/f– 1) Visual acuity N
  2) Pupillary Reac. N
  3) Colour N
  4) Brightness N
  5) Visual Field Defect–
      \[ BS \] → Q. enlargement of Blind spot

First sign of papilloedema → Venous dilatation

Rx– Rx the cause
CAUSES -

PATHOPHYSIOLOGY

[Diagram showing retinal blood flow cues and relationships]

Hypotony

Disturbance of pressure gradient across lamina cribrosa

Stasis of axoplasmic flow

Swelling of axons

Pressure on veins

Leakage

ETIOLOGIES

1. INTRAOCULAR CAUSE
   Any cause of Hypotony
   
<table>
<thead>
<tr>
<th>Trauma</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>chr. uveitis</td>
</tr>
<tr>
<td></td>
<td>ciliary shutdown</td>
</tr>
</tbody>
</table>

2. INTRAORBITAL CAUSE
   ↑↑ Pressure in orbit
   
   Inflammation
   Tumour
   Thyroid disease
III INTRACRANIAL CAUSE.

↑ ICT

Tumour

Abscess

Benign Pseudotumour Cerebri

↓

↑ ICT → Bl papilloedema

CT scan / MRI N

CSF N

⇒ Imbalance of formation, reabsorption of CSF

Causes

1) Obesity
2) Vit A toxicity
3) OCPS
4) Tetrazycline

IV SYSTEMIC CAUSE.

HYPERTENSION HTN

SEVERE ANAEMIA
OPTIC ATROPHY

- All n/v fibers are damaged
- Pt - Blind
- TAPD (Total afferent Papillary Defect)

CLASSIFICATION

1°
- Cause
  - Brain
- optic n/v
- clear disc margin
- Chalky white
- Multiple Sclerosis
- Neurosyphilis

2°
- Retina
- clear margin
- Waxy disc
- Papillitis
- Papilledema
- Retinitis Pigmentosa
- Deffire Choro Retinitis

Consequences

Glaucomatous

Glaucoma

Upsting

nasal shifting

Glaucoma

N PUPILLARY REACTIONS

D LIGHT REFLEX

- Light — constric of Pupil
  - Direct
  - Consensual
2) NEAR REFLEX / ACCOMODATION REFLEX:

\[ \text{Convergence} \rightarrow \text{Miosis} \rightarrow \text{Accomodation.} \]

3) PSYCHOSENSORY REFLEX:

\[ \text{Anxiety} \rightarrow \text{Dilation of Pupil} \]

\[ \text{Dilator Pupillae - Sympathetic} \]

\[ \text{Trig. Sphenoi. - Parasympathetic} \]

**Ab N PUPILLARY REACTIONS**

1) RAPD

- Retrobulbar Neurite
- By swinging flash light test
- Also called Marcus Gunn Pupil

2) TAPD - PR Θ

- Optic atrophy

3) Argyll Robertson Pupil

Light - Near Dissociation.

Accomodation Reflex + Nt, Light Reflex Θ
due to lesion in "Pre-tectal Nucleus"
Neurosyphilis.
47. Holmes-Adie (Tonic Pupil):

1) Sluggish Light Reflex
2) " Accomodation Reflex
3) " Tendon Reflex.

Q. Position of Pupil — "MID - DILATED"
Vermiform movement of iris seen.

57. Horner Syndrome

Lesion of "Sympathetic Chain."

1/F = 1) Ptosis
2) limited
3) Miosis
4) due to uninhibited action of iris sphincter
5) Enophthalmos
6) due to ptosis, apparent enophthalmos.

4) Anhidrosis
5) Loss of sweating
6) Loss of cilia-spinous reflex
7) Pinching at nape causes dilatation of pupil

Best described by — 1) Ptosis + 2) Miosis
Q. Horner is ① congenital, ② acquired

Congenital: Heterochromia tridax.

PUPILLARY LIGHT REFLEX PATHWAY

**AFFERENT**

TN → Strabismus (ARP)

Pretectal nucleus

Edinger-Westphal nucleus

**EFFERENT**

III → N/V

Inf. Div.

N/V to Inf. oblique (③)

HOLMES ADIE

Ciliary Ganglion

Short ciliary N/V

虹膜 sphincter

* 2 internal m/s supplied by III N/V

1) Iris sphincter

2) Ciliary m/s
LESIONS OF VISUAL PATHWAY

1. Ipsilateral Blindness

2. Bitemporal Hemianopia / Heteronymous

3. Incongruous Homonymous
   Hemianopia
   Scotoma not in continuity

4. Incongruous / Congruous
   Homonymous Hemianopia

5. Congruous Homonymous Hemianopia

Only lesions c are Heteronymous = CHIASMAL.
Chiasma is affected in Pituitary Adenomas
CranioPharyngiomas
Aneurysm circle of Willis

Wernicke's HEMIANOPIC PUPIL:
-feature of optic tract lesion.

Radiation lesion:
Cortical Blindness
Pupillary React are

Optic Radiation

Temporal lobe

Superior fibers
(Meyers Loop)

\[ \text{sup. quadrantopia} \]
[Pie in sky]

Parietal lobe

Superior fibers
(Baums Loop)

\[ \text{inf. quadrantopia} \]
[Pie in floor]
**VISUAL CORTEX**

Supplied by

- Post. Cerebral Artery
  - Macular Sparing Hemianopia
  - B Side PCA gone

Middle Cerebral Artery
  - Supplied Macular area
  - Total macular H.N. seen when there is direct trauma to macular area
  - Not seen in vascular blockage at B artery supplying macula

Keyhole/visual Tunnel

1° 2°
17° 18,19

Visual association areas

I
II
III

IV - Thickest Layer: a, b, d, e, f, p
V
VI
Q. Max. optic radiation fibres terminate in Layer IV of visual cortex.

**LATERAL GENICULATE BODY**

I. Magnocellular

II. Parvo cellular

Q $\rightarrow$ Q

1, 4, 6 $\rightarrow$ C/L supply

2, 3, 5 $\rightarrow$ I/L supply

*Key hole visual field defect*

**HORIZONTAL GAZE CENTRE**

**VOLK** HIs $\rightarrow$ C/L Synergists.

HIs of Diff. eye $\rightarrow$ set synergising action

Horizontal Gaze Centre $\rightarrow$ Pons. - PPRF

(Paramedian Pontine Reticular Formation)
1) Defective I/L adduction (Medial Rectus won't work due to lesion of MLF)

2) C/I abducting eye shows ataxic nystagmus

Any lesion of MLF → Internuclear ophthalmoplegia (INO)

III *Nerve Palsy*

1) Down + Out + Intorted

   Depressed + Abducted

2) Defective / Restricted ocular movement

3) Ptosis

4) Fixed + dilated Pupil

5) Accommodation – absent
EXTERNAL OPHTHALMOPLEGIA

INTERNAL OPHTHALMOPLEGIA

TOTAL O.

↓

Only EOM. involved

Only internal m/s involved

Internal Ciliary Sphincter

Q. WEBER'S SYNDROME

IIIrd N/V Palsy + C/L Hemiplegia

Q. BENEDICTS SYNDROME

IIIrd N/V Palsy + C/L Hemitremors

Q. JUARD - GUBLER SYNDROME

6th N/V Palsy + C/L Hemiplegia

Q. FOSTER - KENNEDY SYNDROME

→ IL Optic Atrophy

→ CL Papilledema

Frontal lobe Tx of olfactory groove Tumours
NYSTAGMUS
Involuntary To a Freq Movement of Eye

ANATOMICALLY
PENDULUM  JERKY  MIXED

ETIOLOGICALLY

PHYSIOLOGICAL  PATHOLOGICAL

Sensory Deprivation  Motor Imbalance

PHYSIOLOGICAL

1. Extremes of Age
2. Oculovestibular Reflex (cows)
3. Optokinetic Nystagmus (OKN)

Saccadic  Pursuit
Fast abrupt movement  Slow following movement
to reflex object on fovea

Opt Defective Optokinetic Nystagmus
L. Lesion to Parietal Lobe
Optokinetic Drum Test - 
Objective Test to catch malingering 
Functional Blindness 

**PATHOLOGICAL**

**SENSORY DEPRIVATION**

Foveal reflex develops by 5-6 months

Opaque media in 5-6 months of age 
Can lead to nystagmus 
↓ 
Pendular

**MOTOR IMBALANCE**

1. **Ataxic Nystagmus** → INO
2. **Latent** → Infantile Esotropia 
   
   Manifest by Cover-Uncover test 
   Converging squint <1 yr of age

3. **Spasmus Nutans** 
   Nystagmus + Head Nodding 
   Pendular
4) **DOWNBEAT NYSTAGMUS**

Arnold Chiari malformation

→ Cerebellar Lesions

5) **UP BEAT NYSTAGMUS**

Post. Fossa Lesions

→ Phenytoin Ingestion

6) **SEA-SAW NYSTAGMUS**

Seen in chiasmal lesions. (Bitemporal Hemianopia)

All are jerky except spasmus nutans

* **PASS-POINTING NYSTAGMUS**

Nystagmoid movement

Feature of cerebellar lesion

* **MINER'S NYSTAGMUS**

Rotatory
ORBIT

Q 30cc
Q shape - QUADRILATERAL / PYRAMIDAL
Q weakest wall - MEDIAL WALL
   due to cribiform plate of ethmoid sinu
   "Lamina papyracea"
Q Blow OUT # -
   Floor # due to blunt trauma
   M/c site = Medial to Inf. orbital fissure
   (Posteromedial part)

PROPTOSIS

Protrusion of eyeball -
Lateral orbital margin → apex of cornea
   > 21 mm -
   or difference between 2 eyes > 2 mm

EXOPHTHALMOS - for thyroid disease

EXOPHTHALMOMETER - used for measurement of
EXOPHTHALMOS

Comment: → Hertel's exophthalmometer
In children → Leudde's exophthalmometer
CLASSIFICATION

UL/BL  Painful/Painless  Axial/Non-Axial

THYROID OPHTHALMOPATHY
GRAVE'S EYE DISEASE

- Autoimmune disease
- O
- O. Pt can be Euthyroid/Hypothyroid/ Hyperthyroid

C/F -
1) Ptosis
2) Optic Neuropathy
3) Myopathy
4) Soft tissue signs
5) Lid signs

PATHOPHYSIOLOGY -

1) Infiltration of inflammatory cell
2) Enlargement of m/s
3) Multiplication of adipose cells
4) Intra-orbital pressure
5) Compression optic neuropathy
6) APD
7) Visual acuity
8) Colour
9) Brightness
Rx = 
1. Systemic steroids
27. Radiation therapy \rightarrow \text{anti-inflammatory role of radiation}

37. Severe \rightarrow \text{Decompression Sx}
   \begin{itemize}
   \item L. Involves breaking orbital wall
   \item Q. sequence of wall to be broken
   \begin{itemize}
   \item Medial
   \item Inferior
   \item Lateral
   \end{itemize}
   \end{itemize}

\underline{MYOPATHY}

Restrictive Myopathy

C/F \rightarrow \text{Diplopia}
   \rightarrow \text{squint}

Rx \rightarrow \text{squint surgery}

For an underacting m/s \rightarrow \text{Recession done}
For overacting m/s \rightarrow \text{Recession}

1st m/s \rightarrow \text{Inf. Rectus}

Last m/s \rightarrow \text{Inf. Oblique}

Part of m/s involved - Belly
Q. 1st Defective movement → Elevation.

as the inf. rectus is fibrosed, it
doesn’t allow elevation.

FORCED DUCTION TEST →

do differentiate between

Paralytic

pathology

Restrictive

pathology

↓

sup. oblique can be
elevated by

forcep

SOFT TISSUE SIGN

1) edema around eye

2) Chemosis

3) Sup. Limbus Keratoconjunctivitis

Rx = 1) Adrenaline E/D

2) Acetylcystine E/D to dissolve mucus
LID SIGNS

1) LOCATION - upper lid 2mm below limbus
   Lower lid touches limbus

   Lid signs are due to overaction of LPS m/s

2) DALRYMPLE SIGN → Lid Retraction

3) VON GRAEFE → Lid Lag.

4) KOCKER'S SIGN → Staring Look.
   (Extreme lid retraction)

5) STELLWAG SIGN → Decrease frequency of Blinking

Rx - Recession of LPS (overactive m/s) that by recession

Q. Medical Rx of Lid Lag - Guenethidine E/D.
   * Sequence of sx done in THYROID -
     D  Decompression
     S  Squint
     GL Lid surgery
ORBITAL CELLULITIS

ANATOMY

- Orbital septum
  - Inflammation
    - In front
    - Pre-septal
      - (Insect bite)
    - Behind
      - Orbital cellulitis

C/F of ORBITAL CELLULITIS

1) U/L
2) Painful proptosis
3) Restricted eye movement (Due to proptosis)
4) Fever, malaise

Rx

Ocular EMERGENCY → Becoz of Risk of causing cavernous sinus thrombosis

- Admit pt
- Start iv Antibiotics < aerobics
- iv anti-inflammatory
CAVERNOUS SINUS THROMBOSIS

ANATOMY

C/F -

1st sign → 6\textsuperscript{th} n/v palsy

2) 3, 4, 6 are involved → causing total restriction of eye movement

3) Absent → L: Reflex

4) Absent → Ace. Reflex

5) 5\textsuperscript{th} → Absent Blink Reflex

6) Bil. Painful Pupiostis

7) Bil. Papilloedema

8) Mastoid tenderness

9) Ptosis all except Q
Rx. IV antibiotics < aerobic
               < anaerobic

2) IV anti-inflammatory

Prognosis - Poor

LACRIMAL GLAND TUMOUR.

NON - AXIAL

BENIGN

Benign mixed Tx /

Pleomorphic adenoma

H/c Tx

MALIGNANT

1) Pleomorphic Adenocarcinoma

2) Mucoepidermoid

3) Adenoid-cystic

H/c malignancy

Most dangerous maligny

due to perineural invasion.

PULSATING PROPTOSIS

by CAUSES :

1) Carotico-cavernous fistula (CC) H/c

2) # Roof Intracerebral pulsations are

3) NF-1 Transmitted
INTERMITTENT PROPTOSIS

changes in head posture

Cause - Orbital Varies QQ

ONE-LINERS:

1) M/c Intracocular Malignancy

   Children: RETINOBLASTOMA

   Adults: 1) CHOROIDAL MALIGNANT
           MELANOMA

           2) HEARTYASIS

   M/c Intra-orbital Malignancy

   Children: RHABDOMYOSARCOMA

   Adults: NON-HODGKIN'S LYMPHOMA

   B cell type

   Q. M/c Intra-orbital Tx of adults = CAVERNOUS

   HEMANGIOMA

   Capsulated, so rarely resected

OPTIC N/V GLIOMA = ASTROCYTOMA

All non-neuronal cells of nervous system → Glial cells

EXAMPLES:

1) Oligodendrocyte
2) Astrocyte
3) Neuroglial
4) Microglial etc
1) Disease of childhood
2) More common in $\varphi$
3) U/L
4) Very slow growing Tx
5) H/c - NF-1 $\geq$ 29 G

when size of Tm $\uparrow$

Proptosis is a late feature
Initial sign: optic N/V disease

H/c pathological type: Pilocytic astrocytoma
harm like $s/s$

Inv $\downarrow$
1) MRI
2) CT Scan

Fusiform enlargement

Rx
1) Observation
2) Radiotherapy
3) Surgery
RETINOBLASTOMA

From neuroectodermal cell - Retinoblasts.

1) H/c age of presentation - (2-3 yr)
   Commonest = 18 months

2) H/c mode of presentation - LEUCOCORIA
   (white eye reflex)
   Anamuritic Cat's eye reflex

3) 2nd H/c mode of presentation - STRABISMUS

4) Glaucoma

5) Pseudohypopyon → Tx cells in ant. chamber

6) Pseudo uveitis

7) Orbital cellulitis

[Diagram of exophytic Tx on retina and endophytic Tx]
PSEUDOGLIOMAS (D → G) 159

1) Congenital cataract - N/C cause of Leukocoria
2) Cyclitic membrane
3) Fungal endophthalmitis
4) Central chorioretinitis - Toxocariasis
5) Central coloboma - Sclera shine white a central part not formed
6) PHTPV
   - Persistent hyperplastic 1° vitreous
7) ROP
   - Retinopathy of prematurity
8) Coat’s Disease
9) Retinal Dysplasia
10) Central Retinal Detachment

Q. Differentiating Pt. Bet. RB & Pseudoglioma?
   Retinoblastoma → IOP ↑
   Pseudoglioma → ⊗

Q. Benign counterpart of RB → RETINOCYTOMA

Inv -

Q. 1st Inv → USG (G) scan
   2) CT Scan - for Intracranial extension
5) MRI - for Pinealomas → IOC

4) X-Ray - Rhesy view - optic foramen.

H/e mode of spread through optic n/v ≡ ASSAS

5) Estimation of enzymes in aqueous humour ↑↑ in RB

LDH (Lactose Dehydrogenase) PGI (Phospho gluc /Gomerase) NSE (neuron specific enolase)

PATHOLOGY 8-

Gross -

Necrosis → calcification γ

Microscopic -

Differential

1) Hohor - Wright
2) Flexner - Wintersteiner
3) FLEURETTES
GENETICS

1) QQ: M/c mutation = 13q

```
\[ \frac{p}{q} \rightarrow 14 \rightarrow RB \]
\[ + \]
\[ \text{Dysmorphic feature} \]
\[ + \]
\[ 13q \text{ syndrome} \]

(Tx extending outside 14)
```

2) Bilateral RB

= B/L RB + Pinealoma

**Knudsen's Two-Hit Hypothesis**

- Somatic + Somatic
- Sporadic Non-Hereditary (94%)
- Hereditary (6%)

- B/L
- Multicentric
- Associated with other non-ocular malignances

M/c → Osteosarcoma
STAGING

I. QUIESCENT

II. GLAUCOMATOUS

III. STAGE EXTRAOCULAR EXTENSION

IV. DISTANT METASTASIS

Rx -

1) Laser Photo coagulation can be used if $T_x \leq 3 \text{ mm in height}$

2) Cryotherapy

3) Ant lesions → Cryo

4) Central lesions → Laser
3) Radiotherapy

EBRT
(ex. Beam RT)

4) Thermoderapy
- thermal effect of device is used to damage tumour.

5) Chemotherapy
Neoadjuvant role → size of Tx

↓

Carboplatin

↓
Etoposide Vincristine

6) Surgery

Enucleation
(if intra-ocular)

Exenteration
SURGERIES TO REMOVE EYE

EXTRA NOTE

IRON DEPOSITION

Ferry's Line (at trabeculectomy bleb)

Stocken's Line

Hudson - stable line (Bet middle lower Y/3 rod)

Fleischer's Ring

ENUCLEATION

Enucleation = removal of eyeball
- max part of optic n/c
- 10mm → 15mm (part removed)
- 6-8 weeks

Put orbital implant

- Prosthetic eye

Website: http://mbbshelp.com
WhatsApp: http://mbbshelp.com/whatsapp
**EXENTERATION**

→ Removal of all orbital contents

* Indication:
  1. Tx
  2. Mucormycosis

percusseum is stripped

Lids are cut

↓

Grafting for cosmetic reasons

**EVISCERATION**

full excision

cut cornea at limbus

stich the remaining sclera

scoop out the contents of sclera

If sclera is also inflammed → remove max part of sclera • leave a free a sclera

↓

Full Excision Q

Indication - Panophthalmitis
Artificial eye → prosthesis

**Panophthalmitis & Endophthalmitis**

D/D - Endophthalmitis

Pan

Restricted ocular movement

Other c/f -
→ D/v
→ No fundal glow
→ GTAW pain.

ENDO

No restriction

Inflammation of inner coat of eye

Retina vitreous

Other features are some

Rx = Intravitreal

Antibiotics inj

- Ceftazidime → Gram-ve
- Vancomycin → Gram+ve
- Dexamethasone → very small dose to control inflammation

Antibiotics c/i Intravitreally

Gentamicin → Amikacin

Maculotoxic
Antifungal → Intravitreally Given

Amphotericin B  Vericonazole

BLOW-OUT #

Floor # due to Blunt Trauma

* Mechanism → Buckling effect

* C/F →

1) Periocular ecchymosis → BLACK EYE / PANDA EYE

RACCON EYE → B/L
seen # Base of Skull

2) 1 sensation of affected cheek
   6 Damage to infra-orbital n/v

3) Enophthalmos

4) Diplopia

5) Subcutaneous Emphysema
   (if medial wall broken)

* Inv:

1) X-Ray → Water's View / PNs

2) CT Scan → White opacity against Black Background = TEAR DROP SIGN
*Rx* - Antibiotics + Anti-inflammatory x 10 days

Enophthalmos

Deformities improve

→ No improvement in enophthalmos / Deformities

↑ M/s entrapment

↓ Surgery
LIDS

ANATOMY

Tarsal Plate

openings of meibomian glands

Grey Line

1. TRICHIASIS → misdirection of eyelashes

2. POLIOISIS → greying of eyelashes

3. MADA ROSIS → Loss of eyelash → CAUSE Chronic Blepharitis

" + eyebrows

CAUSES

Leprosy
Myxoedema

4. BLEPHARITIS-
Inflammation of lid margin

ANTERIOR

SQUAMOUS

Dandruff
Antibiotic +
Steroid
Lubricating E/D

ULCERATIVE

Ucers below the scale
(Staph. Infec.)

POSTERIOR

MEIBOMITIS
5) TYLOSIS -
   a) Thickening of Lid Margin

6) ECTROPION -
   Outward turning of Lid Margin

7) ENTROPION -
   Inward turning of Lid Margin

8) HORDEOLUM EXTERNUM / STYE

   ![Diagram of a stye]

   → Staphylococcal Infection of 1) Hair follicle of
   2) Gland of Zeu / 3) Gland of Moll

   Rx: 1) Hot Fomentation
   2) Epilation
   3) Oral Anti-Inflammatory
   4) Antibiotic Ointment

9) HORDEOLUM INTERNUM
   Acute Inflammation of Meibomian Gland
Case - Painful swelling on lid

Rx - Hot Fomentation
- Oral antibiotics
- Oral anti-inflammatory

10. CHALAZION -
- Chronic lipogranulomatous inflammation of meibomian glands
- Present as painless swelling

Rx - 1) Incision & curettage
   2) Intraleisional Inject of Tetramcinolone acetate

Q. Recurrent chalazion →
   - H/c Cause
     - Uncorrected mild refractive error

Q. H/c malignant Tm of lid = Basal Cell Carcinoma
   - H/c site = Upper Lid

Q. H/c malignant Tm of lid = Lower Lid
   - Inner canthus
**Ptosis**

Drooping of lid.

**Types**

- **Neurogenic**
  - IIIrd n/v palsy
  - Horner's syndrome
  - Synkinetic ptosis

- **Myogenic**
  - Marcus Gunn
    - Jaw-winking phenomenon
    - Aberrant connec' betw LPS & lateral pterygoid H/s
      - IIIrd n/v + 5th n/v
  - Myogenic
    - Congenital
      - Simple
        - Blepharophimosis syndrome
          - Ptosis
            - Narrow palpebral fissure
    - Acquired
      1) Myasthenia Gravis
      2) Lambert Eaton syndrome
      3) Ocular myopathies
4) Telecanthus (soft tissue
IPD - 

5) Epicanthus inversus
L, extrafold of skin on medial.
Canthus = Epicanthus.
When arise from lower lid, it is
called Inversus

Rx of Ptosis -

LPS RESECTION

\[ \begin{align*}
\text{Func. of LPS} \\
\text{Upper Lid Excision (ULE)}
\end{align*} \]

MULLERS RESECTION

\[ \begin{align*}
\text{Fasanella-Servat Operation}
\end{align*} \]

SLING OPERATION

Upper lid connected to frontalis m/s
Fascia Lata
Ideal material

Distance from lowermost to uppermost point of lid after blocking Frontalis m/s

\[ N \geq 12 \text{ mm} \]

Hem. Req. for relocation

\[ L \geq 4-5 \text{ mm} \]

SKIN Route
Conjunctival Route

Everbusch operation
Blaskovics
OPTICS & SQUINT

PURKINJE IMAGES

Images formed on refracting surface of eye

Ⅰ Ant. surface of cornea

Ⅱ Post. surface of cornea

Ⅲ Ant. surface of lens

Ⅳ Post. surface of lens

Q. Images absent in aphakia = Ⅲ Ⅳ

Q. c Image in Inverted = Ⅳ

Q. Pseudophakia ⇒ all 4 Purkinje images are present

VISUAL ANGLES

α angle

Optic axis + visual axis at nodal point

K angle

Pupillary line + visual axis at cornea

ASSM 87

[The angular spacing between bars of chart in Snellen's chart in 1 min for 6/6 letter largest letter when viewed from a distance of 6 m, subtend angle of 50 minutes in eye, bars of letter subtend 10 minutes]
REFRACTIVE ERRORS

HYPERMETROPIA
1. Total Refractive Power is less than Required
2. Small eye
3. Light rays focused behind Retina

MYOPIA
1. Total Refractive Power is more than Required
2. Large eyes
3. Light rays focused in front
**ASTIGMATISM**

Difference of refractive power between 2 principal axis.

**ANISOMETROPIA**

Difference of refractive power between 2 eyes of >2.5 D.

**ANISEKONIA**

Difference of image size between 2 eyes. 5% is physiological, this helps the in depth perception. But anything more than that is anisekonia. It is measured by EIKONOMETRE

Rx = ISEKONIC GLASSES
CLASSIFICATION OF ASTIGMATISM

I\(^{7}\)

+ \\
0

- \\
+

Simple HYPERMETROPIC

SIMPLE MYOPIC

- \\
+

- \\
+

COMPOUND MYOPIC

COMPOUND HYPERMETROPIC

+ \\
+

- \\
+

MIXED ASTIGMATISM.

\(\text{II} \Rightarrow \text{According to Axis}\)

\(90^\circ\)

\(180^\circ\)

OBLIQUE ASTIGMATISM

BI OBLIQUE ASTIGMATISM
### Regular Astigmatism

- **+2**
- **+2**
- **+2**

### Irregular Astigmatism

- **+2**
- **-1**
- **0**
- **+3**

#### WITH THE RULE

- Vertical more curved

#### AGAINST THE RULE

- Horizontal more curved

### Myopia

- **-2**
- **-1**

- Means eye is myopic
- Vertical more curved
- Hence **+** the Rule

### Hypermetropia

- **+2**
- **+1**

- Means eye is hypermetropic
- Vertical less curved
- Against the Rule
\[ +2 \rightarrow \text{Hypermetropic} \]
\[ -2 \rightarrow \text{Myopic} \]

\[ \text{vertical lens wavy} \]
\[ \text{against the rule} \]

** Aphakia **

** High Hypermetropia. **

- **Rx:**
  - Spectacles
  - Contact Lens
  - [IOL]
  - Rx for Q

**Q. Choice of Site of IOL Implantation:**
- Capsular Bag > Post-Chamber

**Q. Only Mydriatic & No Cycloplegia Action:**
- Phenylephrine

**Q. Choice of Cycloplegia in Children:**
- Atropine Ointment (1%)  
  TDS x 3 days
  - Check for Atropine Fever
  - Stop the drug
SPECTS \rightarrow +10 \rightarrow +14 D

DISADVANTAGE -

1. Magnification \sim 30 \%
   
   We can't correct unioocular aphakia \& specta due to high aniseikonia leading to diplopia

2. High spherical aberration
   
   Spherical aberration means repres from periphery is more than centres of lens.

   \downarrow

   So, everything is PARABOLA

   \downarrow

   PIN-CUSHION EFFECT

3. High Prismatic Effect
   
   It leads to ROVING-RING SCOTOMA

   \downarrow

   Q. JACK IN BOX PHENOMENON
   
   Things nearby go out of vision due to narrow field of vision.
RETINAL SCOPY

CORRECTION FACTOR

DISTANCE

1 metre
1

-1

2/3

1

-1.5

CYCLOPLEGIC

ATROPINE

1

OTHER

0.5

Add correction factor to reading of retinoscopy

Eg.

\[ \frac{+3}{+4} \]

Dist. \( \frac{2}{3} \) rd

Cycloplegic other than atropine

\[ \frac{+3}{+4} - 2 \quad - \quad \frac{-1}{-2} \]

At 1m.

Movement Significance

With \( \rightarrow \) Hypermetropia/Senility \( \leftrightarrow M < 1 \)

Against \( \rightarrow \) Myopia \( \geq 1 \)

No movement \( \rightarrow \) Myopia \( = 1 \)
eq. \[ \frac{+1}{+2} \]

Prescription

+1D spherical + 1D cycle cylinder at 90°.

+2D spherical - 1D cylinder at 180°.

[Spherical good glasses give power to both axis.]

[So, by adding cylinder, we neutralise power.]

\[ \frac{+3}{+3} \] \[ \Rightarrow +3 \text{ D spherical} \]

\[ \frac{+1}{0} \] \[ \Rightarrow +1 \text{ D cycle cylinder at 180°} \]

-1D cycle cylinder at 90°.

\[ \frac{-1}{-1} \] \[ \Rightarrow -1 \text{ D spherical} \]

\[ \frac{+1}{+2} \] \[ \Rightarrow +1 \text{D spherical} + 1 \text{D cylinder at 90°.} \]

\[ \frac{+1}{+2} \] \[ \Rightarrow +2 \text{D spherical} - 1 \text{D cylinder at 180°.} \]
-5D spherical - 1D cylinder at 180°
-4D spherical + 1D cylinder at 90°.

**CONTACT LENS**

| SOFT | SEMI-SOFT or RIGID GAS PERMEABLE (RGP) |

1. Hydroxyethyl Methacrylate (HEMA)
2. Silicone
3. Fluoro-silicone

M/C infection after contact lens = Pseudomonas

Soft contact lens used are more prone to - Acanthamoeba Keratitis

**TORIC LENS** - Contact lens to cylindrical correct for astigmatism

| SOFT | SEMI-SOFT |

Q: Which type of CL lens used in Keratoconus - RGP

![Diagram of eyes with CLs]
Higher the water content 
Better is O₂ transm. ability

**AMBLYOPIA**

Partial loss of vision no organic cause also called LAZY EYE.

Vision < 6/6

Pathology lies in LGB

c/f-

1) Visual Acuity < 6/6

2) ↓ Sed contrast sensitivity

Q 3) Sunglass effect - Brightness is less in effected eye

Q 4) Crowding phenomenon skipping of nearby letters

A B CD

RxOC - QQ

1) Occlusion of ☯ eye (4-6 hours/day)

Patching Atropine

PENALISATION
BINOCULAR SINGLE VISION/FUNCTION

Difficulty of Brain to fuse 2 Retinal Images as 1

Q. Foveal Reflex formation = 5-6 months
Q. BSV = 5-6 years
Q. Grades of BSV

Simultaneous Perception
Fusion
Stereopsis
[DEPTH PERCEPTION]

VISUAL PERCEPTION

LIGHT SENSE FORM SENSE CONTRAST SENSE COLOUR SENSE.

Q. visual acuity is a measure of
Form sense

DIPLOPIA

Double Vision.

1. HORIZONTAL / VERTICAL / TORSIONAL

2. UNILOCULAR / BINOCULAR

H/ce Subluxation of Lens
H/ce Paralytic Squint
UNILOCULAR

CAUSES
1) Incipient / Intumescent Cataract
2) Polyuria
3) 

CROSSED & UNCROSSED

UNCROSSED
False Image toward squinted eye
Seen in Convergent squint / Esotropia
↑
Lateral Rectus Palsy
↓
Convergent squint

CROSSED
False Image opposite squinted eye
Seen in Divergent squint / Exotropia

BINOCULAR

CAUSE
1) Thyroid ophthalmopathy
2) Blow out #
ACTION OF MUSCLES

<table>
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<tr>
<th>Horizontal</th>
<th>Vertical</th>
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<tbody>
<tr>
<td>LR - Abduction</td>
<td>IS</td>
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<tr>
<td>MR - Adduction</td>
<td>RAD</td>
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Superiors are Recti are Adductors

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<tbody>
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<td>1st Action Elevation Depression Intortion Extortion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd Action Intortion Extortions Depression Elevation</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3rd Action Adduc&quot; Adduc&quot; AB du&quot; ABduc&quot;</td>
<td></td>
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</tbody>
</table>

Yolk M/s

Contralateral Synergists

<table>
<thead>
<tr>
<th>Q.</th>
<th>Dextro Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>@ Inf Rectus</td>
<td></td>
</tr>
</tbody>
</table>

Yolk M/s → @ Sup. Oblique

In outward deviated eye
Action of elevation = Depression is of Recti.

@ Sup. Rectus

@ Inf Oblique
Levo depression

- L Inf Rectus
- R Sup oblique

HERING's LAW

There is equal innervation in yolk H/s

SHERINGTON's LAW

Equal (Reciprocal innervation in against) 
antagonist H/s

↑ − − ↓  
Same, equal + Reciprocal
STRABISMUS
Misalignment of eyeball.

LATENT SQUINT (PHORIAS)
Squint Δ by cover/ uncover test

ESOPHORIA  EXOPHORIA  HYPERPHORIA

CONCOMITANT
1° Deviation = 2° Deviation
Deviation of squinted eye in 1° Deviation
Deviation of O eye behind the cover in 2° Deviation

MANIFEST SQUINT (TROPIAS)

INCONCOMITANT or PARALYTIC
2° Deviation > 1° Deviation
due to Hering's Law

CONCOMITANT SQUINT

ESOTROPIA  EXOTROPIA  ISOTROPIA
**ESOTROPIA**

**INFANTILE**  \(\downarrow\)  **ACCOMODATIVE**  \(\downarrow\)  **NON-ACCOMODATIVE**

Due to activation of accommodation reflex

**INFANTILE ESOTROPIA**
1. Manifests at 6 months
2. Angle of deviation is large ~ 30 prism Dioptr
3. Latent Nystagmus manifested by cover-uncover test
4. Refractive error is \(N\) for age

**ACCOMODATIVE ESOTROPIA** [Due to stimulation of accomodation]

**REFRACTIVE**
- High Hypermetropia
  - That is uncorrected
  - Exerts excessive accommodation to compensate
  - Eyes converge

**NON-REFRACTIVE**
- High \(AC\) ratio \(\frac{A}{A}\)
  - Refraction \(N\)
  - No deviation for Distance

**MIXED TYPE**
- Hypermetropia +
- High \(AC\) ratio \(\frac{A}{A}\)
NON - ACCOMODATIVE

STRESS INDUCED

SENSORY DEPRIVATION IN CHILDREN

DIVERGENCE INSUFFICIENCY SX INCORRECTION

EXOTROPIA

CONGENITAL

1°

2°

CONSEQUITIVE

SX OVERCORRECTION OF ECTROPIA

VERY RARE

FROM 2 YEAR OF AGE

SENSORY DEPRIVATION OF IN ADULTS

CONSTANT INTERMITTENT

PARALYTIC SQUINT

17 Diplopia

27 Confusion

37 Deviation

2° × 1° [due to Hering's Law]

47 Restricted ocular movement

57 Compensatory head posture.
IVth N/V Palsy  [Sup. oblique Paralysed]

Features -
1. Hypertropia
2. Exycloduction
3. Vertical Diplopia worst on looking down.
4. Limited depression in adduc.
5. Compensatory head posture → Head tilt on opposite side Q.

Bielchowsky's Sign Q

Q  Left Hypertropia

Tilt the head toward Q shoulder

To look straight eye has to intort,

Superior are intorters

If so, palsy;
there is over working of SR

↑ in Hypertropia

Hence, so palsy confirmed.
VIth N/V Palsy [LR-6]

1> Convergent Esotropia
2> Defective Adduction of affected side
3> Horizontal Diplopia - worst in affected side
4> Face turned towards Paralytic Side.

MANAGEMENT OF SQUINT

1> HIRSCHBERG TEST:
   1 mm of Deviation of Light Reflex = 7°
   ↓
   15 DD

   Pupillary Border = 18° - 20°
   At Limbus = 45°

2> KRIMSKY'S TEST/ PRISM BAR TEST - Measure exact amount of squint in prism diopter

3> COVER- UNCOVER TEST

4> ALTERNATE COVER TEST

PARALYTIC SQUINT

1. Wait for 5-6 months to improve
   ↓ If doesn't improve
   Squint Sx
   [Underracting → Resection]
   [Overacting → Recession]
CONCOMITANT SQUINT-

1. Refraction

2. Check for amblyopia
   - Occlusion (if needed)
   - Orthoptics exercises (if needed)

[Strengthening the convergence]
   - If nothing works

Squint sx

REFRACTIVE SURGERIES

INCISIONAL

1. Radial Keratotomy

Radial cuts @ 2 diameters at periphery

Myopic - Best results are, 5D

Centre flattening is to be done
27. **ARCUATE KERATOMILEUSIS** / T-CUTS

Used to treat astigmatism.

1° Cut on steeper axis.

That axis flattens on healing.

Compensatory curving on opposite axis.

Reversal astigmatism by "COUPLING EFFECT".

If cataract:

Astigmatism temporarily against the rule.

LAMELLAR/LASER ASSISTED

**KERATOMILEUSIS** - Changing corneal curvature.

Laser used is EXCIMER (Argon F)

\[ \lambda = 193 \text{ nm} \]

**PRE-REQUISITES**:

1. Pachymetry reading
2. Age > 18 yrs
3. Stable refractive error since last 6 months
4. Ant. Seg
5. Fundus
WORK-UP

1) Refraction
2) Pachymetry
3) Corneal Topography

PRK [PHOTO REFRACTIVE KERATECTOMY]
- Remove the epithelium (painful)
- Apply Laser [dealing with superficial stroma]
- Bandage

DISADVANTAGE
- Painful
- Long rehabilitation time

LASIK [LASER IN SITU KERATOMILEUSIS]
- Raise a flap $\rightarrow$ by microkeratome
  $\downarrow$
- Apply LASER [Deeper stroma]
- Put the flap back

EPI-LASIK/LASEK [LASER SUB-EPITHELIAL KERATOMILEUSIS]
- Raising epithelial flap
  $\downarrow$
- Apply Laser [Super. stroma]
- Put the flap back

Done for nebular opacity
1) Dry Eye
2) Regression of No.
3) Sand of Sahara Syndrome
   infiltration of inflammatory cells b/w bed & flap.
4) Epithelial ingrowth Bet" Bed & Flap
5) Inter" bet" Bed & Flap
6) Feltrow ingrowth Bet" Bed & Flap

NEWER PROCEDURE

1) SMILE Procedure – Femtolasers
   [Small Incision Lenticule Extraction]

   Procedure – Focus Femtolasers on stroma
   Cut the lenticule
   Remove the lenticule through a small incision

2) CLEAR LENS EXTRACTION –

   Non-cataractous
   To Rx – High Myopia

   Retinal Detachment may occur if post-capsule
37 PHAKIK IOL IMPLANTATION-

Cataract may develop if IOL touches lens.

47 CONDUCTIVE KERATOPLASTY
Done in Presbyopia.

Ideal Pt-
L Emmetropic N
2-2.5 D

Based on Monocular Vision
So, untreated eye used for Far
treated eye used for near.
RETINA

Most SENSITIVE → Foveola

THINNEST → ORRA SERRATA (0.1mm)

LAYERS OF RETINA

Choroid

Bruch's Membrane

[RPE]

Sub retinal space

[Rod/cons]

[Ext. Limiting membrane]

[Outer Nuclear]

[Outer Plexiform]

[Inner Nuclear]

[Inner Plexiform]

Neurosensory Retina

FLAME H:ge / Superficial

[ganglion]

[N/V fibre layer]

[Int. Limiting Membrane]
HARD EXUDATES ↓ [Lipids]

SOFT EXUDATES ↓ [Axonal Debris]

*SEQUENCE OF EVENTS IN RETINA [RETINITIS PROLIFERANS]*

Hypoxia ↓

↑ ↑ ↑ Capillary Permeability ↓

Leakage ↓

↑ Edema, Exudate, Hoge

↑ ↑ ↑ Hypoxia ↓

Release of Chemotactic Factors ↓

Neovascularisation ← NVD - at Disc

NVE → anywhere else

↑ ↑ ↑ Hypoxia ↓

Neovascular Glaucoma

Neovascular Glaucoma

Vitreous Hoge

Traditional RD

+ Role of Pan Retinal Photocoagulation —

Convert Hypoxia to Anoxia
CHEMOTACTIC FACTORS

1) VEGF (VASCULAR ENDOTHELIAL GROWTH FACTOR)
2) PDGF (PLATELET DERIVED)
3) IGF (INSULIN LIKE)
4) bFGF (BASIC FIBROBLAST)
5) TNF-α (TUMOUR NECROSIS FACTOR)
6) TGF α/β (TRANSFORMING GROWTH FACTOR)

Q. Interferons are not related to angiogenesis → They are related to inflammation.

INVESTIGATION

17) FUNDUS FLOURESCENCE ANGIOGRAPHY (FFA)

Q. Inject dye in Antecubital Vein

\[ \text{FFA} \rightarrow \text{HYPER FLOURESCENCE} \]

\[ \text{HYPER FLOURESCENCE} \rightarrow \begin{cases} \text{BLOCKED} & \text{Hoge Exudate} \\ \text{CAPILLARY BLOCK} & \text{capillary non-perfusion (CNP)} \\ \text{Leakage} & \text{RPE Defects} \end{cases} \]
Q. **ICG ANGIOGRAPHY**

[Indocyanine Green] — 98% bound to Plasma protein.

Specially used to study **choroid**.

Q. ICG → particularly used for occult choroidal neovascularisation.

**DIABETIC RETINOPATHY**

Pathogenesis — Retinitis Proliferans.

Pathological Changes at Capillary —

- Pericyte
- Endothelium

1. Loss of Pericytes

C/F -

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- **Background (BDR)**
  - Harlequin feature
  - Micro-anerysm
  - Inner nuclear layer

- **Pre-proliferative**
  - BDR +

- **Proliferative**
**PRE-PROLIFERATIVE**

BDR

1. T T Cotton - Wool Spots
2. Large Blot Huge [venous Infarcts]
3. Looping & Bleeding of capillary

---

47 IRMA (Intra-Retinal Microvascular Anomaly)

capillary shunt vessel

**PROLIFERATIVE**

Pre-proliferative

Neovascularization

\[ \xrightarrow{WVD} \]

\[ \xleftarrow{NVE} \]

\[ \xrightarrow{NPDR (non-proliferative)} \]

\[ \xrightarrow{Mild} \]

Microaneurysm

\[ \xrightarrow{Moderate} \]

BDR

\[ \xrightarrow{Severe} \]

Pre-proliferative

\[ \xrightarrow{PDR (Proliferative)} \]
Rx - 1) Glycemic Control
     2)

NPDR
   ↓
check for CSMD
[clinically significant macular edema]
   ↓
edema
  ↓
Hard exudates

<500 μm from centre of fovea]
  ↓
FFA

PDR
   ↓
PRP Laser
avoid macular area

Q: Start Laser from inferior quadrant
    Q: 2000-2500 Burns are given

Focal Photocoagulation

Grid Photocoagulation
[2 hours along blood vessel
   Few burns on temporal side]

Q: Most imp factor for occurrence of Retinopathy
   in a diabetic patient - DURATION (25-30yr)

Q: 2nd most imp factor - GYCEMIC CONTROL

Q: 1st Fundus exam when?
   Type I - After 5 years
   Type II - Immediately
Q. Frequency of follow-up

I → II
1 yearly follow-up

Q. Frequency of follow-up in G
3 monthly follow-up

N artery = 2/3

HTN RETINOPATHY
change in retina due to long-standing HTN
KEITH- WAGNER GRADING

I Generalised attenuation of artery

II I + Focal Spasm

III II + Ho'ge + Exudates

IV III + Papilloedema

Q. Pt. of PIH presents with Hypertensive Retinopathy
(Induced HTN)
**Central Retinal Vein Occlusion (CRVO)**

**Risk Factors**

1. HTN
2. Small eye (Hypermetropia) → Small Lamina cribrosa
3. ↑ IOP
   → Blood viscosity Syndrome → Polycythemia/Leukemia

**Pathogenesis**

- **Non-Ischaemic**
  - [Only Leakage]
  - C/E:
    1. Visual Acuity ↓
    2. Cotton wool spot
    3. Pupillary RxN - (N)
    4. O/E
      - Multiple flame shaped H.ğe

- **Ischaemic**
  - [Retinitis Proliferons]
  - VA ↓↓
  - CWS ↑↑
  - RAPD
  - SPLASHED SAUCE APPEARANCE
  - Flame shaped H.ğe
  - 100 DAY GLAUCOMA (O)
  - or 90 DAY
INVESTIGATION-  

\[ \text{FFA} \]

\[ \text{Non-Ischaemic} \quad \text{Ischaemic} \]

\[ \downarrow \quad \downarrow \]

\[ \text{Leakages} \quad \text{Leak + Block (CRP)} \]

RX-

\[ \text{Non-ISCHEMIC} \]

\[ \downarrow \]

\[ \text{IVTA} \]

(Intravitreal Thiamicindone Acetate)

Monitor IOP

CENTRAL RETINAL ARTERY OCCLUSION (CRAO)

\[ \Rightarrow \text{Embolism occurs} \]

A) 1) Heart Disease

\[ 2) \text{Carotid artery Disease} \]

B) Mucormycosis Q

\[ \text{C/E-} \]

1) Sudden, painless loss of vision

2) Severe edema \rightarrow \text{White Retina}

3) Marked attenuation of artery \rightarrow \text{Thread like arteries}

4) Interrupted blood column in brain

\[ \text{Cattle Track appearance of blood flow (veins)} \]

\[ \text{Cherry Red Spot + Hollenhorst plaque are seen in both CRAO + BRAO. But CRAO > BRAO.} \]
5) Cherry red spot

D/D of Cherry Red Spot

1. Berlín’s oedema - G Aims
2. CRAO -
3. Depositions -
   a. Tay-Sach’s
   b. Neiman Pick
   c. Gaucher’s
4. GM-1 Gangliosidosis etc all except

GM1 Gangliosidosis

I

II

×

Cherry red spot

Q: Pt. suffered from CRAO but not blind?

Tubular vision / Tunnel vision.

Cilioretinal artery

Branch of short post. ciliarey artery

Rx -

AIM of Rx → Dislodge to embol

Sudden rise of IOP

IV. Acetazolamide → Ocular Massage
CAUSES OF TUNNEL VISION

1. B/L OCCIPITAL LOBE LESION
2. CRAO vs. CILIARETINAL ARTERY
3. Late Stage of RETINITIS PIGMENTOSA
4. QUININE TOXICITY

RETINITIS PIGMENTOSA

1. Dystrophy of Rods & Cones (Photoreceptor Cell)
   - Primarily affected

2. Genetic Disease & can be
   - HEREDITARY
   - NON-HEREDITARY / SPORADIC
     - AD
     - AR
     - X-Linked
     - Recessive

3. C/F - Nyctalopia

4. O/E -
   - PALE WAXY DISC
   - ATTENUATED ARTERIES
   - TRIAD
   - PIGMENTARY DISTURBANCE
     - BONY SPICULES

5. INV
   a. Perimetry → 1st involves mid periphery
      - RING SCOTOMA
      - Late Stage TUNNEL VISION
b) **ERG (Electro Retino Gram)**

It tells the activity of outer 2 layer of Retina

- Rods, cones → outer nuclear
  - Bipolar cells + Muller cells

\[
\begin{align*}
Q. & \\
a & = \text{Rods + cones} \\
b & = \text{bipolar + muller cell} \\
c & = \text{RPE.}
\end{align*}
\]

In Retinitis Pigmentosa → ↓ amplitude of a < b waves

**ATYPICAL RP**

1) **SECTORAL RP**
   - Better prognosis than a typical case

2) **PERICENTRIC RP / INVERSE RP**
   - Start from centre

3) **RP SINE PIGMENTO**
   - No bony spicule

4) **RP ALBESCENS**
   - Salt & Pepper Fundus
   - White spots
SYSTEMIC ASSOCIATION

1. G. USHERS SYNDROME - MLC
   RP + Deafness
   Rx = no effective Rx
   Vit A for Mod.
   Vit E as an anti-oxidant

2. BEST DISEASE / BEST VITELLYFORM DYSTROPHY
   - AD
   - Childhood disease
   - Dystrophy of RPE
   - O/E = Macula - Egg Yolk Appearance
     Q. EOG - Ab

ELECTRO·OCULO·GRAM

Measures standing potential of eye.

Q. ARDEN RATIO = \frac{\text{Light Peak}}{\text{Dark trough}} > 1.85. (N)

In BEST DISEASE = < 0.15
CENTRAL SEROUS RETINOPATHY (CSR)²

PATHOGENESIS

Weakening of Na⁺/K⁺ ATPase Pump of central Retinal Pigment epithelium

↓

Collection of fluid in Sub-Retinal Space

↓

Causing shallow Retinal Detachment

↓

CSR

C/F -

Q1: young o²
Q2: self-limiting

3: Disturbance of vision

Metamorphopsia (distortion of image) Microopia (small)

OE

Ring Reflex: Ring of light encircling detached retina
5. Inv = ① FFA QA
   Ink-Blot appearance
   Smoke-stack appearance

II. Amsler- Grid Test
   - Piece of paper with a central dot
   - Pt. can tell if any disturbance of vision.

6. Rx - not required
   steroid: c/t → aggravate CSR
   Cystoid Macular Oedema

   Causes
   I. Inflammatory -
      all causes of Intermediate & Posterior Uveitis
   II. Vascular Cause -
   III. Degenerative
       Retinitis Pigmentosa
   IV. Irvine Gass Syndrome
       CME after cataract sx as a post-op complication
C/E-
1) Diminution of Vision
2) O/E → Dull or absent foveal Reflex
3) Inv-
4) FFA

FLOWER-PETAL PATTERN

outer zone form in layer is Radially present → HENLE's Layer

So, leakage is radial

Rx-
1) Oral Acetazolamide *
2) Topical NSAIDS -
   Indomethacin.

PUTSCHER'S RETINOPATHY

ETIOLOGY
Q. 1) Pancreatitis → acute
    Other causes -
    Head Trauma
    Chest

PATHO
  Arterial Fat Embolism

multiple cotton wool spot
BULL'S EYE MACULOPATHY

Alternate areas of hyperpigmentation

ETIO-
1. Chloroquine
2. Hydroxychloroquine
3. Cone Dystrophy
4. Batten Mayo Syndrome / Batten Disease

Cerebro-macular Degeneration

PATHOLOGICAL MYOPIA

Any Myopia = Fundus Changes

1. Rhegmatogenous RD
2. Posterior staphyloma
3. Annular crescent

4. FOSSER / FUSCH SPOTS clumping in macula
5. TIC-ROID FUNDUS when choroidal blood vessels are prominent due to thin uvea
6. LACQUER CRACKS Break in Bruch's membrane due to overstretching
RETINAL DETACHMENT

Separation of RPE from Neurosensory Retina

**TYPES**

1. TRD (Tractional RD)
2. RRD (Rhegmatogenous RD)
3. ERD (Exudative RD)

---

**RHEGMATOGENOUS RD**

- **HOLE**
  - After Degeneration
  - LATTICE DEG.
  - SNAIL-TRACK DEG.

- **TEAR**
  - Traction
    - H/c - Post. Vitreous Detachment

---

C/F:

1. D/v
2. Visual field Defects
3. Floaters (opacities in vitreous cavity
4. Photopsia (flash of light seen by pt)

- due to traction on Rod & Cones
57 Grey Reflex

Look grey due to detachment

Rx -
1) TRD → PRP
2) Sx

Erd → Rx the cause

RRD → Close the break

Retinopathy of Prematurity (ROP)

Patho
Free Radical Injury to developing blood vessel

Hypoxia

Retinitis Proliferans

Cryos + Scleral Buckling
STAGE 1 - Demarcation Line

STAGE 2 - Ridge formation

STAGE 3 - Neovascularisation

STAGE 4 - Subtotal RD

STAGE 5 - Total RD

RX OF ROP -

Q. Laser Photo - coagulation of Hypoxia Pts.

PROPHYLAXIS -

17 Vit E Therapy

Q. What factor is more imp for occurrence of ROP?

⇒ Prematurity

Q. Ideal time of screening for ROP?

Add 4 weeks to Postnatal age (31-33 wks) Later.

THRESHOLD RETINOPATHY - Other name of ROP.

CRITERIA -

<table>
<thead>
<tr>
<th>STAGE</th>
<th>ZONE</th>
<th>EXTENT</th>
<th>PLUS DISEASE</th>
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<tbody>
<tr>
<td>III + Above</td>
<td>1,2</td>
<td>5 contiguous or 8 non-contiguous 8 clock hours</td>
<td>Tortuosity of artery &amp; Vein</td>
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</tbody>
</table>
AGE RELATED MACULAR DEGENERATION (ARMD)

- Choroidal Disease
- Degenerative changes at macula in old age
  - Irreversible loss of vision

\[
\frac{\text{Dry}}{\text{Wet}} \quad \frac{(80-85\%)}{(Exudative)}
\]

1. Drusen

2. Geographic atrophy
   - No effective Rx

1. RPE Detachment
   - 

2. Choroidal/Subretinal neovascularization

Rx

\[
\text{Subfoveal} \quad \text{Juxtapfoveal} \quad \text{Extrafoveal}
\]

Below
Beside
Away

1. Avastin
2. Bevacizumab
3. Ranibizumab
4. Lucentis

\text{Anti-VEGF}

\text{Laser photocoagulation}
Q 2. Photo dynamic therapy

\[ \text{Verteporten} \uparrow \]
\[ \text{Diode } y \]

\{ Hypopigmentation or whitening of the area occurs immediately after PDT \}

Q 3. TPT (Trans-Pupillary Thermotherapy)

Thermal effect is used to damage the membrane

\[ \text{VITREOUS} \]

\[ \text{Hyaloid Tissue} \]
\[ \text{(formed during embryonic life)} \]

\[ \text{Hyaluronic Acid} \]
\[ \text{Zonules of Zinn/Suspensory Ligaments} \]
\[ \text{Type II collagen} \]

\[ \text{MESODERM} \]

\[ \text{NEURO-ECTODERM} \]

Q. Strongest attachment to retina

6. At vitreous base ('ovea serrata')

Q. C is more in vitreous?

Ascorbate

\[ V : P = 9 : 1 \]
FLOATERS
*particles in vitreous*

1) Inflammatory cell
2) Pigments
3) Hæmic clots
4) Synchisis Sceintillans
   - Cholesterol Bodies
5) Asteroid Bodies
   - asteroid hyalosis
   
   Q. Disease of old age
   1) O
   2) Be VA N
   3) Ca + Lipids
   4) A/ DM, HTN, high cholesterol,
   5) Hypermetropia
   6) Not associated to myopia

6) MUSCLE VOLITANTES-
Remnants of Hyaloid Tissue

- Muscae Volitante
- Bergmeister Papilla
- Post. PHPV
- Hyaloid Tissue
- Hitten dot
- Ant PHPV
Ant. PHPV $\Rightarrow$ Better Prog than Post. PHPV. 

Philippines

Associated with Microphthalmos

No calcification
COMMUNITY OPTHALMOLOGY

Q. M/CC of Blindness in India = CATARACT
Q. M/CC of Preventable Blindness = CATARACT
Q. M/CC of childhood Blindness in India Vit A Def
Q. 2nd M/CC of Blindness = Refractive Error (RE)
Q. M/CC of ocular Morbidity = RE
Q. M/CC of Blindness in world = Cataract
Q. M/CC of Blindness in developed countries = Glaucoma & ARMD

Q. Be Define Blindness -> WHO NPCB Legal

Best corrected visual acuity in better eye < 3/60 (BCVA)
or
visual field (better eye)

Q. BCVA < 6/60 NPCB Defn

< Better eye

Q. Prevalence of Blindness in India = 0.56%
(>50yr = 1.1%)
Q. Incidence of cataract in India is 62.6%.

Q. School screening programme

School

Teacher

VISION - 2020

Ophthalmologist : Population

1 : 50,000

Q.

2nd service centre : Population

1 : 5 lakh