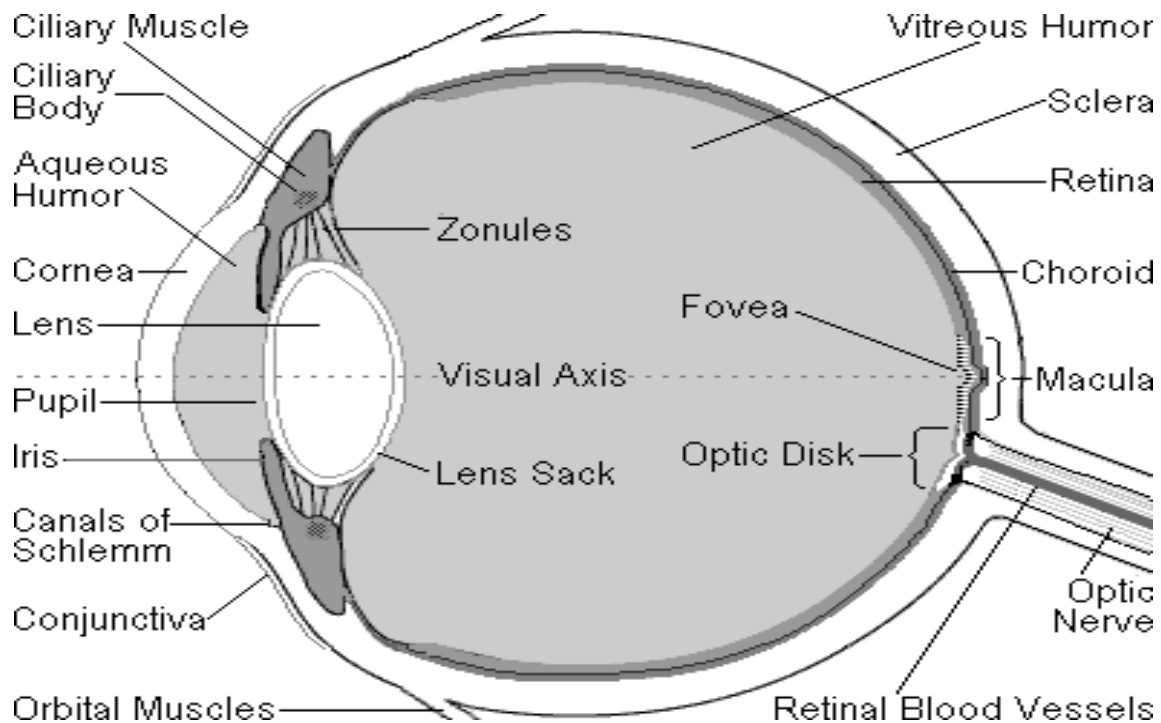


EMBRYOLOGY**A) SURFACE ECTODERM:**

- Crystalline lens
- Epithelium of cornea
- Epithelium of conjunctiva
- lacrimal gland
- epithelial lining of lacrimal apparatus
- Skin of eyelids and its derivatives i.e. cilia, tarsal glands

B) NEUROECTODERM:

- Retina with its pigment epithelium
- optic nerve
- Epithelial layers of ciliary body
- Epith. Layers of iris
- sphincter & dilator pupillae muscles in iris
- secondary / definitive vitreous
- ciliary zonules

C) NEURAL CREST CELLS

- Blood vessels of choroid, iris, ciliary vessels, central retinal artery
- Primary vitreous
- Stroma of cornea- substantia propria, Descemets memb & endothelium
- Stroma of iris
- Ciliary muscle

D) MESODERM

- Sclera
- EOM
- Connective tissue of orbit
- Connective tissue of lower eyelid
- Orbital walls

- Newborns are generally Hypermetropes of around 2 to 3 D
- Macula differentiates at around 4 to 6 months after birth
- Eyeball attains adult size by 8 yrs
- Temporal periphery of retina – complete vascularization by 1 month of birth.

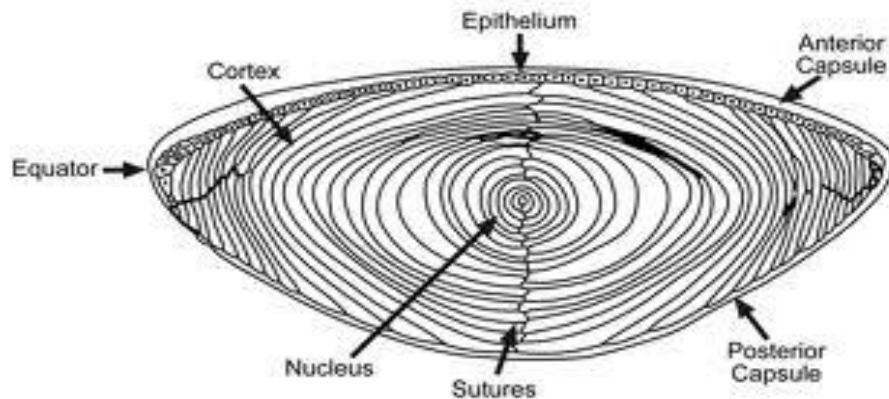
LENS & CATARACT

LENS:

ANATOMY

- It is Biconvex
- Diameter → 9-10 mm
- Power 18-20 D
- Refractive index-1.39
- 2 surfaces Ant & Post → Meet at Equator; Post surface more Convex than ant Surface
- Avascular,
- No Nerve Supply.

STRUCTURE OF LENS:



- **Capsule :**
 - Transparent, highly elastic.
 - **Thickest Basement membrane of body,**
 - anterior capsule 3 times thicker than post. capsule;-
 - Post pole **thinnest.**
- Epithelium → Single layer of cubical cells under ant capsule. No corresponding post epithelium
- Cement Substance → Glues Lens Fibers
- 2 Y shaped sutures (120°) → Lens Fibers meet here.
 - Ant Y → Vertical, Post Y → Inverted
- Lens Fibres → Has Cortical Fibres and Lens Nucleus
- **Zonule of Zinn :**
 - Suspensory ligaments that suspend lens from ciliary Body.
 - They are attached to ciliary processes of pars plicata & posteriorly to ant. aspect of pars plana
 - Have role in Accommodation → Ciliary Muscle contracts → Zonules Relax → Lens more convex (↑in Lens power) → Accommodation (Near object better viewed)

DEVELOPMENT -

Develops from **surface ectoderm**

- Embryonic Nucleus :upto 6-12 wks of embryonic life
- Fetal Nucleus - Has 2 Y shaped sutures :3-8 M of Foetal life, secondary Lens Fibers
- Infantile Nucleus :Last month of IU life till puberty

Adult Nucleus :by 25 years

CHEMICAL COMPOSITION OF LENS

- 66% H₂O 33% protein
- Lens proteins-85% are the soluble crystallin protein. Remainder are insoluble (albuminoid).
- Vitreous is especially rich in hyaluronic acid that acts as 'shock absorber' of the eye.

PHYSIOLOGY:

- 80% glucose is metabolized anaerobically.
- Sorbitol Pathways --- Important in production of cataract in a diabetic patient.
- Lens derives its nutrition from **Aqueous Humor**

Remember :

- Thinnest part of the lens capsule is at posterior pole (4u) and thickest near ant equator (14u)
- Lens in fetal life is spherical.
- Posterior surface more curved than anterior.

CATARACT:**Main Antioxidants of lens:-**

- *Vitamin C,*
- *Vit-E,*
- *Catalase^Q.*
- Beta carotenes (*Vitamin A less important*),
- Glutathione

DEVELOPMENTAL CATARACT

- **Punctate Cataract**→ Multiple small dot like opacities scattered all over lens →Blue dot cataract / cataracta coerulea. When crowded in Y sutures in lens nucle
- us→ Sutura cataract
- Fusiform Cataract/ Coralliform → Spindle shaped opacities
- Embryonal Nuclear Cataract → (Cataracta centralis pulverulenta) :-
 - Development of lens inhibited at early stage, central embryonic nucleus remains opaque.
- **Zonular Cataract/Lamellar Cataract**→Development of interfered at later stage. Formed just just before/ shortly after birth sufficient diameter to fill pupillary aperture ↓Vn.
 - Area around embryonic nucleus opacified; Opacity occupies sharply demarcated zone.
 - Area of lens within & around opaque zone has clear linear opacities, like spokes of a wheel (RIDERS) → run outwards towards equator. Are B/L
 - A.D.
 - Due to Malnutrition in late intrauterine life esp. lack of Vit D-↓ Formation of Enamel; Rickets

RUBELLA - 15% of women of child bearing age are susceptible to Rubella. First trimester infection most likely to lead to cataract in fetus.

Rubella Triad →Eye, Ear, Heart

Systemic Defects →

- Spontaneous Abortions/Still births
- Congenital Heart Lesions (PDA, Pulmonary Art Malformations)
- Deafness
- Microcephaly, IUGR, M. Retardation. Hypotonia
- Hepato Splenomegaly ,Thrombocytopenic purpura, Pneumonitis

Ocular Defects→

- Cataract →50%, depend on gestational age. Starts as nuclear opacity (Dense pearly appearance). Then becomes diffuse opacity of whole lens
- Microphthalmos 15%
- Retinopathy Viral involvement of RPE. Salt and pepper appearance
- Glaucoma 10%
- Cornea Haze, Strabismus, optic Atrophy, Refractive errors, Iris Atrophy, Spherophakia

II.Morphological Classification

➤ **CAPSULAR CATARACT**→

- Ant Capsular (Polar) cataract→ cause is contact of lens capsule with cornea due to perforation in cornea.
- White plaque in lens capsule. May project in anterior cortex. → Ant pyramidal cataract, has additional ant. cortical cataract
- 2 cataracts- one in capsule and other in ant. cortex- similar in appearance, together known as reduplicated cataract
- Posterior capsular cataract → Persistence of anterior part of primary vitreous- Mittendorf Dot.
- Acquired Capsular → Pseudoexfoliation syndrome, gold toxicity.

➤ **SUBCAPSULAR**

- Post SCO → Complicated cataract, corticosteroids, Senile (Cupuliform) cataract
- Ant. SCO Senile, Glaucomflecken, Wilson's disease

➤ **CORTICAL** → Congenital → Punctate eg. Blue dot Senile- Cuneiform cataract

➤ **NUCLEAR** → Congenital → Rubella; Galactosemia Senile Nuclear Sclerosis

A) SENILE CATARACT

<ul style="list-style-type: none"> • SUBCAPSULAR →Causes visual handicap and morbidity.Distance visual acuity good but pt troubled with <ul style="list-style-type: none"> • Glare -head light of oncoming cars • Bright sunlight • ↓Near vision 	<ul style="list-style-type: none"> • NUCLEAR: →Pt. develops→Myopia due to ↑ in refractive index of lens nucleus <ul style="list-style-type: none"> →↑Spherical Aberration → Read again without near spectacles due to myopia (Second sight for aged) Cataracta brunescens →Cataracta Nigra →Brown pigment accumulates in nucleus →known as Urochrome 	<ul style="list-style-type: none"> • CORTICAL → (Cuneiform Cataract) →3 stages <ul style="list-style-type: none"> • Stage of Lamellar Separation • Stage of Incipient cataract- Wedge shaped spokes of opacity (cuneiform opacities); Base of wedge is in periphery while apex projects in pupil, causes diffraction of rays (monocular diplopia). Common in lower nasal quadrant • Intumescent cataract- Progressive hydration of cortical layers. Lens swells →shallow AC; Predisposes to phacomorphic glaucoma Mature cataract:- Entire lens catarctous with no clear area of lens. <ul style="list-style-type: none"> ↓ Hypermature cataract <ul style="list-style-type: none"> • Sclerotic variety)-Cortex disintegrated, pultaceous, lens smaller, wrinkled capsule, dystrophic calcification on capsule, AC depth is deep . Predisposes to subluxation Morgagnian cataract- Total liquefaction of cortex, Nucleus sinks inferiorly. Predisposes to phacotoxic uveitis and phacolytic glaucoma
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B) TRAUMATIC CATARACT Typical rosette cataract

- Penetrating injuries →Direct injury to lens
- Concussion injuries →:Vossius Ring →Imprinting of iris pigment on Ant. Lens capsule
- Glass Blowers cataract --> By Infrared energy. Scrolls of Peeled ant. capsule (Exfoliation), most common posteriorly
- Electric Shock
- Ionizing Irradiation

C) METABOLIC CATARACT:**1. Diabetes** contributes to cataract in two ways:

- Senile cataract onset at early age and progresses faster
- True Diabetic cataract Osmotic overhydration- B/L white punctate **SNOW FLAKE opacities**.
 \uparrow Blood glucose \rightarrow \uparrow glucose in aq. \rightarrow \uparrow glucose in Lens \rightarrow \uparrow 200 mg/ 100 ml glucose in Lens Saturates Hexokinase \rightarrow glucose Piles up \rightarrow glycosylation of lens proteins \rightarrow **SORBITOL** \rightarrow Draw H₂O into lens \rightarrow Opacity of lens. Aldose reductase is a key enzyme in this pathway.
 Causes fluctuating cataract, fluctuating refractive error and vision

➤ GALACTOSAEMIA \rightarrow A.R.

Classic Galactosaemia \rightarrow Due to absence of Gal 1-P uridyl transferase. Dulcitol/Galacticol accumulates. (**OIL DROPLET**) cataract. Rx \rightarrow Remove galctose (Milk product) from diet.

➤ Fabry's Disease \rightarrow Def of β -galactosidase A.

Systemic - Angiokeratomas, CVS & Renal impairment, excruciating pain along fingers and toes
 Ocular \rightarrow Cornea verticillata, Spoke-Like Lens Opacities

➤ Lowe's (Oculo-cerebro-renal) Syndrome- In born error of a.a metabolism System - Mental Retard, Renal dwarfism, osteomalacia, muscular hypotony, frontal prominence. Ocular \rightarrow Congenital cataract \rightarrow capsular, lamellar, nuclear or total; Microphakia, glaucoma**➤ WILSON'S DISEASE (Hepatolenticular degeneration) \rightarrow Def. of α -2 globulin, Ceruloplasmin \rightarrow Inadequate Cu binding \rightarrow Deposition of Cu in tissues Ocular \rightarrow Kayser — Fleischer ring \rightarrow Periph. Part Of cornea Green **Sunflower Cataract**. Cu deposition also seen in Cu foreign body in eye (Chalcosis).****➤ Hypocalcaemic Syndromes \rightarrow Hypoparathyroidism, Multicoloured small discrete white flecks****D) COMPLICATED CATARACT**

- Due to disturbance of nutrition of lens due to inflammatory/ degenerative disease of eye
- Posterior Subcapsular Cataract
- **Bread crumb appearance**
- **Polychromatic lustre \rightarrow Characteristic Rain bow display of colors**
- Spreads peripherally and axially \rightarrow total cataract, soft and uniform in appearance

Causes \rightarrow

- Anterior Uveitis
- Retinitis Pigmentosa
- High Myopia
- Glaucomflecken - previous attack of ACG.

E) TOXIC CATARACT**➤ CORTICOSTEROIDS \rightarrow Post subcapsular cataract**

- More with systemic Rx
- Children more susceptible than adults
- Genetic Factor- High Responders/ Low Responders

➤ Chlorpromazine \rightarrow Star Shaped / Stellate Cataract -Fine Yellow granules under Ant lens capsule. Do not interfere with Vn**➤ Miotics \rightarrow Ecothiophate, Demecarium Bromide. Prolonged Use \rightarrow Ant. Subcapsular Cataract****➤ Amiodarone \rightarrow For Cardiac Arrhythmias. Ant. Subcapsular Cataract****➤ Gold \rightarrow Ra Ant. Subcapsular Cataract, Rx > 3 Yrs****➤ Busulphan Rx CML \rightarrow Lens opacities****➤ ATT drugs- INH and Ethambutol**

Causes of Presenile Cataract

- Myotonic Dystrophy → **Christmas Tree Cataract** and Pig. Changes involving macula & peripheral retina
- Syndermatotic Cataracts- Asso with skin disorders- Atopic Dermatitis; Psoriasis; Rothmund's Syndrome

Syndromes associated with Cataract –

- **Down's Syndrome** - Cataract 15%
 - Narrow & slanted palpebral fissures, Blepharitis
 - Strabismus, Nystagmus
 - Light colored / spotted irides Brushfield Spots
 - Keratoconus, Myopia
- **Werner's Syndrome** →Premature senility, DM, Hypogonadism, Arrested growth, B/L Cataract (20- 40 yrs)

Abnormality of Lens Shape

- **Anterior Lenticonus** →Ant. conical deformity of lens, ceng., B/L, male> amale →Alport's Syndrome.
- **Lentiglobus**→Hemispherical deformity of Lens
- **Post-Lenticonus**→ U/L Males, feature of Lowe's Syndrome

ECTOPIA LENTIS (Subluxated Lenses)

<ul style="list-style-type: none"> • INHERITED • Marfan's Syndrome: A.D. <ul style="list-style-type: none"> • Lens subluxation --> B/L symmetrical, <i>supero temporal</i>; microspherophakia. • Glaucoma- Due to angle anomaly and lens subluxation • Hypoplasia of dilator muscle • Axial Myopia and increased chances of R.D. (Lattice) • Weill— Marchesani Syndrome <ul style="list-style-type: none"> • <i>Microspherophakia</i> • Anterior dislocation of lens • Angle anomaly Mesodermal dysgenesis • Glaucoma →Incarceration of lens in pupil- inverse glaucoma • Homoecystinuria→AR <ul style="list-style-type: none"> • Deficiency of cystathione synthetase →↑ Homocystine in plasma & urine • Mental Ret; Osteoporosis with #; Thrombosis of Art/Veins, Malar Flush • <i>Infero Nasal subluxation</i> • Glaucoma- Pupil block- Due to Lens incarceration in pupil. • Hyper Lysenemia • Familial Ectopia Letis • Aniridia 	<ul style="list-style-type: none"> • Acquired <ul style="list-style-type: none"> • Trauma • Uveitis • Hypermature cat • High myopia • Buphthalmos
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MANAGEMENT OF CATARACTIN ADULTS

Anesthesia

- Choice between Topical vs Retrobulbar/ Peribulbar anesthesia. Both are forms of local anesthesia. In retrobulbar anesthesia a long 1.5 inch needle is used to infiltrate the lignocaine/ sensoricaine mixture directly at orbital apex. Since this delivers the anesthetic close to the ciliary ganglion, it is faster in onset but at same time complications like retrobulbar hemorrhage are more common. Superior oblique is the last muscle to be paralysed as supplied by 4th nerve that is outside the apex of orbit. Peribulbar involves shorter .5 inch needle to inject the anesthetic in peribulbar space around the eyeball and that percolates down. Slow in onset but safer.

CATARACT SURGERIES

➤ **ECCE→ Post capsule left behind**

- Type of anterior capsulotomy- Can-opener or envelope.
- IOL→Anterior, Posterior, Iris claw Lens
- PCIOL- Parts are optic and haptic (C Loop, J Loop)
Material used is PMMA- Polymethyl metha acrylate.
PCIOL., Implanted -In the Bag or In the sulcus (groove b/w iris & ciliary body)
- IOL calculation SRK H formula. For this keratometry & Axial length needed
IOL power (D), A- (2.5L+ 0.9K)
A= A constant, L= Axial Length, K= Keratometry

➤ **ICCE →Whole lens extracted**

- Arruga Forceps, Cryo probe, Erisophake, wire vectis (for removal of subluxated lens) Contraindication
→Young Adults due to Strong Weigert's Lig and Strong Zonules
- Disadvantage →
- PCIOL not possible
- CME, RD common
- Corneal endothelial decompensation- Striate and bullous keratopathy

➤ **PHACOEMULSIFICATION→**

- USG to vibrate at 40,000/sec in eye
- Incisions Sclera], corneoscleral, cornea. Size of incision 3-3.5 mm.
- Type of anterior capsulotomy- Capsulorhexis
- Steps-Wound-Rhexis-Hydrodissection-Hydrodelamination-Nucleus emulsification-Cortical aspiration-foldable IOL-Wound closure
- Techniques of Nucleus splitting- Divide and Conquer, Chip and Flip, Phaco-chop
- Foldable IOL →Silicone/ Acrylic/ Hydrogel

Advantage → Small Incision, Less Astigmatism Rapid wound Healing, Short convalescence Period Disadvantages→ Longer learning curve, Expensive Instrumentation SICS- Small Incision cataract surgery done using a 5-7 mm incision. Nucleus is removed using manual (non USG phaco) techniques.

IOL power calculation: Can be estimated based on the refraction of the other eye
Biometry: Using SRK II formula (Sanders-Retzlaff-Kraff) regression formula which takes into account the axial length (A) and the keratometry reading (k)
Power of IOL = A – 2.5L– 0.9k

Types of IOL

- a) ACIOL
- b) Iris fixated IOL
- c) PCIOL
 - Nonfoldable
 - Foldable- May be Monofocal, Multifocal, Accomodative

Complications of Cataract Surgery

<ul style="list-style-type: none"> • During Surgery → • Vitreous Loss- Up drawn pupil, Iris prolapse, Uveitis, R.D., CME • Expulsive Hemorrhage- Supra-Choroidal Hemorrhage from short post ciliary arteries. 	<ul style="list-style-type: none"> • Early post op.→ • Wound leak →Diagnosis by Siedel's Test • Iris prolapse • Hyphaema • Striate keratopathy →corneal edema due to localized endothelial damage • Endophthalmitis→Staph 	<ul style="list-style-type: none"> • Late postop → • CME Cystoid macular edema (Irvine Gass syndrome) • Post Capsule °pacification → <ul style="list-style-type: none"> • Elschning's pearls → Proliferation of lens epithelium onto post. capsule at site of apposition b/w Remnants of Amt capsule & Post capsule
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<p>Treatment is to immediately close the wound and then drain intraocular blood.</p>	<p>epidermidis commonest cause. Other causes are staph aureus, Pseudomonas. Occurs around 3-4 days after surgery. Prevention is using preoperative topical antibiotics; during surgery- using Povidine Iodine lid scrubs and covering eyelashes; use of postoperative topical/subconjunctival antibiotics also prevents infection. Treatment is Intravitreal antibiotic injection.Pars plana vitrectomy is the next line of management Current used Vancomycin and Cefazolin. Late endoph causes- P acneand fungus.</p>	<ul style="list-style-type: none"> • Sommering →Ring in equator, due to proliferation of cortical fibers Rx Nd:YAG laser capsulotomy • R.D. →More common in Aphakia, after Vitreous loss and in high myopes. • Bullous Keratopathy- Vitreous endothelial contact→Endothelial cells decompensate →Corneal edema • UGH syndrome →Triad: Uveitis + Glaucoma + Hyphaema. (More in ACIOLS) • Sunset syndrome subluxation of IOL Inferiorly • Secondary Glaucoma
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MANAGEMENT OF CATARACT IN CHILDREN

- U/L cataract should be managed more aggressively than B/L cataract as chance of developing amblyopia is more
- Surgery should ideally be done within 6 weeks to prevent stimulus deprivation amblyopia
- Pediatric cataract surgery includes lens aspiration+IOL insertion+posterior capsulorrhexis+anterior vitrectomy

OPTICS



- UV rays ↔ visible light (400nm(Violet) to 700nm(Red)) ↔ IR rays. Visible portion of Electromagnetic Radiation → Lies b/w UV and infrared portion.
- Refractive power of cornea 43D, Lens 20D, Total eye [58-60D] Axial length of eyes →24mm
- Lens power is measured in Diopter .Lens power is reciprocal of its FOCAL LENGTH ($D=1/f$)
- **Refractive Index :**
 - Cornea- 1.376
 - Lens cotex- 1.38;
 - Lens nucleus

Reduced or Schematic eye- Since there are many places in the eye where refraction of the light rays takes place, for **simplicity**, (to make ray diagrams) we can assume that all refraction takes place at the anterior surface of the cornea. (Most of the refraction occurs at the cornea). The wavelengths of visible light range from approximately 397–723 nm

Schematic Eye = Gullstrand (58.0) it has **2 principal foci, 2 principal points & 2 nodal points**

Reduced eye= Listing (+58.6) & later by Donders (+60)
2 principal foci, 1 principal point & 1 nodal point

Refractive indices:

Air	1
Water	1.333
Cornea	1.376
Aq and vitreous	1.336
Crown glass	1.52
PMMA	1.49

Far point:

- Hypermetrope - behind eye
- Myope - in front of the eye
- Emmetrope – infinity

Spectacle correction

Sturm's conoid depicts refraction through an astigmatic surface. Aim of spectacle correction is to collapse Sturm's conoid. Ideally correcting glasses should be placed at the anterior focal length.

Power of glasses required, as we move forward from the nodal point:

- Increases in case of concave lenses. Thus myopic glasses require more power than contact lenses.

- Decreases in case of convex lenses. Aphakic spectacles require a lower power than IOL.

Accommodation:

- Involves change in lens curvature, so that it is able to change its power and focus on to a near object.
- **Mechanism:** ciliary body contraction leads to slackening of lens zonules. This relieves the lens capsule, which then is able to mould the lens into a more spherical shape.
- Lens at rest has anterior radius of curvature 10mm and posterior radius 6mm
With accommodation changes to 6mm and 6mm respectively.
- Accommodation + convergence + miosis is known as **near response**.
- Accommodative paresis in diphtheria or other debilitating illnesses, diabetes.
- Spasm of accommodation seen especially in young individuals. **Causes pseudomyopia.**
- Frequently changing presbyopic glasses in open angle glaucoma.
- Young people are not given pilocarpine due to induced myopia.
- Frequently changing refractive error in diabetes.
- Amplitude of accommodation at 8 years age is 14D and at 40 years age is 6D

Presbyopia

- The capacity of the lens to accommodate decreases with age. As a consequence, the person is not able to see the near objects clearly. Usually the condition becomes troublesome at around 40years of age. The treatment consists of wearing plus glasses for near work to supplement accommodation.

Dark room procedures:

Retinoscopy (skiascopy or shadow test) with plane mirror at distance of 1m

Hypermetropia – with

Emmetropia – with

Myopia < 1 D – no movement

Myopia = 1D – no movement

Myopia < 1D - against

Drugs: Atropine ointment, drops

- Homatropine, Cyclopentolate
- Tropicamide
- Phenylephrine

Indirect ophthalmoscopy	Direct ophthalmoscopy
• Stereopsis present (binocular)	• No stereopsis (unioocular)
• REAL INVERTED IMAGE	ERECT VIRTUAL IMAGE Mn:DEV:(Direct-Erect-Virtual)
• Large field of vision - whole of the retina with pars plana can be seen	• Small - only posterior pole can be seen
• Periphery of the retina visualized	• Not possible
• Useful in hazy media due to strong light	• Not as useful
• More skill required	• Less skill needed
• Bulky instrument	• Small instrument
• Magnification 3 to 5 times (+13D, +20D or +28D lens used giving magnification of 5x, 3x and 2x respectively.)	Magnification 15 times

Distant direct ophthalmoscopy: Done at a distance *of 25cm, with* plane mirror.

- Recognition of the opacities in the media, e.g. corneal or lenticular opacities. Reference is pupillary plane.
- Recognition of retinal detachment
- Confirmation of the results of external exam e.g. iris hole, iridodialysis etc.
- Especially useful for recognition of dislocated/subluxated lens, coloboma of the iris.

Slit lamp examination of fundus Using Hruby lens, +90D and Goldmann 3 mirror

Visual acuity in adults by Snellen's chart - denoted by d/D

Each letter subtends an angle of 5° at the nodal point. Each line of the letter subtends 1° .

Visual acuity in children: by optokinetic nystagmus and preferential looking.

Emmetropia = absence of a refractive error.

Ametropia: Cause can be axial or curvature or index or due to abnormal position of the lens

Hypermetropia

- Infants normally hypermetropic by 2.5-3.0D
- High Hypermetropes predisposed to ACG
- Older age group - hypermetropia increases.
- Total Hypermetropia = latent + manifest
- (Manifest = facultative + absolute)
 - (Latent hypermetropia is the part which is compensated with the help of ciliary muscle tone. This can be ascertained only with the use of cycloplegic. Manifest is the part for which glasses are required. Out of this the person is able to compensate the facultative part by increasing the accommodation. However, the part which cannot be compensated even with accommodative effort is absolute hypermetropia.)
 - Small eye, shallow AC
 - Retina → peculiar sheen → Shot Silk / Water-silk Retina
Pseudopapilloedema b/c disc margins are indistinct as in raised ICT
LARGE +VE angle kappa → visual axis cuts cornea considerably to inside of optic axis
Apparent Divergent Squint

Myopia

That refractive error in which parallel rays of light come to focus in front of retina, when eye is at rest

TYPES →

- Axial Myopia → AP Diameter Of Eye Is Long
- Curvature Myopia → ↑ Curvature Of Cornea → Keratoconus
↑ Lens curvature → Hyperglycemia - Lens intumescent
- Index Myopia → Nuclear Cataract, due to ↑ refractive index.
Simple Myopia → < 6D, Stabilizes by 21 yrs
Pathological Myopia → > 6D, Rapidly ↑ b/w 15-20yrs, Can go upto → 25-30d
Mostly due to inherent weakness of sclera

CLINICAL PATHOLOGY →

- Eye → large, long, prominent
- AC → deep, Pupil → large, sluggish
- Vitreous → Degenerated → Floaters (Muscae volitantes) → Posterior Vitreous Detachment → gives the reflex of Weis Ring
Fundus → Generalised chorio-Retinal atrophy - Myopia crescent
 - Posterior staphyloma, Cystoid degeneration at ora serrata
 - Macula: Foster-Fuchs Spots: dark pigmented area due to proliferation of retinal pigment epithelium. Choroidal heme and thrombosis may be seen. Atrophic patch at macula
 - Retinal Tears in periphery - Lead to Retinal Detachment

Clinical Features →

1. Blurred distance vision, headache → in uncorrected errors
2. Squeezing or Narrowing palpebral fissure → to sharpen distance vision

Treatment → Conventional: SPECTACLES, CONTACT LENSES. Spectacles best tolerated upto 2 diopters of anisometropia. For higher difference in myopia in the two eyes, contact lenses preferred.

Other Modes of Rx →

- **Radial Keratotomy** → For Adults with stable Myopia 2-8 D with minimal astigmatism
- Method → 16 deep radial incisions made from edge of optical clear zone to limbus.
Incisions → weaken the cornea → cause mid periphery to bulge out → center of cornea flattens
- **P.R.K. - Photorefractive keratectomy**
- **LASIK - Laser assisted in situ keratomeilisis**

- Both PRK and LASIK involve use of Excimer laser to ablate a predetermined thickness of corneal stroma to decrease the myopia. In both the corneal epithelium is lifted up using a microkeratome. The difference b/w PRK and LASIK involves the next step. In PRK, the epithelium is totally removed and after completion of the procedure, the cornea is covered with a contact lens and the eye bandaged. This may lead to debris collecting under the epithelium and this is the major disadvantage of PRK.
- LASIK is an improvement such that the patient's epithelium is removed partially, one end hinges and after completion of the procedure, the same epithelium is repositioned.

Prerequisites for LASIK

Age > 18 years

Stable refractive error

Minimum corneal thickness of 500 microns

Residual corneal thickness of 250 microns

- Epi-Lasik- Makes thinner flap with finer epi-keratome.
- **LASEK or E-LASIK- Laser assisted sub epithelial keratectomy.** Similar to LASIK but instead of microkratome, epithelial flap is fashioned using alcohU dilute acid.
- Intracorneal rings- flatten the central cornea while accentuating peripheral cornea.
- Blade-free lasik- Create flap using femto-laser.

Astigmatism

That condition of refraction where a single point focus of light can not be formed on retina

Types

- **Curvature Astigmatism**

Cornea

a. Congenital → Astigmatism with the Rule
> Horizontal C.

b. Advancing age → Due to pressure of U.L. on cornea

Vitreous HC → VC; Astigmatism against the rule

c. Acquired → Keratoconus, Inflammation, Ulceration, Trauma, Chalazion pressing on cornea

2. **Index Astigmatism**→ Gross change of Refractive Index in cataract

Optical Condition→ Instead of single focal point there are 2 focal lines, separated by Focal Interval

- Length of Focal Interval → Measure of degree of Astigmatism
- Error corrected → Reduce 2 foci into one by **CYLINDRICAL LENS**
Acts in plane of one meridian and focuses rays in the other meridian

In a cylindrical lens: Axis of action is perpendicular (or 90 degrees away) from axis of prescription.

Types of Astigmatism:

<ul style="list-style-type: none"> • Regular Astigmatism→ 2 Principal Meridians Are At Right Angles Sub classified As→. • Simple Astigmatism→One Foci →on Retina, Other Focus → in front/behind Retina <ul style="list-style-type: none"> • Therefore one meridian → Emmetropic, Other meridian → myopic/hypermertropic • Simple Hypermertropia or Simple Myopia • Compound Astigmatism→ both foci in front/behind the Retina <ul style="list-style-type: none"> • Compound Myopic or Compound Hypermertropic • Mixed → One focus in front and other behind the retina <p>Clinical Features→ Blurred vision, Asthenopia</p>	<p>Irreaular Astigmatism→ Irregularities in curvature of meridian so that no geometrical figure is adhered to. Seen in .keratoconus and Incipient cataract</p> <p>Treatment → Unsatisfactory with glasses; contact lenses are treatment of choice.</p>
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Contact lens Materials

- **Hard-** PMMA. Less comfortable but preferred to treat astigmatism and keratoconus
- **Soft-** HEMA. More comfortable. Not preferred in high astigmatism. Problem can be allergic conjunctivitis esp. with storing solutions.
- **Semi-soft:** Made of rigid gas permeable (RGP) plastic. Have intermediate properties of both of• above.

PHAKIC IOL

Introduction:

- Phakic IOL is any lens located between the cornea & crystalline lens, which is left undisturbed in the eye.
- AC phakic IOL used since 1950 but failed due to lack microsurgery devices & poor understanding of the endothelial function.
- These lenses came back in 1987.

Types of Phakic IOLs:

- Anterior chamber angle fixated IOL eg. ZBM5, NuVita MA20, Phakic 6.
- Anterior Chamber-iris fixated IOL eg. Verisyse Phakic IOL(Artisan lens).
- Posterior chamber sulcus fixated IOL eg. STAAR Implantable contact lens & phakic refractive lens(PRL).

Patients Selection for Phakic IOLs.

- Age above 18 yrs.
- Mod. to high myopes (>-9.00D) & hyperopes(>4.5).
- Lesser degrees of ametropias if LASIK is contraindicated such as:
 - Cornea thinner than 500 M.
 - Steep or flat corneas.
 - Topographic change suggestive of Keratoconus.
- Endothelial cell density: at least 2250-2500mm³.

- Pupil smaller than 6mm in scotopic luminance.
- Stable refraction at least for 1 yr.
- AC depth at least 2.8mm.
- Angle width at least 30 degrees.
- No eye pathology except refractive.
- No systemic pathology such as diabetes, collagen diseases etc.

ANISOMETROPIA

- State in which there is a difference in refractive errors of 2 eyes
- Patient is visually uncomfortable by→V.A. Difference b/w 2eyes and Anisokonia→Difference in size of retinal image

Treatment

- Spectacles tolerated upto 2 D of anisometropia. For greater than 2D cliff. contact lens preferred
- Any muscle imbalance →Rx By Prisms or Surgery
- Extreme Anisometropia →Aphakia →IOL

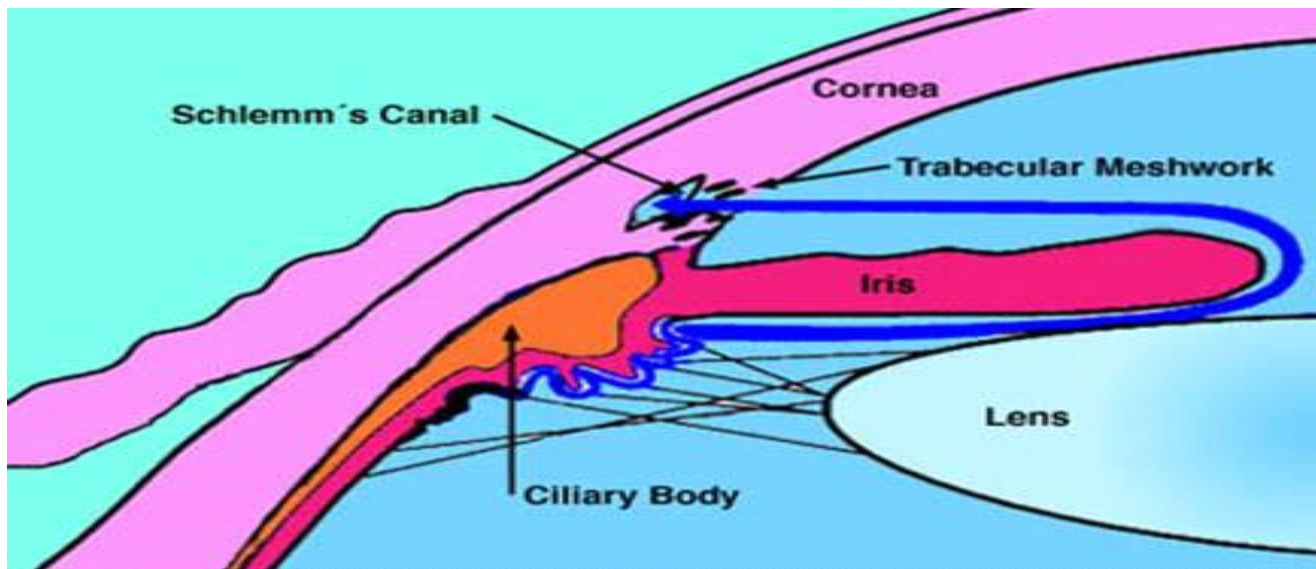
GLAUCOMA

Glaucoma is a type of optic neuropathy occurring in response to raised intraocular pressure characterised by typical visual field changes

Aqueous humor production and circulation:

- Produced by the non pigmented epithelium of the ciliary processes by the process of
 1. Secretion - Active transport - about 80%
 2. Ultrafiltration
 3. Diffusion
- Rate of aqueous production is 2.3 μ L/min
- Composition of Aqueous in relation to plasma: Hypertonic
- More ascorbate, pyruvate, lactate
- Less protein & Hco₃

Anterior chamber angle structures (anterior to posterior):



- Schwalbe's line (termination of Descemet's membrane)
- Trabecular meshwork: Posterior half is adjacent to Schlemm's canal and is the functional part
- Scleral spur
- Ciliary body band
- Root of iris

Anterior chamber is 2.5mm deep in normal adults. Shallower in infants, old age, & hypermetropes.

Circulation of aqueous humor:

Conventional system accounting for 90% of aqueous outflow

Ciliary processes → posterior chamber → pupil → anterior chamber → anterior chamber angle → trabecular meshwork → Schlemm's canal → emissary veins → episcleral vein

Unconventional system accounting for remaining 10% aqueous outflow

1. ciliary body → suprachoroidal space → episcleral veins (uveoscleral flow)
2. ciliary body → suprachoroidal space → vortex veins (uveovortex flow)
3. iris vessels → → vortex veins

Parameters for Glaucoma evaluation

- IOP (intraocular pressure)
- Anterior chamber angle
- Optic disc
 - Visual fields

1) IOP

- Normal: 11 to 21mmHg or 15.5 ± 2.5 mmHg
- Diurnal variation is less than 5mmHg.
- Patterns of diurnal variation - Morning rise, Evening rise, Biphasic rise

Tonometry

1. Indentation tonometry: Schiotz tonometer. Disadvantage: factor of scleral rigidity
2. Applanation tonometry: Negates scleral rigidity. Based on Imbert Fick principle
Eg. Goldmann, Perkins, Draeger, Pneumatic & Tonopen
(Most accurate is Goldmann applanation tonometer)
3. Non contact tonometer: using a puff of air.

Tonography:

Technique to measure the facility of aqueous outflow or the C-value.
Normal C-value is $0.28 \mu\text{l}/\text{min}/\text{mmHg}$

2) Anterior Chamber Angle

Direct gonioscopy : Koeppe, Barkan, Thorpe, Swan Jacob
Indirect gonioscopy : Goldmann, Zeiss, Posner, Sussmann

Latest:

- ULTRA SOUND Biomicroscopy (UBM) ,
OCT and Schemplflug video imaging used for visualizing Ant. Chamber Angle***

3) Optic Nerve Head

Glaucomatous damage due to: 1) Mechanical effect of raised IOP
2) Compromised blood supply

Normal Optic disc: Vertically oval
C:D ratio $\leq 0.3:1$ in majority. (However in 1-2% it may be even 0.7:1)

Latest:

Optical Coherence Tomography(OCT)
Confocal Scanning used for visualizing Optic nerve head & Nerve fibre defects
(HRT and NFLA are based on confocal principle)***

Glaucomatous optic disc changes:

Cup: Deep cup
C:D ratio increased, with vertically oval cup
Asymmetry of >0.2 between two eyes
Pallor cup discrepancy
Polar notching starting inferotemporally
Thinning of neuroretinal rim
Laminar dot sign
Bean pot cupping

Vascular changes: Bayoneting
Nasal shifting of vessels

Nerve fibre bundle defects

4) Visual Fields

Island of vision surrounded by a sea of blindness

Boundaries: 60° sup and nasally
 70° inf
 100°-110° temporally

Blind spot: Between 10°-20° temporally

Visual field changes in glaucoma:

Central visual field: Paracentral scotomas
 Seidel or Sichel scotoma
 Arcuate or Bjerrum scotoma
 Ring scotoma
 Nasal step

Peripheral visual field: Concentric constriction
 Peripheral nasal step of Roenne
 Extension of double arcuate scotoma to periphery

Late stages central and temporal fields of vision remain. If still untreated, total vision is lost.

Classification of Glaucomas:

- 1) Primary glaucomas: Primary open angle glaucoma
 Primary angle closure glaucoma
- 2) Developmental glaucomas: Buphthalmos / Infantile (< 3ys)
 Juvenile glaucoma (3 to 16 yrs)
 Developmental glaucomas with associated anomalies
- 3) Secondary glaucomas: Glaucomas associated with other ocular diseases

Glaucoma definitions

	IOP	Anterior chamber Angle	Optic disc or visual field changes
Primary open angle glaucoma (POAG)	> 21mmHg	Open/Normal	Present
Glaucoma Suspect (Ocular hypertension)	> 21mmHg	Open/Normal	Absent
Low tension or Normal tension glaucoma (NTG)	< 21mmHg	Open/Normal	Present
Primary angle closure glaucoma	< 21mmHg	Shallow, potentially occludable	Absent
Chronic angle closure glaucoma	> 21mmHg	Peripheral anterior synechiae	Present

Primary open angle glaucoma:

1% of general population suffers from glaucoma. Bilateral disease.

- **Risk factors:** Age: more after 65years of age
 - Diabetes mellitus
 - Thyroid disorders
 - Family history
 - Ocular: Myopia

Presentation: Eyeache
 Blurred vision

Frequently increasing presbyopic correction****Diagnosis:** IOP, gonioscopy, optic disc, visual fields**Tonography - C-value less than 0.20 μ l/min/mmHg significant****

Diurnal variation of IOP - Positive if difference between max and min is > 8mmHg

Water drinking test (After 8 hrs fast- measure IOP – Pt given 1 litre of water to drink rapidly – IOP measured every 15 min till 1 hr.- Positive if difference between max and min is > 8mmHg)**Causation:** Trabecular meshwork sclerosis with reduction in intertrabecular spaces**Treatment:**

- Medical therapy
- Laser trabeculoplasty
- Filtering surgery when maximum tolerable medical therapy is not sufficient

Normal tension glaucoma (NTG)

It is considered to be a subset of POAG wherein the IOP does not rise beyond 21mmHg but the damage to the optic disc is there.

One additional risk factor is cardiovascular or haematologic abnormalities.

The treatment is the same with the target pressure being lower in case of NTG.

Optic nerve head haemorrhage seen commonly in NTG**Primary Angle closure glaucoma**5th-6th decade. More common in females. Bilateral.**Risk factors:**

- Age
- Sex – females
- Hypermetropes

Presentation

Stages of ACG

- Prodromal Stage → Ocular Pain, Headache, mild ↓Vn, shallow AC, colored haloes, transient ↑IOP →Attack few mm to few hours → subsides completely without Rx.
- Stage of Constant Instability → Attacks regularly at fixed time intervals Colored Haloes due to corneal epithelial edema - Red outside, blue innermost To differentiate colored haloes of cataract & glaucoma do Fincham's Test →Stenopic slit passed across eye → In Glaucoma, Haloes remain intact due to diffuse corneal edema; in Cataract ,Haloes break due to presence of cataract spokes in a particular axis only
- Acute congestive stage/acute attack →
 - Excruciating pain radiating to entire ophthalmic nerve distribution
 - Nausea/ Vomiting
 - Lid edema, chemosis, circum corneal congestion, photophobia, markedly .↓Vn
 - Cornea →Edematous & insensitive
 - AC irregularly shallow- flat in periphery, deeper centrally due to iris bombe.
 - Pupil →Vertically oval, mid dilated, fixed/non reacting
 - IOP markedly ↑to 60-70 mmHg
 - Fundus examination →not possible due to corneal edema. If seen, Disc →Hyperemic and edematous.
 - V. Field change → Generalized depression
- Chronic congestive stage →Optic disc cupping and Field changes
IOP moderately↑
Angle Synechiae - called goniosynechiae if subtle, peripheral anterior synechiae (PAS) if large. Vogt' s triad is characteristic: Pigment dispersion on corneal endothelium+ Sector iris atrophy+ Glaucomaflecken (Ant. capsular lens opacity)
 - Absolute Stage →Painful blind eye

Diagnosis: Coloured halos - **Fincham's test** (glaucomatous haloes do not break)

Anterior chamber angle - Slit lamp examination

Gonioscopy - assess the depth of the angle

Shaffer’s grading of Angle width

Grade	Angle	Structures visible	Configuration	Chances of closure
IV	35 – 45⁰	schwalbe line - ciliary body	Wide open	Nil
III	20-35⁰	schwalbe line - scleral spur	Open	Nil
II	20⁰	schwalbe line – T. meshwork	Moderately narrow	Possible
I	10⁰	Schwalbe’s line only	Narrow	High
0	0⁰	None	Closed	Closed

Provocative tests:

- Mydriatic provocative test - Positive if diff > 8mmHg
- Dark Room test (Pt kept in dark room with eyes open for 1 hour-Positive if diff > 8mmHg before & after the test)
- Prone provocative test (Pt made to lie prone in dark room with eyes open for 1 hour - Positive if diff > 8mmHg)
- Mydriasis/ Miosis (Pilocarpine/Phenylephrine) test. Positive if diff > 8mmHg)

Precipitating factors: Dim illumination
 Emotional stress
 Drugs as anticholinergics

Mechanism of glaucoma: Pupillary block

Management

- Prodromal stage/ stage of constant Instability →Gonioscopy first to confirm narrow angles followed by provocative test. If positive — Laser YAG iridotomy in both eyes. Provocative Tests →Positive if IOP ↑8mmHg
- Dark Room Test →60 min
- Mydriasis Miosis Test
- Prone position Test 60 min
- Dark Room prone position test
- Acute attack- Hyperosmotics first line treatment.
- IV mannitol 20%, 1-2 gm / kg; Syp glycerol 50%, 1 gm/kg
- Oral Acetazolamide- 500 mg stat →QID
- Followed by intensive Pilocarpine 2% to constrict pupil and break pupillary block.
- ↓
 Gonioscopy to check extent of angle synechiae. That decides surgery to be done

Surgery

No/ < 180 degrees angle has Ant synechiae
 Laser Iridotomy is treatment of choice

Ant synechiae > 2/3 angle
 Trabeculectomy

- Chronic stage- Trabeculectomy
- Absolute stage- Cyclodestructive laser/ cryo if patient is symptomatic. Destroys ciliary processes in ciliary body that manufacture aqueous humor. Thus the TOP falls and pt. is symptom free while retaining the eyeball for cosmetic purpose. Enucleation is second line treatment now.

Primary congenital glaucoma

Buphthalmos or hydrophthalmos or infantile glaucoma

Present with triad of:

- 1) Epiphora
- 2) Photophobia
- 3) Blepharospasm

Due to associated corneal edema

Examination shows:

- Increased corneal diameter: (>12mm in first year of life is abnormal)
- Corneal edema
- Deep AC
- Myopia
- Haab's striae - tears in Descemet's membrane
- Tonometry shows high tension.
- Gonioscopy may show abnormal tissue in the angle (Barkan Membrane-very rarely seen)

Cause: Abnormal development of the anterior chamber angle with retention of the tissue.

Management: Surgery: Goniotomy
Trabeculotomy
Trabeculectomy

Best modality is Trabeculectomy combined with trabeculectomy +/- MMC

GLAUCOMA ASSOCIATED WITH CONGENITAL ANOMALIES

- A. With irido-corneal dysgenesis
- a) Axenfeld's anomaly
 - b) Reigers anomaly
 - c) Reigers syndrome
 - d) Peter's anomaly

B. With Aniridia IN 75%

C. Associated with ectopia-lentis syndromes – Marfan syndrome, Weil-Marchesani syndrome & Homocystinuria

Secondary congenital glaucomas

- A. Congenital ectropion uveae
 - B. Nanophthalmos
 - C. Naevus of ot a
 - D. Lowe's syndrome
 - E. Phacomatosis
1. Sturge - Weber syndrome
 2. Von-Recklinghausen's Disease

Secondary Glaucomas:

Glaucomas associated with Corneal Endothelial disorders

Iridocorneal endothelial syndromes (ICE):

- Progressive iris atrophy
- Chandler's syndrome
- Cogan Reese

Glaucoma due to proliferation of abnormal endothelial membranes and associated iris atrophy

Treat : Medical management & Filtering surgery if IOP uncontrolled.

Glaucomas associated with Irido Corneal dysgenesis (ICD): due to iris tissue covering up the meshwork

- Aniridia
- Axenfield-Rieger
- Peter's Anomaly

Pigmentary glaucoma

Glaucoma due to pigment blocking trabecular meshwork

Seen more commonly in young males, 25-35 yrs with myopia

Iris heterochromia & transillumination defects seen

Krukenberg spindle - Vertical Spindle of pigment on corneal endothelium

Lens induced glaucomas

Phacomorphic, Phacolytic, Phacotoxic, Phacoanaphylactic

Pseudoexfoliation syndrome (Glaucoma capsulare)

Whitish flaky material deposited on the iris, angle, zonules, lens, ciliary body etc. Sampolesi line seen in the angle

Tt – Same as POAG

Glaucomas associated with Retinal disorders: Neovascular glaucoma

Associated with rubeosis iridis.

Initially open angle glaucoma and later angle closure glaucoma.

Tt : Panretinal photocoagulation/cryotherapy ,Filtering surgery, Glaucoma implants

Glaucoma associated with elevated Episcleral venous pressure

Seen in thyroid orbitopathy, Orbital inflammations, carotico cavernous fistula

Treat the cause. Treat glaucoma medically/surgically.

Glaucomas associated with Intraocular / Orbital tumors

Seen with retinoblastoma, malignant melanoma, neurofibromatosis, Sturge Weber syndrome etc

Glaucomas associated with uveitis

Acute uveitis,

Possner Schlossman syndrome

Fuchs heterochromic iridocyclitis

Chronic uveitis

Epidemic dropsy

Due to sanguinarine (Argemone oil) in Adulterated Mustard oil used for cooking

Hypersecretory glaucoma. Associated with telangiectasia.

Tt as for POAG

Steroid induced glaucoma

In general population about 5% are high responders to Steroids

Glaucoma develops mainly in 2/3rd of these.

Steroids cause edema of TM because of increased swollen glycosaminoglycans - thereby clogging TM

Tt : Discontinue steroids. Medical therapy. Surgical therapy may be required in some.

Glaucoma Due to Trauma

- Penetrating injuries: Glaucoma associated with AC collapse
- Blunt trauma :

a) Glaucoma due to uveitis and trabecular meshwork edema

b) Glaucoma due to hyphaema: Danger of corneal blood staining and secondary glaucoma`Eight Ball`

Hyphaema*

Medical therapy initially, Evacuate if tension too high.

c) Ghost cell glaucoma

- Seen in Vitreous haemorrhage.
- RBCs are deformed to Ghost cells, enter AC and clog TM.
- Medical therapy usually suffices

d) Angle recession glaucoma

Immediately after trauma or years later.

Associated angle recession (widening of ciliary body band)

Medical / Surgical

Malignant glaucoma

- May occur after ICCE Surgery, surgical PI, aphakia, pseudophakia etc
- Shallow AC with very High IOP
- Non responsive to miotics
- Cause is posterior pooling of aqueous, pushing the lens iris diaphragm forward
- Tt : Cycloplegics , Vitrectomy

Antiglaucoma Drugs

LATEST-RHO KINASE INHIBITORS

Beta blockers		
Timolol maleate (non selective Beta blocker) 0.25, 0.5% drops bid	Reduces aq production via Beta receptor blockade on ciliary body	Exacerbation of COPD , Congestive heart failure, hypotension, mask symptoms of hypoglycemia. Ocular- stinging, dry eye, corneal anaesthesia
Levobunolol 0.25, 0.5% drops od or bid	Same	
Betaxolol (Selective Beta ₁ blocker) 0.25, 0.5% drops bid	Reduces aq production via Beta ₁ receptor blockade on ciliary body	Less chances of exacerbation of COPD due to Beta ₁ selectivity.
Adrenergic agonists		
Epinephrine 1% drops bid	<ul style="list-style-type: none"> • Decreases aq production via Alpha receptor stimulation on ciliary body • Increases outflow through trab meshwork via Alpha₂ receptors. • Also increases uveoscleral outflow. 	Mydriasis, adrenochrome deposits , cystoid macular edema, follicular conjunctivitis , hyperemia, palpitation, hypertension.
Dipivefrin 0.1% drops bid	Prodrug converted to epinephrine in the eye.	Fewer side effects.
Brimonidine 0.2% drops bid	Decreases aq production and increases uveoscleral outflow through Alpha ₂ receptors	Allergic conjunctivitis blurring of vision, dry mouth
Cholinergics		
Pilocarpine 2-4% drops tid, qid	Increases trabecular meshwork outflow due to reorientation. In angle closure glaucoma, break the pupillary block by miosis	Brow ache, headache, myopia (accommodative spasm), retinal detachment, reduced vision in cases of cataract due to miosis, rarely bronchospasm, iris cysts
Cholinesterase inhibitors <ul style="list-style-type: none"> • Echothiophate iodide • Demecarium bromide 	Increase available acetylcholine through inhibition of cholinesterase	In addition to pilocarpine side effects, cataract, iris cysts, posterior synechiae
Carbonic anhydrase inhibitors		
Acetazolamide 250mg tablet tds-qid	Decreases aq production through inhibition of carbonic anhydrase	Parasthesias , GI upset, renal stones, sulfa sensitivity, metabolic acidosis , cardiac arrhythmias through potassium depletion, aplastic anaemia

Dorzolamide 2% drops bid	Same	Burning, sulfa sensitivity, bitter taste
Prostaglandins		
Latanoprost 0.005% drops od Bimatoprost 0.03% drops od Travoprost 0.004% drops od	Increases uveoscleral outflow	Hyperemia, iris pigmentation , cystoid macular edema, anterior uveitis, hypertrichosis
Hyperosmotics		
Isosorbide 45% orally	Reduces vitreous volume through elevated plasma osmolarity gradient	Nausea, vomiting, headache, confusion etc
Glycerin 50% orally	Same	In addition to isosorbide, cardiac arrhythmias, hyperosmolar nonketotic coma
Mannitol 20% intravenous	Same	In addition to isosorbide, electrolyte imbalance, congestive heart failure
Urea intravenous	Same	In addition to isosorbide, electrolyte imbalance

Laser Iridotomy

Indications:

- Angle closure glaucoma (Sub acute and Acute) – after medically controlling the IOP & Inflammation.
- Prophylactic Iridotomy in fellow eye of ACG

Lasers used: Argon Laser & NdYAG (Preferred laser)

Laser applied to iris at Upper Nasal Quadrant (through Abraham Iridotomy lens - 66 D Plano convex) after inducing Miosis.

Complications – Mild Iritis, transient rise in IOP& rarely hyphema

Argon Laser Trabeculoplasty

Indications:

- Primary Open angle glaucoma
- Pseudoexfoliation and Pigmentary glaucoma

Argon Laser applied (through Goldmann 3 mirror lens) at the Junction of Ant. Non pigmented and post pigmented trabecular meshwork in angle. This causes heat contracture and hence pulling up of TM – opening up its channels.

Glaucoma Surgeries:

- Surgical Iridectomy (rarely done as prim. Surgery nowadays)
 - Goniotomy & Trabeculotomy (for congenital glaucoma)
 - Filtration Surgery: Free filtration eg Iridencleisis, Punch sclerotomy & Schei’s thermosclerotomy.
 - Guarded Filtration: Trabeculectomy
 - Filtration + antimetabolite (MMC) in refractory cases
- Non Penetrating Sx : Visco- canalostomy

Glaucoma valves/Setons

Used in cases of Refractory galucomas when Medical & filtering surgery fail or have high chances of failure.

Implants have a drainage tube that drains a controlled amount of aqueous to Sub Tenon space.

Indications –

- Failed Trabeculectomy
- Glucoma sec to vitreo – retinal surgery
- Neovascular Glaucoma
- Cases of Infantile glaucoma.
- Intractable cases of Pprimary & Sec. Glaucoma

Eg. Molteno Implant, Krupin- Denever, Schocket’s & Ahmed Glaucoma value

Cyclodestructive Procedures

Used in cases of Absolute Glaucoma (Painful blind eyes with no vision) to destroy ciliary body epithelium.

- Cyclocryotherapy (-80⁰ C)
- Nd:Yag Laser cyclo destruction

- Diode laser Cyclophotocoagulation

CONJUNCTIVA

Conjunctiva is a translucent mucous membrane lining the post Surface of eyelids and anterior aspect of eyeball.

Parts of Conjunctiva:

Palpebral	Forniceal	Bulbar
<ul style="list-style-type: none"> • Lines eyelids, adherent to tarsus 	<ul style="list-style-type: none"> • Loose, Redundant 	<ul style="list-style-type: none"> • Covers Sclera

- At limbus the epithelium of conjunctiva becomes continuous with that of cornea

Structure of Conjunctiva:

- 1) Epithelium: it is *stratified squamous non keratinized epithelium*
- 2) Adenoid layer: also called the lymphoid layer and contains the lymphocytes.(follicles form in this layer).
This layer develops 3 – 4 months after birth. Hence no follicular conjunctivitis seen in new borns.**
- 3) Fibrous layer: consists of collagenous & elastic fibres, vessels & Nerves.

Glands of Conjunctiva:

- 1) Mucin Producing : Goblet cells , Crypts of Henle and Glands of Manz
- 2) Accessory Lacrimal Glands : Glands of Krause (in Fornices) and Wolfring (along tarsal borders)

Goblet Cells - Present in →All portions of conjunctiva, plica semilunaris, caruncle

Lymphatic drainage - to *preauricular and submandibular lymph nodes*.

Pathological Terms:

<p>Follicles:</p> <ul style="list-style-type: none"> • Aggregation of lymphocytes and other inflammatory cells in adenoid layer surrounded by blood vessels in their periphery. • Max. in inf. Fornicial conjunctiva • Follicular conjunctivitis may be Viral ,Chlamydial (trachoma) or Toxic
<p>Papillae:</p> <ul style="list-style-type: none"> • Elevated reddish , flat topped raised areas giving red and velvety appearance. • Consists of central core of blood vessels surrounded by lymphocytes. • Max in upper palpebral conjunctiva. • Seen in Allergic conjunctivitis, bacterial infections etc.

ALLERGIC CONJUNCTIVITIS:

- **Spring Catarrh (Vernal Kerato Conjunctivitis)**
 - Exogenous allergy → pollen →therefore in summers
 - Characterized by → Papillae in palp conjunctiva
Thick ropy mucoid, lardaceous discharge
 - Most important symptom → **Itching**
 - Age →Males, 4-5yrs – puberty

Types

- 1) Palpebral.
- 2) Bulbar .
- 3) Mixed

- Signs Raised **Papillae** → **Cobble stone appearance**
- Hypertrophy of sup. Limbal conjunctiva → discrete white spot → **Horner Trantas Spots**

Treatment:

- Topical steroids for treatment of acute episode
- Antihistaminics
- Sodium cromoglycate 2% QID for prophylaxis

2.Phlyctenular Conjunctivitis →

- Due to endogenous proteins to Tuberculous antigen
- In young, un nourished, unhygienic children (8-15 yrs)
- Well circumscribed, yellowish-white nodule solitary/multiple at limbus
- If encroaches on cornea → Phlyctenular Keratitis (Fascicular Ulcer)
- S/S → Pain, discomfort, ↓Vn, Photophobia, Mucopurulent discharge, Lacrimation
- Rx→ 1. Topical Steroids/Topical Steroid+Antibiotics 2. Deworming

Acute Bacterial Conjunctivitis

- Very common, self limiting
- Causes → Staph epidermidis, staph aureus Haemophilus, streptococcus
- **Symptoms**→ Redness, grittiness, discharge, sticking of lashes. Pain is not a feature.
- **Signs**→ B/L conjunctival congestion, more in fornices, Purulent/Mucopurulent discharge
VA →Normal unless cornea involved, No Lymphadenopathy

Treatment: Self limiting, Local antibiotics

Adenoviral Kerato Conjunctivitis:

	Pharyngo Conjunctival Fever	Epidemic Kerato Conjunctivitis
Strain	3-7 Systemic-symp URI.	8-19,
Keratitis	30%	80%

Conjunctivitis→ B/L, Follicular, Preauricular lymphadenopathy
 Watering, redness, Photophobia
 Subconj haemorrhage, chemosis, Pseudomembranes
Rx→ Supportive, Resolves without Residua after 2 wks.

ANGULAR CONJUNCTIVITIS

- Redness limited to intrmarginal strip specially at inner & outer canthi
- Excoriation of skin at Lateral angles
- Cause → **Moraxella**

Symptoms → Discomfort, Slight mucopurulent discharge, Frequent Blinking

Rx→ Zinc Lotion → Inhibits Proteolytic enzyme, Oxytetracycline→inhibits growth of org

ADULT INCLUSION CONJUNCTIVITIS (SWIMMING POOL CONJUNCTIVITIS)

Follicular conjunctivitis,

Chlamydia→ B/L conjunctivitis, Ac. Mucopurulent discharge,

Large opascent (5mm) follicles in fornices

Lymphadenopathy

Keratitis→ upper ½ of cornea with marginal infiltrate

Rx→ Tetracycline oint.

OPHTHALMIA NEONATORUM

- Acute inflammation of conjunctiva seen in a new born child within one month of birth
- Catarrhal discharge(no tears during first 2-4 weeks)

D | D→

- Chronic Dacryocystitis →Mucopurulent discharge
- Buphthalmos → Large cornea, photophobia

Cause	Incubation Period
Chemical	4 – 6 hrs
Gonococcal	2 - 4 days
Other Bacterial	4 - 5 days
Herpes simplex	5 - 7 days
Inclusion (Chlamydia)	5 - 14 days

CAUSES:

<p>1. Chemical –</p> <ul style="list-style-type: none"> • evident few hours after delivery. • Caused by 1% AgNO₃ / antibiotics use as prophylaxis against gonorrheal infection (Crede’s method) • Clinical picture – mild transient hyperemia
<p>2. Gonococcal – presents 2-4 dyas after birth</p> <ul style="list-style-type: none"> - Clinical presentation – purulent conjunctiviites, keratitis, chemosis, membrane / Pseudomembrane formation - It treatment is delayed – corneal ulceration / perforation -Treatment – systemic benzyl pencillin – 50000 U/Kg in 2 divided doses given for 7 days in addition to topical
<p>3. Bacterial – develops b/w 4-5 days after brith</p>
<p>4. Herpes simplex – develops b/w 5th & 7th days of life, due to HSV-2</p> <ul style="list-style-type: none"> - Clinical presentation – blepharo conjunctivitis, Keratitis
<p>5. Chalmydia –</p> <ul style="list-style-type: none"> Most common cause of ophthalmia neonatorum • Chlamydia trachomatis serotypes D to K presents between 5 to14 days • Clinical presentation – acute mucopurulent conjunctivitis / frankly purulent • If treatment delayed – sup. Corneal pannus, conjunctival scarring, corneal opacity • Treatment – topical tetracycline: oral erythromycin 50mg / kg in 4 divided doses for 3 weeks besides treatment of parents

TRACHOMA

Specific communicable kerato conjunctivitis, Affects mainly upper palpebral conjunctiva characterized by formation of follicles and Pannus. Resolution is by cicatrisation

Prevalence :

High Endemic → 50-70% Punjab, Rajasthan, U.P.

Moderately Endemic → 20-50% → Gujrat, M.P. Bihar, Assam, Karnataka

Low Endemic → <20% → J.K. A.P. Tamilnadu Maharashtra

- Age → 1-2yrs. At 5 yrs → Prevalence of active disease declines
- Season → April – September
- Quality of Life → Poverty, illiteracy, ignorance poor housing, dusty, dry climate
- customs → Applying a mixture of lamblack and castor oil called kohl in young children.
- Use of Kajal/Surma with the same Rod by all family members
- Flies → Major vector in infection-reinfection cycle
- Reservoir of infection →, Children with active disease
- Incubation period → 5-12 days
- Etiology → A, B, Ba, C serotypes of Chlamydia trachomatis. C is commonest type in India

Mac Callan Classification:

- Incipient trachoma → Immature Follicles on upper tarsus
- Established trachoma – Follicles predominant
- Cicatrizing trachoma → Trichiasis + Entropion
- Cornea → Superficial punctate Keratitis in upper part of cornea
- Trachomatous Pannus →
 - Develops as lymphoid infiltration with vascularization of the margin of cornea
 - Tends to spread towards centre and involve whole of cornea
 - Level of pannus initially is b/w epithelium and Bowman's membrane. Later Bowman's membrane gets destroyed and superficial stroma becomes involved
- Progressive Pannus → vessels extend to level which forms a horizontal line, beyond this line there is narrow zone of lymphoid infiltration haze.
- Regressive Pannus → line of lymphoid infiltration stops short of vessels

WHO Classification (1987):FISTO

- Trachomatous Inflammation – Follicular
- Trachomatous Inflammation – Intense
- Trachomatous-Scarring
- Trachomatous Trichiasis
- Corneal Opacity

SEQUEALE:

- S-shaped border upper lid
- Trichiasis, Entropion
- Ptosis due to Tylosis and involvement of Muller's muscle or LPS in scar tissue
- Madarosis
- Posterior symblepharon
- Goblet cell destruction and lacrimal duct obstruction → Xerosis

WHO Recommendation of Trachoma Prophylaxis:--Evans JR, Solomon AW. Antibiotics for trachoma.

Prevalence(in population 0-9yrs)	Prophylaxis
>10%	• Mass prophylaxis
5-10%	• Family prophylaxis
<5%-	• Only individual treatment

Treatment :

- Tetracycline → 1% ointment
- Topical sulfonamides → 10%, 20% 30% drops
- Systemic drugs in severe cases-Azithromycin(500mg) single dose

SAFE STRATEGY

- S: Surgery for trichiasis/entropion
- A: Antibiotics for active infection
- F: Facial cleanliness

CORNEA

Anatomy

- Refractive Index 1.37
- Refractive Power +43.0D
- Thickness → Central → 550µm

Layers : Five layers

Epithelium -stratified squamous non keratinized epithelium, has excellent property to regenerate
Bowman’s layer -does not regenerate when damaged, leaves opacity
Stroma - thickest layer, contributes 90% thickness
Descemet’s membrane -toughest layer of cornea
Endothelium - single layer of hexagonal cells, maintain deturgescence of cornea, with age number decrease. 2500-300-cells/mm ² at birth, 1500-2000 cells/mm ² in adults. Most metabolically active layer of the cornea

Special Investigations related to cornea:

1. Pachymetry	Measures corneal thickness
2. Specular microscopy	Photographs corneal endothelium and delineates various cellular characteristics, like size, shape, density and distribution
3. Keratometry	Measures corneal curvature
4. Corneal Topography	Detects abnormalities of corneal shape, surface
5. Laboratory investigation	<ul style="list-style-type: none"> • Scrapings • Corneal biopsy
6. Vital staining	Flourescein stains corneal defects, ulcers; Rose Bengal stains mucus and dead & damaged cells

Corneal Transparency:

- Epithelium→ Homogeneity
- Stroma→ Fibrils arranged in orderly lattice pattern separated by α of light (4000-7000A⁰)
- Endothelium → By its deturgescence function. Most important factor

Corneal Lesions:

Punctuate epithelial erosions→

- Superior → f.b., vernal ds
- Inferior → Trichiasis, entropion, lagophthalmos, drug toxicity

Filaments → Dry eye, herpes zoster keratitis

Descment’s membrance:

- Posterior embryotoxon → Prominence of schwalbe’s line (corresponds to descem. Membrane)
- Hassel-henle warts→ peripheral excrescences in descemments membrane
- Corneal guttata → Central excrescences in descemments membrane
- Breaks in descemments membrane→ congenital glaucoma, birth trauma, keratoconus

Bacterial Keratitis

- Bacterial which invade Normal corneal epithelium
 - N. gonorrhea, N. meningitis
 - Corynebacterium diphteriae
 - Listeria

Other bacteria require predisposing factors→

- Chronic infection of ocular adenaxae
- Underlying corneal disease-Herpetic Keratitis, Bullous Keratopathy, Trauma (Foreign Body)
- Dry Eyes
- Contact Lens wearers
- Neurotrophic/Exposure Keratopathy

Clinical Features→

- Staph. Aureus & Strep. Pyogenes→ Yellow, dense stromal suppuration, surrounded by clear cornea.
- Pseudomonas→Irregular sharp ulceration, diffuse Liquefactive Necrosis. Semi opaque 'ground glass' adjacent stroma. Progresses Rapidly-corneal perforation within 48 hrs.
- Hypopyon Ulcer → Most dangerous→ Pseudomonas pyocanea,
- Common in old, Debilitated and Alcoholics
- **Ulcer Serpens- Pneumococcus→(Most Common in Adults)**

↓

Yellowish-white disc in centre of cornea well marked in one direction

↓

Ulcer↑ in size & depth, on side of densest infiltration (yellow crescent)

Complications of Corneal Ulcer→

- Corneal opacity
 - NEBULA Slight opacity→interferes more with vision due to diffraction of light.
 - MACULA Dense
 - LEUCOMA Dense & White
- Cornea thinned→ Buldges due to IOP→**Keractasia**
- Bulging of Descemets Membrane→ Keratocele/Descemetocoele
- Perforation→
 - Small perforation→Iris adheres to cornea→Adherent leucoma
 - Total Iris prolapse→ Exudate over it→ Pseudo Cornea
 - Anterior Staphyloma-Ectatic cicatrix in which Iris is incarcerated
 - Subluxation of Lens

Treatment→

- Frequent Fortified gentamicin/tobramycin and Cephazolin eye drops
- Subconj injection of Gentamicin or Cephazolin
- Atropine

FUNGAL KERATITIS:

Filamentous- Aspergillus, Fusarium

Non-filamentous-Candida

Clinical Features

- Ocular Trauma by vegetable Matter
- Signs >symptoms
- Greyish white lesion; dry parchment paper like
- Indistinct feathery margins
- Multiple satellite lesions
- Overlying epithelium edges elevated
- Hypopyon may develop-Fixed Hypopyon, infected with fungal hyphae

Treatment- Anti Fungals

- Polyenes – Amphoterecin B, Nystatin. Natamycin preferred currently.
- Imidazoles → Ketoconazole & Triazoles → Fluconazole
- Atropine

ACANTHAMOEBA Keratitis

- Contact Lens wearers

- Fresh water protozoon

Clinical Features→Pain → Severe, out of proportion to degree of inflammation
Ring Shaped infiltrate
Associated limbitis
Radial keratoneuritis

Diagnosis:

- Staining of scrapings with **CALCOFOUR WHITE**
- **Non Nutrient Agar enriched with E.coli**

Treatment:-

- Propamidine Isethionate
- **Polyhexamethylene Biguanide**
- Neomycin drops
- Corneal Grafting → in resistant cases

VIRAL KERATITIS:**Herpes Simplex**

- HSV - 1→ Infection above waist (Skin, lips, eyes). Causes eye infection.
- HSV - 2→ genital herpes. Spread by infected birth canal in neonates

A Primary Infection → virus travels up the axon of sensory nerve to its ganglion Ocular Infection →6M - 5 YRS of age

- **Skin**→ Lids, periorbital area have vesicles → crusts → heal without scarring
- Acute follicular conjunctivitis mild superficial punctate keratitis: (SPK) Treatment→ Acyclovir ointment→5 times/d

B. Reactivation Stage

Active Epithelial→Invasion of the epithelium by the virus

- Dendritic Ulcer → Single/Multiple stains with Fluorescein, ↓ **corneal sensitivity**
- Geographical Ulcer→ Dendritic Ulcer enlarges → Geog. Ulcer
- Treatment → Acyclovir ointment for 7-10 days.

Stromal-Immune response to viral antigen

Disciform Keratitis-Immune response to viral antigen

Endothelitis

- By Hypersensitivity Reaction to viral antigen
- Endothelial damage→ Oedema and area of stromal thickening surrounding wessely ring of Infiltration. Associatea with Descment folds, Mild Ant uveitis KP's

Treatment → Steroids

Herpes Zoster:

- **Elderly**
- Chemotherapy for Lymphomas
- Corticosteroid, Immuno suppressive therapy
- **Initial exposure** → virus remains latent → in sensory ganglion. With stress virus reactivated, migrates down the sensory N. and causes skin vesicles

Active Stage	Healing/Scarring Stage
<ul style="list-style-type: none"> Active Stage → Acute lesions within 3 wks of Rash Skin Lesions → Vesicular rash along distribution of ophthalmic div. of Trigeminal n. In 10% cases -3 ophthalmic division of Trigeminal N. involved. Cutaneous involvement of Nasociliary nerve heralds ocular complications → HUTCHINSON'S SIGN (corneal involvement occurs when vesicles are present, at tip of nose). <p>Treatment → 1.Oral Acyclovir 2. Antibiotic - corticosteroid ointment</p> <ul style="list-style-type: none"> Ocular Lesion- While Herpes Simplex is Primarily Keratitis, Zoster has multiple ocular findings Mucopurulent conjunctivitis with Keratitis Episcleritis/Scleritis → Develops after 1 week Anterior Uveitis Neuroretinitis Neurological Affections→ C.N. Palsies → III. (M. common), IV VI N palsies. Recover within 6 M. Rarely Encephalitis or C/L Hemiplegia 	<ul style="list-style-type: none"> → Chronic lesions, mainly sequale Skin Lesions → Punched out skin scars with Hyper/Hypopigmentation Ptosis, Ectropion, Entropion, Loss of lashes Ocular Lesions → 1. Subconj. Scarring with Dry Eye- Mucus Plaques --> B/W III- VI months. Scleritis→ chronic → sclera atrophy Neurotrophic keratitis Post Herpetic Neuralgia → Severe stabbing, aggravated by touch, heat <p>Recurrent Lesions → may reappear even after 10 yrs.</p>

INTERSTITIAL KERATITIS:

Inflammation of corneal stroma without primary involvement of epithelium/endothelium		
Cause:		
Congenital syphilis	Tuberculosis	Leprosy
Sarcoidosis	Filariasis	
Clinical Features- Vn markedly ↓. Deep vascularisation in centre of cornea (Salmon Patch cornea). Lead to non perfused vessels (ghost vessels)		
Treatment→ Treat primary condition; topical and systemic steroids based on severity		

EXPOSURE KERATOPATHY

- Lagophthalmos due to facial nerve palsy (Neuro paralytic keratopathy)
- Severe Proptosis
- Comatose Patients
- Clinical Features** → Inferior punctate erosions is the classical lesion
- Treatment → Treat underlying cause.

Short term- Artificial tears, lubricating ointment at night, bandage contact lenses, lid taping

Long term - Tarsorrhaphy

NEUROTROPHIC KERATOPATHY

- Occurs in anaesthetic cornea- trigeminal n palsy, Herpes
- Treatment :Artificial tears, patching, Tarsorrhaphy

PERIPHERAL ULCERATION & THINNING

<ul style="list-style-type: none"> • Marginal Keratitis (Catarrhal Ulcer) → Hypersensitivity reaction to staphylococcal exotoxins in pts with chronic staph Blepharitis. Clinical Features→ Subepithelial Infiltrate (separated from limbus by clear zone) at 10, 2,4,8, o' clock positions. Very similar to fasciular ulcer of phlyecten. Rx-> Topical Corticosteroids
<ul style="list-style-type: none"> • Rosacea Keratitis → In Acne Rosacea female → 30-50 years <ul style="list-style-type: none"> • Skin→ chronic Hyperemia of Face, Nose, Central Forehead, Cheeks - Flushing, Telengectasia, Papule, pustule, Hypertrophied sebaceous glands, Rhinophyma • Keratitis→ Not common. Peripheral vascularisation in Inferior part with Pannus • Blepharo Conjunctivitis → Recurrent Chalazia & styes Rx 1. Topical Steroids 2. Systemic Tetracycline
<ul style="list-style-type: none"> • DELLEN→ Saucer like thinning of periph. Cornea due to tear film instability Aetiology→ 1. Raised Limbal lesions→ Dermoids, Episcleritis, Pterygia, Large subconj Haem, Filtering Bleb, 2. Squint Surgery→ Post Op. chemosis 3. Old age Rx→ Remove cause. Patching, Lubricants
<ul style="list-style-type: none"> • Terrien's Marginal Degeneneration → 40 yrs, B/L Asymmetrical Early → Fine, yellow white, Punctate stromal opacities, Mild superficial vascularisation. Present. in upper cornea → Separated from limbus by clear zone Late → progression slow. Peripheral thinning increases → periph gutter Complications→ Perforation, Severe Astigmatism, Pseudopterygia
<ul style="list-style-type: none"> • Mooren's Ulcer <ul style="list-style-type: none"> • Peripheral ulcerative keratitis without any detectable cause • Vasculitits of limbal vessels → ischemic necrosis due to ↑collagenase & proteoglyconase (produced by conjunctival blood.vessels) Clinical features → <ul style="list-style-type: none"> • Early → ↓vn due to irregular astigmatism. Infiltrate near margin of cornea, spreads with advancing border and overhanging edge Late → Ulceration in entire circumference of cornea may spread to centre. severe pain, photophobia, ↓vn if visual axis involved Rx → Topical corticosteriods.and immunosuppressive therapy (systemic steroids and cytotoxic drugs)
<ul style="list-style-type: none"> • Collagen vasulcar disease→ RA, SLE, PAN, Wegener's granulomatosis
<ul style="list-style-type: none"> • Phlyctenulosis

DEGENERATIONS:

ARCUS SENILIS	BAND SHAPED KERATOPATHY (BSK)
<ul style="list-style-type: none"> • Present in 60% pts. b/w 40-60 years. Present in all pts. > 80 years <ul style="list-style-type: none"> • In children / young adults (arcus juvenilis) → may be a feature of systemic hyperlipidemias • B/L lipid deposition which starts in superior and inferior perilimbal cornea. Progresses circumferentially to form a band which is Imm wide • Peripheral border is separated from limbus by a clear zone of cornea. This clear interval may undergo thinning known as senile furrow • Lipid is first deposited in anterior half of 	<ul style="list-style-type: none"> • Deposition of Ca++ salts in subepithelial space & Ant. part of Bowman's layer. Interpalpebral area with clear space separating sharp margin from Limbus Causes <ul style="list-style-type: none"> • Local- Chronic Uveitis, Silicon oil in anterior chamber • Systemic causes- Hyperparathyroidism, Hypervitaminosis D, Multiple Myeloma Rx → Scrape corneal epithelium over the band area. Chelation with EDTA Phototherapeutic Keratectomy(PTK) Superficial Keratectomy

Descemet's membrane and then in anterior stroma	
<p>CLIMATIC DROPLET KERATOPATHY</p> <ul style="list-style-type: none"> • Also known as Spheroidal degeneration, Labrador keratopathy • Prolonged exposure to uv rays is the cause • Golden yellow spherules are seen in the interpalpebral area • Treatment is PTK or superficial keratectomy 	

DYSTROPHIES

Anterior Dystrophies :

<p>(Corneal Epithelium & Basement Membrane)</p> <ul style="list-style-type: none"> • Microcystic (Cogan's):- B/L Dot Like, Cystic/ Linear Finger Print Like Lesions Which Interchange • Reis-Bucklers Dystrophy- Characterized by Recurrent Corneal Erosions (RCE)→ <ul style="list-style-type: none"> • Lack Of Hemidesmosomes→ Poor anchorage of epithelium with basement membrane • When Pt Awakes From Sleep → Severe pain, Lacrimation Photophobia, ↓ V.A.Recurrent corneal erosion <p>Rx - Mild Cases → Artificial Tears, Lubricating ointment Severe Cases → Remove Loose Epithelium and Patch the eye with Atropine ointment. • May need corneal grafting (penetrating keratoplasty or PK)</p> <ul style="list-style-type: none"> • Meesmann's Dystrophy- Tiny Epithelial Cysts In Interpalpebral Area

Stromal Dystrophies→

LATTICE A.D.	GRANULAR A.D.	MACULAR A.R.
Amyloid deposits at different levels in stroma	Discrete crumb like-white granules of Hyaline in ant. Stroma of Axial cornea Does not involve periphery	Focal grey white poorly delineated opacities of Mucopolysaccharides. Extends upto corneal periphery
Stain congo Red Corneal Haze, ↓corneal sensation	Stain →Masson Trichrome	Stain alcian Blue
VA is not much affected	VA is not much affected but scattering of light may be seen	↓VA during early life→ P.K. needed

POSTERIOR DYSTROPHIES

- **Cornea Guttata** → (Central cornea); Similar lesions in periphery →Hassall — Henle bodies
 - Warts/excrescences of Descemets Membrane; Advanced cases → Beaten metal appearance
 - Seen in old age and early stages of Fuch's endothelial dystrophy
- **Fuch's Endothelial Dystrophy** →A.D;- B/L Progressive Female>Male
 Corneal Guttata with Endothelial Decompensation → Corneal Oedema →Bullous Keratopathy → Stromal Oedema in turn leads to epithelial edema and bullae that cause pain on rupturing
 Rx →Hypertonic Agents →Nacl 5% →For Epithelial Oedema and ↓IOP. Soft Bandage C.L., P.K. in advanced cases
- **Posterior Polymorphous Dystrophy** →A.D.
 - Vesicular, geographical, band like opacities on post corneal surface with endothelial dysfunction →Stromal & epith oedema.
 - Associated with OAG, ACG → Irido corneal adhesions, corectopia

KERATOCONUS

- Conical cornea with thinning of entral/ inf paracentral areas
- B/L, Asymmetrical
- Irregular Myopic Astigmatism
- Diagnosis-Scissoring Reflex
- **Slit Lamp** →Fine Vertical Folds (Vogt's Lines) in deep stroma or Descemets membrane Prominent Corneal nerves
- Bulging of lower lid when pt. looks down → Munson's Sign
- Fe deposits at base of cone →Fleisher's Ring
- Corneal Topography is used for diagnosis-KISA index

Complication Rupture in descemets memb→leakage of fluid in stroma & epith.leads to acute hydrops

Rx - contact lens →hard/ semi soft do not stop progress of disease.

- Newer Rx- Collagen cross linking (C3R)- Application of riboflavin followed by infra-red exposure re-arranges corneal collagen neutralizing keratoconus.
- P.K. in advanced cases

Associations:

- Down's Syndrome
- Vernal Catarrh
- Turner's Syndrome
- Blue Sclera
- Marfan's Syndrome
- Aniridia
- Ehler's Danlos Syndrome
- Retinitis Pigmentosa
- Osteogenesis Imperfecta

<p>Penetrating (Full Thickness) Indications →</p> <ul style="list-style-type: none"> • Optical → improve vision →replace opaque cornea with clear donor tissue • Tectonic →restore conical anatomy in stromal thinning and descmetoceles • Therapeutic→Removes infected corneal tissue unresponsive to antimicrobial / antiviral rx <p>Donor tissue →removed in <6 hours after death. Young pts preferred. Pts not taken as donors- HIV +ve, hepatitis b/c, slow virus diseases, head and neck malignancies,septicemia</p> <p>Graft failure' Early → Cloudiness of graft from first post op. day</p> <ul style="list-style-type: none"> • Due to defective donor endothelium in number and quality. Other causes- glaucoma/ Uveitis. • Late → due to allograft rejection. First clinical sign → kp on graft endothelium. Others- ciliary flush,endothelial rejection line, graft oedema. Rx →Topical/Periocular corticosteroids, Immuno suppressive agents 	<ul style="list-style-type: none"> • Lamellar (Partial Thickness) → Opacification of superficial 1/3 of corneal stroma. Photo therapeutic keratectomy is the new alternative. Newer techniques are Deep Lamellar Endothelial Keatoplasty (DLEK) and Descemets Stripping Endothelial Keatoplasty (DSEK)
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Corneal Preservation and Eye Banking

- Corneal Preservation technique must be such so as to maintain endothelial viability

- Ideal death enucleation time is 6 hrs
- **Refrigerated Moist chamber**:- Eyes stored in a special bottle with sterile solution placed at the bottom of jar to produce moist chamber. Eye is supported by a metal holder with cornea facing up. Jar kept in refrigerator at 4°C. Eye can be stored for b/w 24 - 48 hours. This is **short term preservation**
- **Modified M.K. Medium** (McCarey Kaufman Medium)- (i) 5% Dextran 40 (ii) HEPES buffer, Phenol Red as pH indicator. Most surgeons prefer using the stored tissue within 3 -4 days. This is **intermediate preservation**
- **Long term preservation -Cryopreservation or tissue culture**

Corneal Changes In Metabolic And Toxic Disorders

- Corneal Crystalline Deposits: in stroma mainly/epithelium.
 - A. Chrysiasis -> Deposition of gold
 - B. Monoclonal Gammopathy- Occurs In Association With →Multiple Myeloma, Lymphoma
- Cornea Verticillata (Vortex Keratopathy)
 - Symmetrical, B/L, Golden corneal epithelial deposits that appear In Vortex/ Whorl Fashion
 - Occurs In → Fabry's Disease. Patients Treated With →Chloroquine, Meperidine, Arniodarone , Indomethacin, Chlorpromazine , Tamoxifen
- Mucopolysaccharidoses → Corneal Deposition In Hurler And Scheie
- Wilson's Disease (Hepatolenticular Degeneration)- Deficiency Of α -2 Globulin →Ceruloplasmin Ocular Features → 1. Classic Kayser - Fleischer Ring 2. Green Sunflower Cataract

Prominent Corneal Nerves

- Keratoconus
- Congenital Glaucoma

Enlarged Corneal Nerves

- Neurofibromatosis
- MEN2B
- Leprosy
- HSV keratitis
- Acanthamoeba Keratitis
- Refsum's disease

XEROPHTHALMIA

It is the term used to cover all the ocular manifestations of vitamin A deficiency.

WHO classification (1982)

- XN-Night blindness
- XIA- Conjunctival xerosis
- XIB- Bitot's spots– triangular, foamy, grey, sharply demarcated patch
- X2- Corneal xerosis – surface dry (tree bark appearance)
- X3A - Corneal ulceration / keratomalacia < 1/3 corneal surface
- X3B- Corneal ulceration / keratomalacia > 1/3 corneal surface
- XS- Corneal scar or opacity
- XF- Xerophthalmia fundus– ujemura spots – focal loss of RP epithelium

Treatment

- Children 1-6 yrs – 3 doses of 200,000 IU Vit A orally given on day 0, 1, 14
- If persistent vomiting / diarrhea – IM 100,000 IU of vit A is substituted for first oral dose
- Children < 1 year or whose weight is less than 8 kg- treatment with half the dose of above

Prophylaxis:

Children Less than 6 months: 50,000 IU orally
 Children 6 – 12 months: 100,000 IU orally
 1-6 yrs: 200,000 orally every 6 months
 Pregnant Females: 20,000 IU orally at time of delivery and next month

TRAUMA

- **Subconjunctival hemorrhage** obscures the underlying details. No treatment is required; the blood takes around 2-3 weeks to clear.
- Abrasion in the cornea is best managed with patching the eye with antibiotic and cycloplegic medication. Descemet's membrane tears are vertical; generally, two or more parallel or concentric lines may be present. Reduced vision and overlying stromal edema are present.
- The commonest location of an extraocular foreign body is the sulcus subtarsalis. Corneal foreign body can be removed with a special spud or a hypodermic needle. A deeper FB in the cornea is removed surgically.

Chemical injury to the eye:- Alkalis are more dangerous than acids as they denature the proteins.

- First line treatment is copious irrigation of the eye with any fluid available.
- Corneal abrasions are common, secondary glaucoma is generally seen. Later, symblepharon formation, corneal opacities and severe dry eye are significant complications.

Corneal pigmentation:

Pigmentation:

Iron	Keratoconus (Fleischer's Ring)	Epithelium
	Old Age (Hudson Stahli Line)	Epithelium
	Pterygium (Stocker's Line)	Epithelium
	Filtering Bleb (Ferry's Line)	Epithelium
	Siderosis	Epithelium
Gold	Chyriasis	Epithelium
Silver	Argyrosis	Stroma, Descemments Membrane
Copper	Wilson's ds (kayser-flesischer ring)	Descemments membrane
Melanin	Pigment dispersion syndrome	Endothelium (Krukenberg's spindle)

SCLERA

Episcleritis: No pain
Not associated with uveitis
Responds to topical steroids

Scleritis: Extremely painful
Associated with connective tissue disorder in 50%.
Most common association is with **rheumatoid arthritis**. Others are Wegener granulomatosis, polyarteritis nodosa and SLE.
Associated with uveitis
Needs NSAIDS - Flurbiprofen; Oral Steroids

Classification of Scleritis

a. Anterior

- Non-necrotising- may be nodular or diffuse
- Necrotising-May be with or without inflammation. **Scleromalacia perforans** is a type of necrotising scleritis without inflammation, associated with long-standing RA.

b. Posterior

- Non-necrotising
- Necrotising- Surgically induced necrotising scleritis(SINS)

Blue sclera

Osteogenesis imperfecta
Paget syndrome
Ehler Danlos syndrome
Marfan syndrome
Staphyloma
Healed scleritis

Staphyloma: Ectasia of the outer coats of the eye with incarceration of the uveal tissue.

- 1) Anterior-Due to perforated corneal ulcer
- 2) Intercalary - within 3mm of the limbus.(3mm is the site where the anterior ciliary vessels enter.)
- 3) Ciliary - Posterior to 3mm from the limbus. Healed scleritis is the cause
- 4) Equatorial - in the region of vortex veins. Seen in high myopia
- 5) Posterior - seen in myopia

UVEITIS

- UVA means grapes. Its colour is dark like that of grapes
- Uvea has 3 parts — Iris
Ciliary body
Choroid

IRIS

- Diameter →21 mm
 - Divided by Collarette (thickest part, 2 mm from pupil) into inner pupillary zone and outer ciliary zone
 - Iris consists from before backwards following 5 layers:
 - Anterior Endothelium
 - Anterior limiting layer
 - Stroma
 - Posterior membrane of Bruch
 - Posterior epithelium
- STROMA** →consists of loose connective tissue
- In it are embedded →Sphincter pupillae muscle, Vessels and nerves of Iris and Pigment cells.
 - Sphincter pupillae- Circular, 1 mm broad smooth muscle, forms a ring all around the Papillary margin
 - Derived from ectoderm
 - Supplied by *III* cranial N via short ciliary n.
 - Vessels →Form bulk of iris
 - Run radially, form streaks on ant. surface, sinuous course allows movements of iris
- Posterior Membrane of Bruch →Consists' of thin layer of plain muscle fibres →Dilator pup illae that extends from pupil to iris and innervation by sympathetic via long ciliary nerves
- Posterior Epithelium →consists of 2 pigmented layers.
- After lining the back of iris, pigment epithelium curls around pupillary margin and forms black fringe on front of iris known as ectropion uveae. In darker races, iridal stroma contains pigmented melanocytes at birth, thereafter it increases in amount

CILIARY BODY

- Continuous with choroid and iris. Begins 1 mm behind limbus
- — 8 mm on temporal side; 6.5 — 7 mm on Nasal side.
 - Has 2 parts: Pars Plicata (Anterior part, 2 mm wide) and Pars Plana (Posterior part, 4 mm wide)
 - Pars Plicata has 70-80 ciliary folds or processes (pleats, thus the name)
 - Bulk of ciliary body has ciliary muscle (CM)
 - 3 parts of CM →> outermost →> longitudinal (Meridional), Middle oblique (Radial), inner Circular.
- Action of C.M.** → Accomodation (helps in near vision). Mainly done by circular and radial part of C.M.
- N. supply →parasympathetic Nerve (Via III N) via Nerve to Inferior Oblique
 - Resting tone of C.M. is + ID
- CILIARY PROCESSES**-Most vascular structure of eye
- Covering these processes →2 layered epithelium.
 - Outer pigmented epithelial cells
 - Inner non pigmented epithelial cells posterior outer Blood Retinal Barrier
 - main action of aqueous formation is in the non pigment epithelial cells

CHOROID

- Posterior part of vascular coat of eye. Extends from optic nerve to ora serrata
- Made of 5 layers →
- Suprachoroid lamina/Lamina Fusca→Lamina more tightly adherent posteriorly than anteriorly. Choroidal detachment occurs more commonly anteriorly
- & 3. Layer of large and medium vessels respectively 4. Choriocapillaris --> Fenestrated capillaries of choroids. Nourish the outer part of Retina 5. Basal Lamina / Bruch's membrane → Firmly adherent to retinal pigmented epithelium (RPE)

BLOOD SUPPLY OF UVEA

Short posterior Ciliary arteries → supply Choroid
 Long posterior ciliary and Anterior ciliary arteries → Supply Iris and ciliary Body.

Ophthalmic Artery
 2 Trunks of post ciliary arteries
 Divide in 10 -20 branches

Majority form short posterior Ciliary arteries ↓ Pierce sclera around optic nerve Some anastomose ↓ Circle of zinn (Supplies Optic Nerve)	2 branches form Long posterior Ciliary arteries Ciliary arteries ↓ Pierce sclera around optic nerve ↓ Enter suprachoroidal space between choroids and sclera ↓ Reach the ciliary muscle ↓ CIRCULUS IRIDIS MAJOR Supply iris and ciliary body
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Majority supply ↓ Choroid

Anterior Ciliary Arteries → 7 in number

- Derived from muscular arteries to 4 Recti muscle
- 2 arteries emerge from each muscular artery except that of lateral rectus from which only one comes gives branches to - sclera, iimbus, conjunctiva.

Major arterial circle → Site →on ciliary body and on root of iris, Made of long posterior ciliary arteries and Ant ciliary arteries

Minor Arterial circle→ present at collarette

- From major arterial circle, radial branches run towards pupil in iris stroma and near pupillary margin, arterial and venous anastomosis takes place (circulus vasculosus iridis minor)

UVEITIS CLASSIFICATIONS

Anatomical		
<ul style="list-style-type: none"> • Anterior Uveitis- Iritis Iris or Iridocyclitis -Iris + Pars Plicata • Intermediate Uveitis →Pars Planitis →Pars Plana • Posterior Uveitis Choroiditis/ Retinitis/ Chorioretinitis • Pan Uveitis →Entire Uveal Tract 		
Clinical →Acute →Sudden Onset, Persists < 6 Wks; Chronic →Insidious, Persists Months/Yrs		
Pathological	Granulomatous	Nongranulomatous
Onset	Insidious	Acute
Course	Long	Short/self limiting
Inflammation	++	+++
Pain	±	+++
Iris nodules	+++	-
KPs	Mutton Fat (Epitheloid cells)	Small (Lymphocytes)
Fundus	Nodular lesions (Granulomas)	Diffuse involvement

<ul style="list-style-type: none"> • ANTERIOR UVEITIS → Symptoms → Redness, ache/ pain, ↓ Vn. Lacrimation, photophobia may be present → Chronic uveitis → eye white, minimal symptoms • Signs → • Circumcorneal congestion • KP's → Mid & Inferior zones as Ar ▲ s Triangle → Size : Small KP's - Herpes Zoster; Large KP's → MUTTON FAT (Greasy waxy) in granulomatous Uveitis. Made of epitheloid cells + macrophages Fresh KP'S → White, Round white. Old KP'S → Shrink, Fade, Pigmented • Aqueous Cells → Sign of active uveitis Grade 1-5 ± 5-10 + 10-20 ++ 20-25 + + + >50 ++++ • Aqueous Flare → Leakage of proteins in aqueous from damaged blood vessel. • Iris Nodules → Koeppe → Small, at Pupillary Border → Post synechia. Prototype TB Busacca → Large, on Iris away from pupil. Seen in Sarcoidosis, Leprosy. • Iris Atrophy → Moth eaten appearance of Herpes Zoster • Post Syrtachiae → B/W Iris & Lens 360° → Seclusio Pupillae (Total ring or annular synechia) ↓ Aq. Trapped Behind Iris (Iris Bombe) → Angle closure ↑ IOP • Occlusio Pupillae → Fibrovascular memb covers iris & blocks pupil. Can cause glaucoma. 	<ul style="list-style-type: none"> • POSTERIOR UVEITIS → Symptoms Floaters, ↓ in central Vn Signs → • Vitreous Opacities → Small or Snowball Snow Ball → Large size opacities in Pars Planitis, candidiasis, sarcoidosis • Vitreous Flare • Chorio-Retinitis 4. Vasculitis - Periphlebitis or Periarteritis • R.D. → Exudative Harada's ds
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MANAGEMENT OF UVEITIS

<ul style="list-style-type: none"> • Cycloplegics • To give comfort → by relieving spasm of ciliary muscle. For this Atropine is given for 1-2 weeks. Once inflammation shows signs of subsiding, use short acting mydriatic eg Tropicamide. • To prevent posterior synechia- Combine with short acting mydriatic to keep pupil mobile • Steroids- Can be used topical, sub-tenons inj or systemic as per severity <p>Complications → Glaucoma, Cataract, Corneal ulcers, Ptosis</p> <ul style="list-style-type: none"> • Cy-totoxic Drugs- In potentially blinding conditions or if intolerance to steroids: <p>Used in:-</p> <ul style="list-style-type: none"> • Behcet's disease → Chlorambucil/Azathioprine • Sympathetic uveitis → Chlorambucil + cyclophosphamide • Intermediate uveitis → Azathioprine, chlorambucil, cyclophosphamide; JRA → Chlorambucil • In any other refractory uveitis Methotrexate and cyclosporine are used also
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REITER'S SYNDROME

- Young males, HLA B-27 + ve

Clinical Features→

- Uveitis → In 20% cases, unilateral Iridocyclitis as first attack, recurrent attacks are less severe
- Keratitis → SPK / Subepithelial stromal infiltrate; Often accompanies conjunctivitis
- Urethritis → Non specific urethritis & cystitis; chronic prostatitis in recurrent cases
- Arthritis In wt. bearing joints → Knees, Ankles
- Keratoderma blennorrhagica of palms and soles, circinate balanitis, nail dystrophy Prognosis → Both ocular and systemic features are self limiting

JUVENILE RHEUMATOID ARTHRITIS (JRA)

Sero-ve arthritis < 16 yrs; ANA + VE.

3 types:

- Systemic onset JRA → Still's Disease → Uveitis → Rare
- Poly articular onset, IRA → 5/> Jts involved in I - 3 months, Knees, wrist, ankles. Uveitis rare
- Pauciarticular onset JRA 4/ < JTS in I - 3 months, Knees— Uveitis → common Chronic Non Granulomatous uveitis

In severe cases → Band shaped Keratopathy 40% and Complicated cataract — 30%. Have florid uveitis with cataract surgery. IOL may be avoided.

ANKYLOSING SPONDILITIS

Most common orthopedic condition associated with uveitis

- Chronic Inflammatory arthritis, Involves axial skeleton esp sacroiliitis
- Male --> 20-40yrs; HLA B 27+ ye, -ve for RF Seronegative
- Acute, recurrent non granulomatous iridocyclitis
- Diagnostic Test → X-ray of sacroiliac Joint

SARCODISIS

Multisystem granulomatous disorder of unknown etiology

Young adults →B/L Hilar LNopathy with pulmonary infiltration

Eye lesions:

Violaceous sarcoid plaques on skin

Infiltration of lac gland → dry eye

Episcleritis/conjunctivitis

Chronic Granulomatous Iridocyclitis→B/L, older pts

Complicated cataract, Sec glaucoma

Vitreous→ Diffuse vitritis, Snow ball opacities

Fundus→

- Bl. Vessels→ Peripheral Retinal Periphlebitis exudation→candle wax drippings
- Sarcoid Nodules- Choroidal, Retinal or Preretinal nodules or granulomas. Typically discrete grey-white and located inferiorly and anterior to equator→Lander's Sign
- Optic Nerve→ Focal granuloma, papilloedema (CNS involvement)

BEHCET'S DISEASE

- Idiopathic Multisystem Disease in young males. HLA B5 +ve

• 4 major Features

- Recurrent oral ulceration → Aphthous ulcer
- Genital ulceration
- Skin Lesions → Erythema Nodosum
- Eye signs: External → conjunctivitis, episcleritis, keratitis Uveitis- B/1 recurrent nongranulomatous iridocyclitis associated with transient hypopyon Vitreous → severe & persistent vitritis with Fundus → neuro retinitis Treatment- Steroids with Chlorambucil/Azathioprine.

VOGT KOYANAGI HARADA (VKH) SYNDROME

Idiopathic Multisystem disorder

- Cutaneous signs→ Alopecia, poliosis, vitiligo
- Neurological signs → Encephalopathy
- Auditory symptoms → Tinnitus, vertigo, Deafness

- Anterior & Posterior Uveitis - B/L granomatous iridocyclitis Fundus choroiditis → Exudative R.D.
- Perilimbal vitiligo(Suguir's sign)
- Chronic cases show Sunset Glow Fundus

SYPHILIS

Congenital Syphilis→ Salt & pepper fundus with pale optic nerve
Corneal Lesions

Other causes of salt & pepper Fundus- Rubella, Influenza, Rubeola, Mumps, Herpes Simplex.

Acquired Syphilis→ Iridocyclitis in 4% cases. Granuloma tous / Nongranulomatous

- **Iris Roselola**→ Hyperemic bright engorged preexisting blood vessels in middle 113 of iris
- Gurnmas → At Root of Iris
- Papillitis → Hallmark sign and Neuro Retinitis → Diffuse assoc with meningitis
- ChorioRetinitis→B/L, multifocal, diffuse exudative choroiditis, and periphlebitis

Complications→Chorioretinitis → Bone 5ipicule →Ring scotoma; Optic atrophy

Treatment → Steroids under cover of systemic penicillin

TOXOPLASMOSIS

- Infestation by intracellular protozoan → Toxoplasma gondii;
- Definitive Host → cat; Intermediate host → Humans, mice, livestock
- Congenital toxoplasmosis → Most human cases are congenital.
Transmitted to Fetus thru placenta

Inactive at birth

Recurrent Retinochoroiditis (10 — 35 years, Average 25 years)

B/L Healed chorio-retinal scars. Organisms well encapsulated in the cysts are released ---> Hypersensitivity to them causes inflammation near scars.

Clinical Features → Granulomatous/Nongran.Uveitis

- AC → Quiet but Vitreous → Severe vitritis, has white color
- Fundus → 1. Focal Necrotising Retinitis at/ near macula→ Yellow lesion at macula→ Fluffy indistinct edges: Headlight in Fog appearance

Complications:CME, Retinal Neovascularisation, Tractional R.D

Rx →Steroids with: Clindamycin/ Spiramycin Sulphonamides Pyrimethamine

OCULAR TUBERCULOSIS

Ocular Manifestations- Very diverse:

- Phlyctenular Keratitis
- Granulomatous/Non Granulomatous Iridocyclitis:- Focal/multifocal choroiditis or yellow choroidal tubercles/nodules. Optic Nerve →Granulotna
- Miliary Tb →Panuveitis

Treatment- Steroids under AU cover

LEPROSY

Uveal involvement more common in BL and LL varieties of Lepromatous

Ocular Findins→ Loss of lateral third of eye brows, madarosis of lashes

Keratitis (neuroparalytic or interstitial)

Episcleritis/ Scleritis

Chronic Iritis → Granulomatous. sIRIS PEARLS at pupillary margin (Necklace) → Bacilli

within histiocytes with bussacas nodules - his Atrophy

Treatment-Steroids under cover of Anti leprosy treatment

OCULAR AIDS

- External →
 - Kaposi's Sarcoma → Conjunctiva (Bright Red mass in Lower Fornix)
→ Eyelid skin tumors --> Elevated, Purple, Non tender Nodule
 - Severe Herpes Zoster ophthalmicus
- Slit Lamp →Herpes Zoster uveitis →Iris Atrophy
- Vitreous →Vitritis in eyes with CMV retinitis, candida encioph. and Toxoplasmic retinitis

• **FUNDUS** →

- Microvasculopathy- Cotton wool spots →Commonest ocular lesion. Resolve in 4-6 weeks

- CMV Retinitis → Involves the central fundus. Typical appearance is called Sauce and Cheese Retinopathy or Pizza-pie retinopathy
May spread along the peripheral retinal blood vessels. This is called Brushfire appearance.
- Treatment- Ganciclovir/dfoscarnet/ Cidofovir

EAL'S DISEASE

- Idiopathic B/L peripheral retinal periphlebitis
- Young males
- Symptom → Sudden ↓VA due to vitreous haem
- Signs → Sheathing of small peripheral retinal venules (periphlebitis) causes retinal hypoxia

↓
Retinal Neovascularization

Complications → Extensive retinal & Vit. Hemorrhage & Tractional R.D.; Rubeosis → Neovascular glaucoma
Treatment → Pan Retinal Photocoagulation Pars plana vitrectomy for Vit Haem, Tract R.D

Other common causes of **Vitreous hemorrhage**:

Older adults- DM, CRVO; Young pts- Trauma, Eales disease

PARS PLANITIS (Intermediate Uveitis)

- Chronic intraocular inflammation. Bit, Asymmetrical Young Adults

Symptoms → Floaters and ↓VA due to macular edema

Vitreous → cells in ant, vitreous, snow balls/cotton balls

At Pars plana -Peripheral vasculitis — Sheathing of Terminal venules - grey white plaque in Inf. pars plana (snowbanking)

Complications (1) CME (2) Complicated CATARACT (3) Tractional R.D

Treatment → Steroids- Subconjunctival injection or pulse I/V methylprednisolone based on severity

SYMPATHETIC OPHTHALMITIS

- B/L granulomatous panuveitis due to penetrating trauma associated with uveal prolapse
- Traumatized eye time eye. Other eye Sympathizing eye Latent Period- following trauma 2 weeks — 3 months, 90% → within 1 year

Symptoms → *Photophobia, Loss of Accomodation* → *First symptom*

↓Vn → Transient myopia due to cyclitis

Slit Lamp → Earliest feature → flare in retrolental space
→ Keoppe Nodules and Mutton Fat KPs

Fundus → Small, deep, yellow spots → **Dalen Fuchs Nodules** → scattered in both fundi → Made of epitheloid cells lying between RPE and Bruch's membrane, may spare choriocapillaris.

Complications → Cataract, Glaucoma, phthisis bulbi

Treatment → Early diagnosis followed by trial of pulse IV methylprednisolone with or without immunosuppressants is the modern line of management. Encucleation of exciting eye within 2 wks if medical trial fails.

Fuch's Uveitis Syndrome Or Fuch's Heterochromic Cyclitis

- Chronic Non granulomatous Ant. Uveitis
- Unilateral, middle aged adults
- Slit Lamp → KPs → small Round stellate scattered throughout corneal endothelium
- Iris → Iris Atrophy, Heterochromia, Rubeosis, absence of posterior synechia
- Gonioscopy → Haemorrhages develop due to fine new vessels in the angle (Amsler's sign)
- Complications → Cataract, Glaucoma

Choroidal Melanoma

- 85% of all uveal melanomas
- Most common primary intraocular tumor in adults. Most frequent in sixth decade
- Diagnosis- Subretinal dome shaped mass, brown or grey with surface orange pigment (lipofuscin)
- USG -FA Shows typical dual circulation

Treatment- Brachytherapy for tumors < 10mm in elevation and <20mm in diameter

- External Beam radiotherapy for larger tumors and tumors close to macula
- Transpupillary thermotherapy (TTT) for small tumors and tumors close to fovea
- Local resection for thick tumors unresponsive to radiotherapy
- Modified Callender classification - Spindle cell 45%
 - Epitheloid cell 5%
 - Mixed spindle and epitheloid cell

Poor prognostic factors

- Many epitheloid cells; lymphocytic infiltration
- Large tumors,
- Extrascleral extension, anterior location
- Age >65 years

RETINA

ANATOMY

- Retina is innermost nervous tunic of eye
 - Thickness of Retina →

100μ	-	Ora Serrata
350μ	-	Macula
150	-	Equator
90μ	-	Fovea
 - Important cells that form Retina →
 - Visual Cells (Rods & Cones)
 - Bipolar Cells
 - Ganglion Cells
 - 10 Layers Of Retina From Without Inwards→
 - Retinal Pigment Epithelium (RPE)
 - Layer Of Rods & Cones
 - External Limiting Membrane
 - Outer Nuclear Layer - Contains cell bodies of photoreceptor cells
 - Outer Molecular (Plexiform) Layer - Synapse between photoreceptors and bipolar cells
 - Inner Nuclear Layer-Contains the cell bodies of bipolar cells
 - Inner Molecular (Plexiform) Layer-Synapse between bipolar and ganglion cells
 - Ganglion Cell Layer
 - Retinal Nerve Fibre Layer (RNFL) -Constituted by the axons of the ganglion cells
 - Internal Limiting Membrane
- **Retinal Pigment Epithelium** → Extends from Optic Nerve to ora serrata
 - Single layer of cells firmly adherent to basal lamina of choroid, but loosely to Rods & cones
 - Hexagonal cells, have macrophagic function. Involved early in Siderosis bulbi
 - Photoreceptors (Rods & Cones)

Rods - Contains Rhodopsin. Help vision in dim light and register movement at periphery of visual field

 - Rhodopsin

Opsin (Glycoprotein)	Retinal (Chromophore of Vit A aldehyde → Retinaldehyde)
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 - Vit A ordinarily exists as trans isomer Photoactive form →11-cis Retinal (When bonded to opsin)
 - Rhodopsin has peak absorption at 500 nm i.e. deep green light → Most effective in bleaching & color to which dark adapted eye is most sensitive
 - There are ≈ 120 million Rods in Retina
 - No Rods at Foveola (Central 350μ of Fovea), Maxm Rods →20° off fovea

Cones → 6.5 million cones in Retina
 → Highest Concentration of cones at Fovea, here they elongate & thin & are tightly packed Cone Pigments have collective absorption peak at 565 nm
 Serve color vision for blue, green and red
 Transduction & Receptor Potential Hyperpolarised with light
- OPTIC DISC → White, circular, 1.5mm (1500μ) in diameter. Only layer present is →Nerve Fiber Layer. No photoreceptors, If Light Falls → No visual impression is excited. known as BLIND SPOT
- MACULA → Oval area at Post. Pole, 5 mm in diameter.
- Centre is present 4 mm temporal and 0.8 mm inferior to centre of optic disc
 - Has xanthophyll pigment.
 - Ganglion cells are arranged in 6-8 layers around Fovea
 - Fovea → Depression in centre of Macula. 1.85mm
 - No Rods present. All Retinal layers spread aside so that light falls directly on cones

- Foveola → Forms central floor of Fovea. 0.35 mm in diam. Thinnest part of Retina → No ganglion cells, entire thickness has cones. 3 cone cells connected to one ganglion cell
- Site of Maximum vision [In rest of Retina one ganglion cell connected to 100 cones]

Ora Serrata → Junction b/w Retina and Ciliary Body. Corresponds to insertion of Rectus muscles i.e. in emmetropic eye 7 mm Behind Limbus Temporally and 6 mm Behind Limbus Nasally.

Vitreous Base → Attachment of vitreous in ora serrata region.

Vortex Veins → Venous drainage of Uvea is by vortex system

- Located post to equator in 1,5,7 & 11 O'clock meridians
- Choroidal melanoma spreads thru these veins

EXAMINATION OF RETINA

- Indirect Ophthalmoscopy- Used to visualize Peripheral Retina.
- Fundus Contact Lenses e.g. Goldmann Triple Mirror contact Lens
 - Central Part → for 30° view of post pole of retina; Equatorial Mirror → (largest & oblong) → for viewing 30° to equator; Peripheral Mirror → (Intermediate & Square) B/W Equator and ora serrata
 - Gonioscopic Mirror → (Smallest, Dome shaped)—Extreme Periphery, pars plana & angle of eye

Retinal Detachment

Definitions:

- Retinal Break- Full thickness defect in neurosensory retina.
- Types- Horseshoe tear and retinal hole.
- Retinal Detachment → Separation of neurosensory retina from RPE by vitreous (Sub retinal in) fluid).
- Choroidal Detachment Effusion of fluid in suprachoroidal space, b/w choroid and sclera

Types:

- RHEGMATOGENOUS R.D. → Essential lesion is rhegma (Retinal break)
 - Predisposing Peripheral Retinal degeneration → All predispose to retinal breaks:
 - Lattice degeneration → In 2nd to 3rd decade
 - Present in → Myopes
 - Sharply demarcated, circumferential, spindle shaped areas of retinal thinning.
 - Have arborizing network of white lines
 - Snail track degeneration → Sharply demarcated bands of tightly packed snow flakes → frost like appearance
 - Acquired Retinoschisis → Splitting of neurosensory retina in 2 layers
 - Typical Retinoschisis → Split at outer Plexiform Layer
 - Reticular Retinoschisis Split at level of Nerve Fibre Layer
 - More common in hypermetropes.
 - Most common site Infero temporal periphery of Fundus
 - White with pressure → grey appearance of retina on indenting sclera
 - White without pressure → Grey appearance of Retina without indenting sclera, giant tears develop at post.border of white without pressure
 - Trauma 10% of R.D. cases.

CLINICAL FEATURES

- Photopsiae → Flashes of light → Due to vitreo-retinal traction at site of break
 - Floaters
- **Visual Field Defect** → Black curtain
- Loss of Central vision → Involvement of Fovea

Signs → **Fresh R.D.**

- Retinal Breaks (Rhegma) → Red due to contrast b/w sensory retina and choroids
- Configuration → Convex
- Mobility → Detached Retina → undulates freely

Prophylaxis → Is given in following circumstances

- Horse shoe tear dangerous than hole; Large break dangerous than small break
- Tears with symptoms of photopsiae, floaters.
- Superior Breaks (Sub Retinal Fluid spreads due to gravity) & supero-temporal tears as may involve Macula
- Aphakia, Myopia, one eyed patient

Done with: Photocoagulation for central break or Cryotherapy for peripheral break

Surgery → First thing to do is seal the break. Done with laser or cryo.

- Scleral Buckling → Surgical procedure to create inward indentation of sclera
Done with buckle explant or encirclege band → silicone material sutured directly onto sclera to create a buckle effect.
- Drainage of Sub Retinal Fluid
- Intra Vitreal Injections → Cause internal pressure on separated retinal layers
- Air or Air +SF6 → Lasts twice as long. New Gas Is C3F8. 2. Silicone Oil

TRACTIONAL RD → Due to contracting vitreoretinal membranes due to long standing vitreous hemorrhage.

Causes → D.R., CRVO, Eales disease, Trauma

Signs → 1. No Breaks

2. Configuration -Concave. Highest elevation retina at site of vitreo Retinal Traction

3. Reduced Mobility

Treatment- Pars Plana Vitrectomy + Endophotocoagulation

EXUDATIVE R.D. Passage of fluid from choroid to sub retinal space leads to RD

Cause → Choroidal Tumours Melanoma, Heiniangioma, Metastasis

Choroiditis Harada's disease, Post scleritis

Symptoms → No photopsiae, Floaters seen due to vitritis

Visual Field defect → suddenly, progresses rapidly

Signs → 1. No Breaks 2. Configuration → Convex Retina smooth (not corrugated)

- Shifting Fluid → Hall mark

Treatment- Treat primary choroidal lesion and RD is reversible.

RETINAL VASCULAR DISORDERS

DIABETIC RETINOPATHY

Most important risk factor is duration of diabetes.

CLASSIFICATION

1. Background
2. Preproliferative
3. Proliferative
4. Maculopathy

BACKGROUND D.R. →

- Microaneurysms → They are dilated capillaries at level of Inner Nuclear Layer. 20-200 pm in size, Most present temporal to macula. First detectable lesions of D.R..
 - Dot & Blot Hemorrhages: From microaneurysm. Located in the outer plexiform layer
 - Flame shaped haemorrhages- Present in the nerve fibre layer
 - Hard Exudates B/W Outer plexiform & Inner Nuclear Layer.
 - Yellow waxy appearance. Can present as Circinate ring at macula
- Rx → Good metabolic control of DM

PRE PROLIFERATIVE → Due to Retinal Ischemia

- Cotton wool spots (Soft exudates) → Interruption of Axoplasmic Flow in arterioles-ischemia
 - IRMA- Intra retinal microvascular abnormalities; Venous changes → Dilation, Beading, Looping
- Rx Photocoagulation in areas of capillary nonperfusion

PROLIFERATIVE →

- Neovascularization- NVD (Neovascularization at the disc) and NVE (Neovascularization elsewhere)—*
Along major vascular arcades, (not at disc)
- Vitreous Hemorrhage- Intragel (Vitreous gel) and Pre Retinal (Retrohyaloid space is Boat shaped)
- Tractional RD
- Rubeosis Iridis and Neovascular Glaucoma
Rx — Pan Retinal Photocoagulation. Argon, Diode or Double frequency YAG laser used.
- Current advance in DR is Intravitreal Bevacizumab

MACULOPATHY

- Focal → Focal leakage from microaneurysms & capillaries. Rx Focal Argon Laser Burns
- Diffuse → Generalized retinal thickening, microaneurysms, heme. F.A. → Diffuse Leakage
Rx → Intravitreal steroid and Avastin/ Lucentis injections are recent advances. Grid Pattern laser is alternative.
Ischemic → Diffuse Maculopathy. FA → Capillary Non perfusion in Macular & paramacular areas

RETINAL VEIN OCCLUSION**Predisposing Factors**

- 6th -7th decade of life
- Systemic H. T. → Vein compressed by thickened artery.
- Raised IOP (glaucoma), risk for CRVO
- Periphlebitis → Eales disease, risk for BRVO
- **Branch vein occlusion (brvo)**
Symptoms → Loss of part of field of vision, ↓V.A, metamorphopsia
Signs → Acute → Dilated & Tortuous veins, Flame shaped/splinter Heme
Cotton wool spots, Retinal edema
Chronic → Venous sheathing, Hard exudates, Microaneurysms, collaterals, shunts
Complications → CME; Neovascularization → Vitreous Haem., Traction R.D.
- **Central Vein Occlusion (CRVO)**
Vision. → Moderately Reduced <6/60, upto Count Fingers
 - Afferent Pupillary Defect → Marked

FUNDUS →

- 1) Marked tortuosity & engorgement of Retinal veins
- 2) Hemorrhage → In both peripheral and central Retina **Splashed Tomato or Blood and Thunder appearance**
- 3) Cotton wool spots → common
- 4) OPTIC DISC → Swollen, Hyperemic (Papilledema)
- 5) Marked Macular oedema + Haem

Rx → PRP for NVD

FA → Extensive areas of capillary non perfusion

100 day glaucoma seen in ischaemic CRVO

CENTRAL RETINAL ARTERY OCCLUSION

Aetiology- Embolization- Heart or Carotid Arteries

Clinical Features:-

- Marked ↓VA, Afferent Pupillary defect
- Retina → white, oedematous at post pole as N. Fibre & ganglion cell layer is thickest
 - Central fovea Devoid of those layers
 - Intact choroidal vessels stand in contrast to surrounding opaque Retina → **Cherry Red Spot**
 - Marked narrowing, Irregularity in calibre of Retinal arterioles
 - **Sludging & segmentation of blood column (Cattle Track Sign)**
 - Sectorial visual field defect in BRAO

Emergency Rx →

- Firm ocular Massage 15 min - ↓IOP, ↑Blood Flow, Dislodges Emboli

- IV Acetazolamide 500 mg
- Inhalation of 5% CO₂ + 95% O₂
- A.C. Paracentesis

Preventive Rx -->

- Endarterectomy for carotid thrombus
- Aspirin, Dipyridamol, Anticoagulants

HYPERTENSIVE RETINOPATHY

Hypertensive Features

- Vasoconstriction + Leakage
- Diffuse Arteriolar Narrowing
- Focal Arteriolar Narrowing
- Grade I → Mild generalized arteriolar attenuation
- Grade II → Severe Grade I + Focal Arteriolar attenuation
- Grade III → Grade II + flame hemorrhages + cotton wool spots
- Grade IV → Grade III + Papilledema (Malignant H.T.)

Arteriosclerotic Features

- ↓
- Thickening of Vessel wall
- ↓
- Intimal Hyalinization
- Grade I → Broadening of Arteriolar Light Reflex
 - Grade II → Grade I + Deflection of veins proximal to A-V Crossings (SALU's Sign)
 - Grade III → Grade II + Copper wire arterioles + Marked A-V crossing changes
 - veins appear dilated distal to AV crossing (Bonnet's Sign)
 - Grade IV → Grade III + Silver wire arterioles + Severe AV crossing changes or BRVO

OTHER FEATURES → Ischemic choroid Infarcts → Elschnig's Spots/Macro Aneurysm

RETINOPATHY OF PREMATURITY (ROP)

- Retinopathy of prematurity (ROP) occurs due to abnormal proliferation of retinal vessels.
- The most important risk factors which predispose to development of ROP include **Prematurity** (single most) oxygen therapy, anemia needing blood transfusion, sepsis and apnea.
- Very low birth weight neonates, **those born at ≤ 32 week of gestation (B.wt < 1500 gm)**, those born at **≥ 32 weeks weighing between 1500-2000 gm** and having risk factors for ROP should be screened
- For neonates born prior to 28 weeks screening is done at 31 weeks. For those born after 28 weeks screening is done 4 weeks from birth
- **Peripheral retinal ablation with diode laser under adequate analgesia and sedation is the preferred method for treatment of severe ROP.**

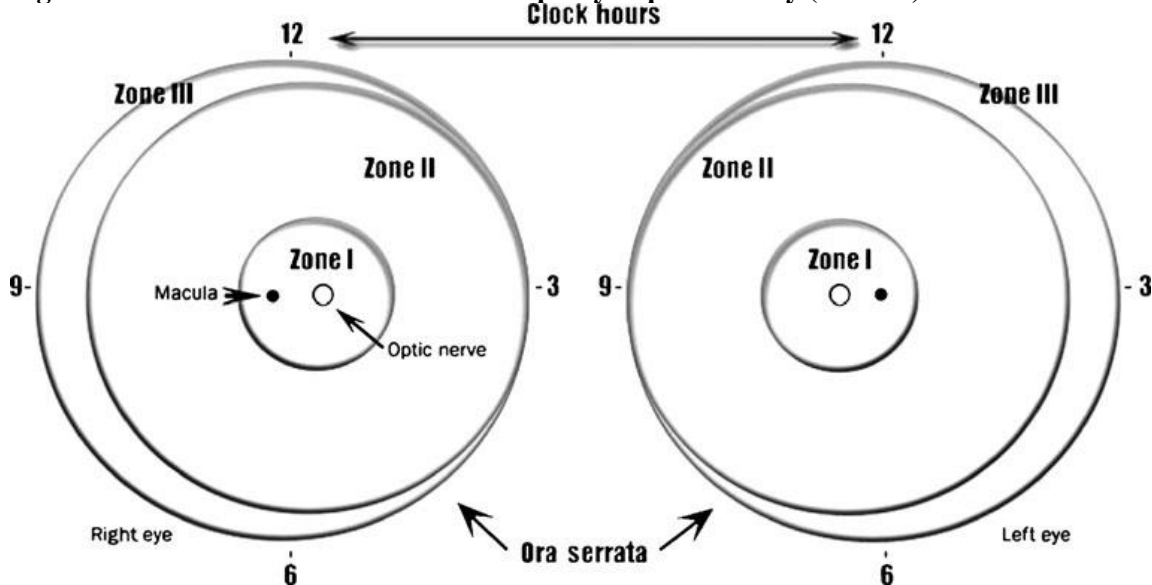
ICROP describes vascularization of the retina and characterizes ROP by its position (zone, table-& fig-), severity (stage), and extent (clock hours).

Classification of retinopathy of prematurity

1. Location	Zone I	Circle with optic nerve at centre and a radius of twice the distance from optic nerve to macula
	Zone II	From edge of Zone I to the nasal ora serrata nasally and equator temporally
	Zone III	Lateral most crescent shaped area from Zone II to ora-serrata temporally

2. Severity	Stage 1	Presence of thin white demarcation line separating the vascular from avascular retina
	Stage 2	The line becomes prominent because of lifting of retina to form <i>a ridge having</i> ^Q height and width
	Stage 3	Presence of <i>extra retinal fibro-vascular proliferation</i> ^Q with abnormal vessels and fibrous tissue arising from the ridge and extending into vitreous
	Stage 4	Partial retinal detachment; not involving macula (4A) or involving macula (4B)
	Stage 5	Complete retinal detachment
3. Plus disease		Presence of <i>dilatation and tortuosity of posterior retinal vessels.</i> ^Q Associated with vitreous haze, pupillary rigidity
4. Extent		Extent of involvement of the retina as expressed as clock hours (30 degree sectors)
5. Pre-plus disease		Vascular abnormalities of the posterior pole that are insufficient for the diagnosis of plus disease but that demonstrate more arterial tortuosity and more venous dilatation than normal

Fig. 1 International classification of retinopathy of prematurity (ICROP) zones



Based on results of ETROP (Early Treatment of Retinopathy of Prematurity,) two new terminologies have been suggested:

Type	Treatment
Type 1 ROP : Zone I, any stage ROP with plus disease & Zone I, stage 3 ROP with or without plus disease & Zone II, stage 2 or 3 ROP with plus disease.(Threshold ROP)	Peripheral retinal ablation should be carried out for all cases
Type 2 ROP : & Zone I, stage 1 or 2 ROP without plus disease & Zone II, stage 3 ROP without plus disease	Continued serial examinations are advised

- Prevention:**
- Judicious Oxygen Therapy -PaO₂ should be maintained between 50-80mm Hg. SaO₂ should be maintained between 89-95%
 - Judicious Use of Blood Transfusions
 - Vitamin E Supplementation
 - Prenatal Steroids-prevent respiratory distress and intraventricular hemorrhage, two important risk factors

of ROP. In Preterm labor between 24–34 weeks of gestation
betamethasone in two doses of 12 mg each given intramuscularly, 24 h apart.

ACQUIRED MACULOPATHIES

SYMPTOMS of Macular Disease → Blurring of central vision, Positive scotoma

Metamorphopsia

Micropsia (Spreading apart of Foveal cones) and Macropsia (Compression of Foveal cones)

SIGNS → (1) V.A. → ↓ in central Vn

(2) Pupillary Reactions → Normal

Best examined with:

- Direct S/L Biomicroscopy Fundus Contact Lens
- Amsler Grid → 10 cm chart with 5mm squares viewed from 1/3 M.
 - Pt looks at central dots & Reports → Distortion/wavy lines, blurred areas, blank spots
- Photostress Test → CME, CSR. In macula disease PSRT > 50 sec

Macular Function Tests in Opaque Media →

- Blue Field Entoptic Flying corpuscle Test → Entoptic perception of Leucocytes in capillaries when retina illuminated by blue light of entoptoscope.
- Two Light Discrimination Test → 2 Pen Lights held close together at 60 cm. from pt are separated, till pt. says he can see 2 lights
- Laser Interferometry (LI)
- Potential Acuity Meter (PAM)

FLOURESCEIN ANGIOGRAPHY (FA)

To study normal. Physiology of— Retinal and Choroidal Circulation and in macular ds.

- Flouroscein Binding → 70-80% → Protein Bound, Remainder → Free Flouroscein
- Inner Blood — Retinal Barrier → Tight Junctions of Retinal capillary endothelial cells Outer Blood — Retinal Barrier → RPE

Technique → Flouroscein 5 ml of 10% solution injected in Antecubital vein. Serial photographs taken.

Phase →

Phase I → Prearterial phase → Choroidal Circulation is filling no dye in Ret. Arteries

Phase 2 → Arterial Phase → Dye appears first in retinal arteries till whole arterial circulation is filled

Phase 3 → A-V Phase → complete filling of arteries and capillaries, Lamellar Flow in veins

Phase 4 venous Filling & Arterial emptying

Results:

Hyper Fluorescence → RPE window defect (typical in CSR)

Choroidal/ Retinal Neovascularisation

Leakage from Optic Nerve Head → Papilledema

Hypofluorescence → Blockage of Fluorescence- Hard Exudates, Hemorrhage

Indo-cyanine Angiography- Uses indo-cyanine green (ICG) dye. Specially highlights choroidal lesions.

AGE RELATED MACULAR DEGENERATION (ARMD)

Earliest presentation: appearance of DRUSEN

DRUSEN — Collection of Hyaline material b/w Basal Lamina of RPE & Bruch's Membrane of choroid

- Non Exudative/ Dry ARMD → Hallmark lesion is Drusen
 - Sharply circumscribed circular areas of RPE Atrophy with loss of chorio capillaries. Have mild ↓VA
 - Treatment with Vitamins/ antioxidants may prevent progression
- Exudative/Wet ARMD →
 - RPE Detachment
 - Choroidal Neovascularization → Sub Retinal Neovascular Membrane (SRNVM) → Chorio capillaries extend through defect in Bruch's Membrane → Sub RPE space

Rx For extrafoveal lesions: Laser Photocoagulation

For subfoveal lesions: Anti-VEGF injection, Photodynamic Therapy(PDT), Transpupillary Thermotherapy(TTT)

- Disciform Scar- Advanced Stage Disease. Rx →Low Vision Aids

CENTRAL SEROUS RETINOPATHY (CSR)

- Male→20-40 years
- Sudden onset ↓Vn, U/L positive scotoma, micropsia, metamorphosia.

Elevated Retina →Acq. Hypermetropia. Shallow round macular detachment, Ring Reflex around it

- F.A. →Due to defect in outer Blood retinal barrier
 - Smoke Stack →Initial Hyperfluorescent spot- Ascends vertically till upper border of detachment (mushroom/ umbrella pattern)
 - Ink Blot →Hyperfluorescent spot- Increases in size circumferentially (Enlarging dot sign)
- Rx→Wait and Watch; Spontaneous Resolution occurs in about 12 weeks. Photocoagulation in selected cases if defect away from fovea.

CYSTOID MACULAR OEDEMA (CME)

- Accumulation Fluid in outer plexiform (Henle's) Layer centered around Foveola
- Due to defect in inner blood retinal barrier
- Fluid Filled Microcysts →Large cystic spaces →Lamellar macular Hole
- F.A.→Flower Petal Appearance
- Aetiology→ 1. D.R. 2. R.V.O. 3. Irvine gass syndrome (After cat surgery)
- 4. Pars planitis 5. Retinitis Pigmentosa
 - **Rx-** Anti-inflammatory drugs, Steroids, Anti-VEGF injection

ANGIOID STREAKS –

Crack like Dehiscence in/of Bruch's Membrane of choroid with Sec. changes in RPE & choriocapillaris

Systemic Association →

- Pseudoxanthoma Elasticum
- Paget's disease, Ehlers Danloss syndrome
- Sickle cell disease

TOXIC MACULOPATHIES

- Chloroquine→Rx of RA, SLE - 250 mg/d →3 yrs = 300gm
Established Maculopathy →Central Hyperpigmented beneath Foveola; surrounded by Depigmented circular zone; Encircled by area of ↑Pigmentation: Bull's eye maculopathy
- Hydroxy chloroquine, Quinine 3. CPZ, Thioridazine 4. Tamoxifen

OCULAR ELECTROPHYSIOLOGY**A. Electroretinogram(ERG)**

1. Flash ERG- Provides the mass response of the whole retina. Useful in the diagnosis of generalised retinal disease

'a wave' → Initial Negative Deflection . Arises from photoreceptors

'b wave'- Second positive Deflection, represent processes occurring in Bipolar cell region.

'c wave'- Lower amplitude, more prolonged +ve response. Originates from RPE

2. Pattern ERG-Useful in the diagnosis of macular disorders

3. Multifocal ERG

B.Electroculegram (EOG) →Measures standing potential b/w cornea (+ve) & back of eye (-ve).

Measured in Arden ratio

Based on activity of RPE & Photo Receptors (PR)

Used in modern ophthalmology for diagnosis of Best's Vitelliform Macular Dystrophy

C. Visual Evoked Response(VER)

Clinical Uses of VER

1. Determine VA in children and detection of Malingering.
2. Diagnosis of Optic nerve disease.
3. Useful for assessment of the visual pathway from optic nerve to occipital cortex

RETINITIS PIGMENTOSA

Night Blindness + Constricted Visual Fields

- **TYPICAL** → Diffuse, B/L, Symmetrical Retinal Dystrophy - Damage to RODS predominant
 Inheritance → Sporadic → Most common, A.R. → Next common
 X-Linked Recessive → Least common

Clinical Features → Classic Triad

- (1) Bone spicule pigmentation
- (2) Arteriolar attenuation
- (3) Waxy disc pallor (least reliable sign)

Female carrier → golden metallic Tapetal Reflex temporal to macula
 Course- Gradual constriction of field, starts peripheral, encroaches central field → Ring Scotoma/
 Tubular Vision

Maculopathy- CME, Atrophic, Cellophane
 Other Features → Glaucoma, Post subcapsular cat, Keratoconus, Myopia
 ERG → Subnormal amplitude in Scotopic ERG, Photopic
 ERG → Relatively unaffected
 Prognosis → Progressive blindness by middle age.

B. ATYPICAL

- RP Sine Pigmento → Inconspicuous pigmentary change. Other features as in typical RP.
- Retinitis Punctata albescens → Scattered white dots. most numerous b/w Post Pole & Equator

ATYPICAL R.P. is associated with →

- Refsum's Syndrome (Phytanic acid storage ds) → peripheral neuropathy, cerebellar Ataxia, Deafness
- Usher's Syndrome → Non progressive sensorineural deafness
- Cockayne's Syndrome Dwarfism, Bird like facies, Deafness, Nystagmus, Ataxia, Mental Retardation
- Kearns Sarye Syndrome → CPEO + Heart Block
- Laurence — Moon — Biedl syndrome → MR, polydactyly, obesity, Hypogonadism.
- Friedreich's Ataxia → Post column ds, Ataxia, Nystagmus
- NARP- Neuropathy, ataxia, Retinitis Pigmentosa Mitochondrial DNA inheritance

Leber's Congenital Amaurosis - Autosomal Recessive, Blind from Birth/ within first few years of life. Nystagmus, Strabismus, Keratoconus, Keratoglobus, cataract. Oculodigital syndrome → (Child constantly rubs eyes) to induce mechanical sensation of light. ERG → ↓/ Non recordable

Best's vitelliform macular dystrophy (Best's disease)

- A.D
- Egg yolk/Sunny side up lesion at the macula is the characteristic lesion
- VA → Normal / ↓
- EOG ↓

Stargardt's disease-

- AR.
- Presents in First-second decade children with decreased central vision.
- Have flecked retina with macular degeneration and eventual macular atrophy. Typical appearance is called beaten bronze appearance of macula
- ERG is mostly normal, EOG may be subnormal.
- Adult variant is fundus flaviraculatus

CHERRY RED SPOT

- Tay Sachs Disease and Sandhoff variant
- Niemann - Pick Disease
- CRAO
- Significant Commotio retiniae
- Other causes- GM1 gangliosidosis, metachromatic leukodystrophy, Niemann Pick disease, Farber's disease, Goldberg's Syndrome, Gaucher's disease

RETINOBLASTOMA

Most common primary malignant intraocular tumor of childhood

2nd most common primary Intraocular malignancy of all age groups (Choroidal Melanoma more common)

- 1 in 17000- 34000 live births. Av. Age of diagnosis 18 M Inheritance

Familial Cases

6%

+ve Family History

A.D.

High But Incomplete Penetrance

Sporadic Cases

94%

Germinal

Mutation 25%

Tumour passes to offspring

B/L

Somatic

75% mutation

Tumour not perpetuated

U/L

Genetics→

Genetic Counselling Issues:

- Healthy parents with one affected child →6% Risk of producing another affected child
- 2/> siblings affected →change in subsequent child →50%
- Survivor of Retinoblastoma →50% chance of offspring affected

Knudson's Two-Hit Hypothesis→ M1 (Predisposing Mutations) → Inactivating genetic change that one parent contributes to **13q 14** RB locus in fertilized ovum M2 (Tumorigenic Mutations) →Loss / inactivation of the remaining allele of RB locus

Need mutation in somatic and genetic cell lines

CLINICAL FEATURES →Common - Leukocoria (Amauratic cat's eye) →Most common. 2/3 cases

- Strabismus →Esotropia →20% cases
- OTHERS →
- Buphthalmos - Keratitis/Perforating ulcer - Complicated cataract
- Orbital cellulitis/ Endoph - Hyphaema / Hypopyon - RD
- Rubeosis - Phthisis Bulbi - Loss of vision

Microphthalmos not compatible with RB.

TYPES→

- **EXOPHYTIC**→ Grow in subretinal space- Total R.D.
- **ENDOPHYTIC** → projects from Retina in vitreous cavity
 - white / pearly pink colour
 - Fine B.V, on surface
 - Secondary calcification →sharply demarcated →Resembles cottage cheese

MODE OF SPREAD →

I Intra ocular Extension - Implantation growth or direct Extension

II Extraocular Extension - Thru Optic Nerve, most common.

- a) To Brain b) To Orbit- Emissary veins

III Lymphatic spread or by Blood Stream

PATHOLOGY→Tumour derived from Neurosensory Retina

- Arises from →Primitive cell precursors of Photoreceptors elements in outer Retinal Layers Undifferentiated →Tightly packed, Round cells, Large Hyperchromatic nuclei
- Differentiated →Flexner - Wintersteina or Homer Wright Rosette
- Pseudo Rosettes →clusters of tumor cells around bl.vsls. with necrosis

ASSOCIATED TUMOURS→

- Osteosarcoma 2. Malig Melanoma 3. Testicular Ca 4. Ewing's Tumour 5. Wilm's Tumour

Trilateral Retinoblastoma →Bilateral Retinoblastoma+ pinealoblastoma, poor prognosis**INVESTIGATIONS**→

1. X-ray of globe →Bone - free dental Films →Calcification
2. USG →B- Scan →Calcification
3. CT Scan/ MRI. Detects calcification Involvement of ON, CNS, Orbit, Pineal
4. Aq. Humour paracentesis →Aq : Plasma LDH > 1 5. FNAB

Rx →

LAMS

1. CRYO →Small Tumor Ant. to equator.
 2. Photocoagulation Small Tumors Post to equator < 4 mm diam
 3. Brachytherapy for small tumors
 4. Enucleation →along with long piece of O.N, for large tumors.
 5. External Beam Radiotherapy → ON Invasion, Intracranial metastasis.
 6. Chemotherapy →Extraocular / orbital spread/ Choroidal invasion / O.N. involvement
IV Carboplatin, IV Etoposide, IV Vincristine, Tab Endoxan
- **Newer Modalities**
 - a). Thermochemotherapy →Systemic Carboplatin →Followed by Continuous Diode Laser
 - b). PDT- Photodynamic Therapy
 - c). Transpupillary Thermochemotherapy

LEUKOCORIA D/D

- | | |
|------------------------|-------------------------------|
| 1. Retinoblastoma | 2. Cataract |
| 3. Coloboma | 4. PHPV |
| 5. Toxocariasis | 6. Metastatic endophthalmitis |
| 7. Retinal Astrocytoma | 8. Coat's disease |
| 9. ROP | 10. Retinal detachment |

TOXOCARIASIS

- Chronic Endophthalmitis 2-9 yrs of age, Leukocoria, Strabismus, U/L visual loss
- Posterior pole granuloma →6-14 years, U/L visual Loss
 - Round solitary granuloma yellow-white, elevated, 1-2 DD at/ around macula
- Peripheral granuloma →6-40 yrs. Distortion of Vn to Macular distortion or R.D
- Visceral Larva Migrans is associated

PERSISTENT HYPERPLASTIC PRIMARY VITREOUS

- Development disorder of vitreous- Failure of regression of primary vitreous
- Most common in Microphthalmic eye. U/L Retrolental mass. Does not calcify

Perforating eye trauma

- The commonest intraocular foreign body is iron from chisel and hammer injuries.
- Weakest part in coat's of eye is at site of insertion of recti muscles and limbus.
- Localized corneal entry wound with corresponding iris hole are tell tale signs of perforating eye injury.
- Location of the FB in the eye can be known by orbital X ray using a limbal ring. Intra vitreal FB is removed either using the giant electromagnet or the currently popular vitrectomy and FB removal

Retinal Telangiectasia

- Idiopathic, congenital retinal vascular anomalies
- Idiopathic Juxtafoveolar Retinal Telangiectasia
- Leber's Miliary Aneurysm
- **Coat's disease** →Leukocoria and ↓V.A. U/L, common in boys in 5-10 year age
 - Clinical Features: Dilated & Tortuous B.V & SubRetinal Exudates
 - Rx Cryo, Photocoagulation

Sickle cell disease-Associated retinopathy will have new vessels in retina. Have a sea-fan configuration. Associated cork-screwing of conjunctival blood vessels.

Retinal Astrocytoma- Astrocytoma of Retina & O.N. →Tuberous sclerosis (Bourneville's ds), TRIAD - Mental Retardation, Epilepsy, Adenoma Sebaceum

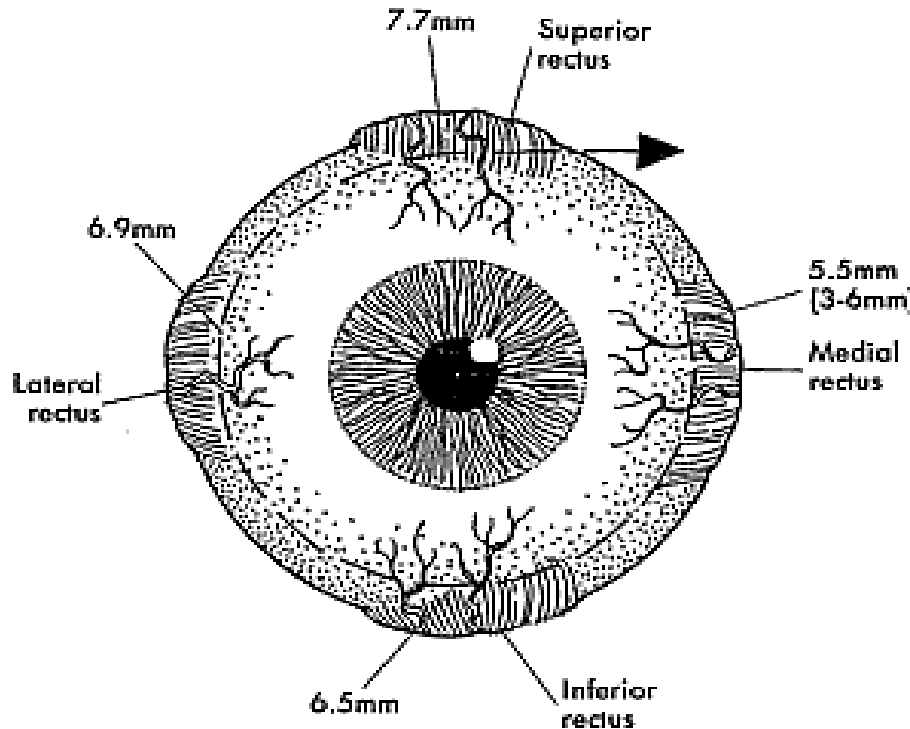
- A.D. B/L (15%), From Inner Retinal Layers, At optic disc or Peripheral. Nodular, Well circumscribed, 0.5-1DD Hypopigmented Iris and fundus lesions

STRABISMUS

EXTRAOCULAR MUSCLES

7 = 4 recti + 2 obliques + LPS

- **Origin :** *All Recti and SO* arise from **Annulus of Zinn** (common tendinous ring at orbital apex, encircling optic foramina and medial part of superior orbital fissure). *EXCEPT inferior oblique* which arises from the orbital plate of maxilla, just lateral to lacrimal fossa.)
- **Insertion:** Recti Muscles → Insert on sclera as illustrated below:



**The spiral of Tillaux and the relationship of the rectus muscle insertions from limbus*

- S.O. - Originates from Annulus of Zinn - Travels superomedially - passes through trochlea (U-Shaped pulley), makes an angle of 20° with muscle belly and then inserts in sclera behind equator.
- I.O. Originates from Lateral aspect to lacrimal fossa- passes laterally & posteriorly and then inserts into globe below LR.
 - Connective Tissue of I.O. and I.R fuses together and is known as Lock Wood Ligament. Serves as lower lid retractor.
 - Similar connective tissue condensation around SR – Whitnall’s Ligament

Muscle	Insertion from limbus	Action			Nerve supply
		Primary	Secondary	Tertiary	
MR	5.5mm	Adduction			III
IR	6.6mm	Depression	Extorsion	Adduction	III
LR	7mm	Abduction			VI
SR	7.7mm	Elevation	Intorsion	Adduction	III
SO	Above & lateral to post pole	Intorsion	Depression	Abduction	IV

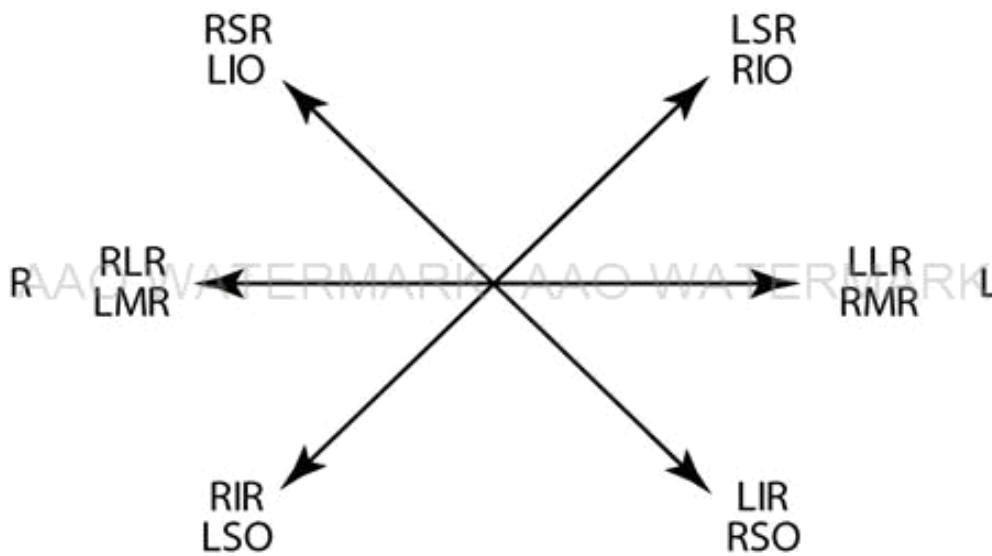
IO	Below & lateral to post pole	Extorsion	Elevation	Abduction	III
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REMEMBER: ALL 3 LR 6 SO 4 --- Lateral rect-6th cr nv, Sup.oblique 4th cr nv, Remaining All supplied by 3rd cr nv.

Ocular Movements

Unocular (Ductions)	Binocular	
	Version	Vergence
Adduction & Abduction	Dextoversion & Laevoversion	Convergence Divergence
Sursumduction (elevation)	Sursumversion & Deorsumversion	
Deorsumduction (depression)	Dextroelevation & Dextrodepression	
Incycloduction (intorsion)	Laevoelevation & Laevodepression	
Excycloduction (extorsion)	Dextrocycloversion & Laevocycloversion	

Cardinal positions of gaze



Cardinal positions and yoke muscles. RSR, right superior rectus; LIO, left inferior oblique; LSR, left superior rectus; RIO, right inferior oblique; RLR, right lateral rectus; LMR, left medial rectus; LLR, left lateral rectus; RMR, right medial rectus; RIR, right inferior rectus; LSO, left superior oblique; LIR, left inferior rectus; RSO, right superior oblique.

Yoke muscle Pairs acting in cardinal positions of gaze

YOKE MUSCLES

- When eyes are moving in 6 cardinal positions → a muscle of one eye is paired with a muscle of opposite eye to produce synchronous movement

e.g. In DEXTROVERSION Yoke muscle are → Rt. LR. & Lt. M.R.

In DEXTROELEVATION Yoke muscle are → Rt. S.R. & Lt. I.O.

Dextroelevation	RSR & LIO
Laevoelevation	LSR & RIO

Dextroversion	RLR & LMR
Laevoversion	LLR & RMR
Dextrodepression	RIR & LSO
Laevodepression	LIR & RSO

Hering's Law of Equal Innervation

- During any conjugate movement, equal & simultaneous innervation flows to yoke muscles

Primary Deviation	Secondary Deviation
Left eye used for FIXATION	Paretic RE used for FIXATION
↓	↓
Inward movement of RE	Additional innervation flows to Rt. L.R.
Due to unopposed action	↓ HERING'S LAW
Of Rt. MR (antagonist)	Equal amount of innervation flows to Lt.
M.R.	(Yoke muscles)
	↓
	Excessive adduction of LE

Agonist: Primary muscle moving the eye in a specific direction

Synergist: Muscle of the same eye acting in conjunction. For example IO & SR for elevation

Antagonist: Muscle acting in opp direction to agonist. For example MR & LR

- Agonist/Synergist/antagonist terms are used when uniocular movements are discussed.
- Yoke muscles are talked about when binocular movements are mentioned.

Sherrington's Law of reciprocal innervation: Contraction of a muscle is associated with reciprocal decreased innervation and relaxation of its antagonist.

Convergence

Ability of both the eyes to move inwards simultaneously. Two types:

- Voluntary
- Reflex Convergence – it has 4 components
 - Tonic Convergence- due to basal tone of muscle
 - Proximal Convergence- Induced by psychological awareness of a near object
 - Fusional Convergence- to maintain fusion and binocular single vision.
 - Accommodative Convergence- Induced by the process of Accommodation.

For each Diopter of Accommodation a fairly constant increment in accommodative convergence occurs: AC/A Ratio

AC/A RATIO

It is the amount of convergence (prism D) per unit change in accommodation.

Normal is 4-5 (i.e.1 D of accommodation associated with use of 4 prism diopters of convergence)

High AC/A Ratio - Excessive convergence used – Esotropia

Low AC/A Ratio- Exotropia

Binocular vision: Fixation **starts** by 2-4 months of age, binocular vision fully develops by 3-5 years. Grades:

- 1) Simultaneous macular perception
- 2) Fusion
- 3) Stereopsis

Horoptor is an imaginary surface in space, all points on which stimulate corresponding retinal points.

Panum's area is the zone surrounding the horopter, in which objects are seen as single.

STRABISMUS: Classification

Can be classified in a no. of ways based on:

1. Tendency	2. Angle of deviation	3. Eye affected	4. Onset	5. Deviation
Latent - Phoria. Manifest - Tropia	Comitant (Constant angle) Incomitant (variable angle)	Unilateral Alternating	Congenital Acquired	<ul style="list-style-type: none"> • Horizontal - eso/exotropia • Vertical - hyper/hypotropia • Torsional - incyclo/excycloversion • Combined

Examination of Squint

- Visual acuity
- Refraction under cycloplegia
- Ocular alignment:
 - Corneal reflex test (Hirschberg test)
 - Corneal reflex test using prisms- Krimsky test
 - Cover test + Cover uncover test + Alternate cover test
 - Prism bar cover test
 - Maddox rod
 - Maddox wing
 - Hess & Lees screen
 - Worth four dot test
 - Synoptophore
- **Angle kappa:** Angle between visual and pupillary axis.
Normally corneal reflex is slightly nasal to the pupillary centre (fovea temporal to posterior pole). Angle kappa is positive in emmetropes and hypermetropes and is negative in myopes. Abnormally large + or - angle simulates exodeviation and esodeviation respectively. This is called pseudosquint.

Latent squint (Phoria= hidden): These are also called the hidden squint.

- May be Esophorias or Exophorias
- Pt. generally maintains binocular single vision by fusion
- Squint manifests during episodes of physical debility / high fever.
- Complaint of asthenopia
- Diagnosis by Cover test, Maddox rod, Maddox wing
- Treatment:

Correct error of refraction	Orthoptic treatment
Prisms	Surgery

CONCOMITANT DEVIATIONS

In Concomitant deviations- Angle of deviation remains the same in all directions of gaze.

Concomitant esodeviations
Starts as esophoria →→intermittent esotropia→→esotropia

Pseudoesotropia: prominent Epicanthal folds, large -ve K angle

Concomitant exodeviations
Starts as Exophoria →→ intermittent exotropia →→ exotropia

Pseudoexotropia: Large positive angle kappa, wide interpupillary distance (HYPERTELORISM)

ESOTROPIA

A) INFANTILE ESOTROPIA (EIE)

- Not seen at birth
- Arises within 6 months of age
- Family history present
- Fairly large deviation
- Constant angle of deviation
- Seen more commonly with cerebral palsy and hydrocephalus
- May be unilateral or alternating or cross fixator
- Associated DVD or IO overaction may be present
- Management - Refractive error (usually absent)
 - Amblyopia therapy
 - Surgery as soon as possible to prevent development of amblyopia

B) ACCOMMODATIVE ESOTROPIA

- Acquired
- Develops around 2-3 years of age
- Initially intermittent and then may be constant

	Type		
	1.Refractive	2.Non refractive	3.Partially accommodative
Refractive error	Hypermetropic - +4 to +7D	Nil. High AC/A ratio	Hypermetropic + non refractive component
Treatment	Spectacles	Surgery	Spectacles + surgery for residual

C) NON ACCOMMODATIVE ESOTROPIA: No hypermetropia.
 Near deviation equal to distance deviation.
 Treatment - surgical

D) SECONDARY ESOTROPIA:

- a) **Sensory deprivation esotropia:** Due to cataract, corneal opacity etc.
- b) **Consecutive esotropia:** Following surgery for exotropia

EXOTROPIA

Types of exotropia

A. CONGENITAL

B. PRIMARY

	Types			
	1. Basic	2. Divergence excess	3. Simulated divergence excess	4. Convergence insufficiency
Angle of deviation	Same for near and distance	More for distance	Appears more for distance, actually basic	More for near

Starts as intermittent exotropia at around 2 years of age or later
 Precipitated by illness, tiredness, fatigue etc
 Amblyopia rare
 Management: refractive error correction (some patient's myopes)
 Orthoptic treatment Surgery

C. SENSORY EXOTROPIA: Due to cataract, corneal opacity etc.

D.CONSECUTIVE EXOTROPIA: Following surgery for esotropia

INCOMITANT/NONCOMITANT SQUINT

It may be:

- 1. Paralytic: a) Neurogenic b) Myogenic
- 2. Restrictive: Brown’s Superior oblique sheath syndrome

Features of Paralytic Squint:

- Angle of deviation varies in different directions of gaze.
- Due to paralysis of one or more extraocular muscles.
- A lesion affecting the supranuclear pathways produces conjugate gaze palsy, without causing paralytic squint and diplopia.
- A lesion affecting the nuclear or distal pathways causes paralytic squint.

Symptoms and signs

- Limitation of ocular movement
Secondary deviation greater than primary deviation (both equal in concomitant squint)***
- Diplopia
 Binocular
 Crossed in exotropia
 Uncrossed in esotropia
 Determined by diplopia charting with diplopia (red & green) goggles
- Head position
 LR palsy - turn towards paralysed side
 Ocular versus true torticollis - in ocular chin rotation present and no contracture of sternocleidomastoid
- Vertigo

Muscle or Nerve	LR	SO	III N
Eye position	Esotropia	Hypertropia	Exotropia and intorsion and down
Head position	Face turn towards affected side	Head tilt towards opposite shoulder	None, due to complete ptosis
Eye movement restriction	Restriction of abduction	Restriction of depression in adduction	Restriction of all movements except abduction
Diplopia	Uncrossed diplopia	Vertical diplopia worse on looking down	Crossed diplopia on raising the eyelid
Others			Pupil semidilated and fixed; accommodation lost

Treatment of paralytic squint

- Patch
- Prism
- Surgery after 6 months, if required (give due time to paralysis to recover)

SPECIAL SQUINTS

I Duane's Retraction Syndrome

TYPE I → Limitation of Abduction with Relatively Normal Adduction

TYPE II → Limitation of Adduction with Relatively Normal Abduction

TYPE III → Limitation of both Abduction and Adduction

Most Common Type → type I: Absence of Abduction of one eye; On attempted Adduction → Restriction of movement + Retraction of globe Narrowing of Palpebral Fissure

Rx Not needed as in most cases → eyes are straight in primary position & do not have Amblyopia

II Brown's Superior Oblique Tendon Sheath Syndrome → Limitation of elevation in adduction & normal elevation in abduction; EDT + ye. B/L in 10% cases

- Etiology -4 Trauma / Tenosynovitis of S.O. Tendon trochlear apparatus

III Mobius Syndrome → Congenital aplasia of VI, VII, IX, XII N. Nuclei

- Horizontal Recti → Fibrotic FDT +ve
- Feeding difficulties, B/L Atrophy of Tongue. Expressionless Face, Exposure Keratitis

IV Double Elevator Palsy → Paresis of S.R. + 1.0 of same eye

- PTOSIS, Marcus gunn jaw winking phenomenon
- Caused by Nuclear III N Lesion

SQUINT SURGERY

A Weakening Procedures:

1. Recession - Insertion of a muscle is moved posteriorly towards its origin. Can be done on any of 6 EOM
2. Marginal Myotomy - Length of muscle is increased without altering its insertion.
3. Myectomy – in very large angle deviations the Muscle is severed from its insertion and not reattached

B. Strengthening Procedures:

1. Resection - Pull of muscle is enhanced by making it shorter
2. Tucking - To enhance action of S.O. in IV N Palsy
3. Advancement- Muscle disinserted & advanced near to limbus et in S.O. Palsy

As a rule first recession is done and then resection of antagonist muscle is done to correct further deviation.**

AMBLYOPIA

Amblyopia is unilateral or bilateral reduction of best corrected visual acuity due to:

- visual form deprivation or
 - abnormal binocular interaction
- in the absence or any organic cause.

No structural abnormality of the eye or visual pathway is discernible in these cases. Somehow the neurons of lateral geniculate body and/or visual cortex lose their innate ability to respond to visual stimuli. This inability is thought to be due to arrested development of these cells, which is due to abnormal visual stimulation.

Classification: Amblyopia can be:

1. **Strabismic:** If a child is having strabismus, the constantly deviated eye develops amblyopia. This is seen more commonly in esotropia as against exotropia because exotropias are usually alternating and the child has equal vision in both the eyes. In strabismic amblyopia, the child preferentially uses the 'straight' eye for visual purposes. The vision of the deviated eye is initially suppressed to prevent diplopia and later on it develops amblyopia. In alternating tropias, amblyopia does not develop as both the eyes are alternately used for fixation.**
2. **Refractive amblyopia:** This is due to uncorrected refractive error.
 - a. **Anisometropic amblyopia-** due to difference in refractive error of two eyes. This leads to amblyopia in the eye with the larger refractive error if the corrective glasses are not worn. The reason is abnormal development of the visual system due to blurred vision in that eye. **Hypermetropes are more prone to develop anisometropic amblyopia because their vision is never clear.** Myopes have clear vision at near, therefore there are less chances of development of anisometropic amblyopia.
 - b. Bilateral amblyopia can occur if the refractive error is high (>+5D or >-10D) and is not corrected. There is no anisometropia in this case, though refractive error is the cause of amblyopia. The condition is called **isoametropic amblyopia.**
 - c. **Meridional amblyopia** is the term used when amblyopia affects only one meridian due to high astigmatic error.
3. **Deprivation amblyopia:** Seen in cases having media opacity in the form of cataract or corneal opacity etc. These children develop amblyopia due to visual form deprivation. Though by amblyopia definition this

condition is structural in nature, these children have a component of subnormal visual system development due to which even after media opacity treatment, they do not gain full vision. Therefore the condition is included in types of amblyopia.

4. **Idiopathic:** When the cause is not found

5. **Organic amblyopia:** There are some cases in which, though gross examination is normal, subtle changes in visual pathway e.g. disorientation of retinal receptors at the microscopic level, are causative of amblyopia. Organic amblyopia is suspected when during therapy, a child responds to a degree and then stops responding. The changes causing organic amblyopia cannot be demonstrated by routine testing.

Examination:

- Unilateral or bilateral reduced vision
- Refractive error present in one or both eyes in case of anisometropic amblyopia
- Strabismus present in case of strabismic amblyopia
- Media opacity seen in cases of deprivation amblyopia
- Typically in amblyopia, the cornea, lens, retina and visual pathways are normal. Pupillary reaction is normal.
- **Crowding phenomenon** may be seen: The patient is able to identify a Snellen chart character with the amblyopic eye when the character is presented in isolation. If the character is shown on the Snellen chart the person may not be able to recognize it. For example, Snellen acuity of the amblyopic eye may be 6/36, but when a letter smaller than 6/36, say 6/24 or 6/18 is shown singly the person may identify it. Therefore ‘crowding’ reduces the visual acuity in amblyopia.
- **Neutral Density Filter Test - (NDF)** When Pt. asked to read through NDF In the Amblyopic eye there is no change in V.A. while in Normal eye there is Drop in acuity of one or two lines

Treatment

- Correct refractive error
- Remove media opacity as cataract
- Force the amblyopic eye to work more than the normal eye. This is accomplished by
 - **Occlusion:** Generally cycles of occlusion of the normal eye for few days followed by occlusion the amblyopic eye for 1-2 days is done. The idea of occluding amblyopic eye is to prevent development of deprivation amblyopia (or occlusion amblyopia) in the normal eye. Occlusion forces the child to see with the amblyopic eye and with time helps in maturation of the visual system in that eye.
 - **Penalization:** If a child is not co-operative, do penalization :
 - Atropine: Instilled in the normal eye. Blurs vision and forces the child to use other eye.
 - Optical: Making the spectacle lens of the normal eye translucent so that the vision is less than that in the amblyopic eye.

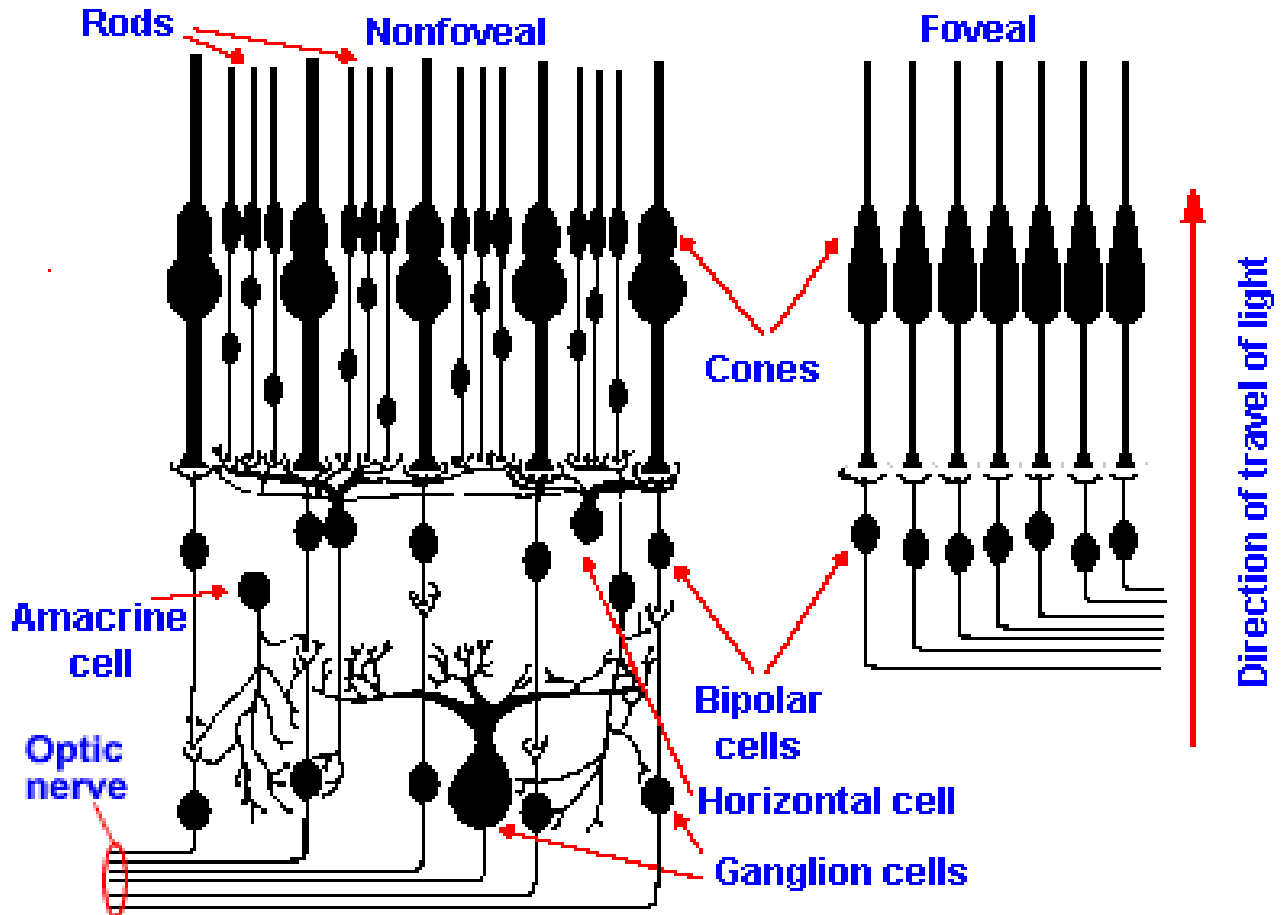
Amblyopia treatment should be tried till the child is 12 years old. Best results are seen between 5-8 years of age

Differences b/w Paralytic & Concomitant Squint

	Paralytic	Concomitant
1. Angle Of Deviation	Secondary Deviation > primary Deviation	Primary Deviation=Secondary Deviation
2. Ocular Movement	Limitation of movements in direction of action of paralysed muscle	Normal
3. Binocular Diplopia	PRESENT	ABSENT
4. False Projection or Orientation	present i.e. pt. cannot correctly locate the object in space when he sees in direction of palsied muscle	Accurate
5. Head Posture	Abnormal	None
6.Amblyopia	Absent	May be present

NEURO OPHTHALMOLOGY

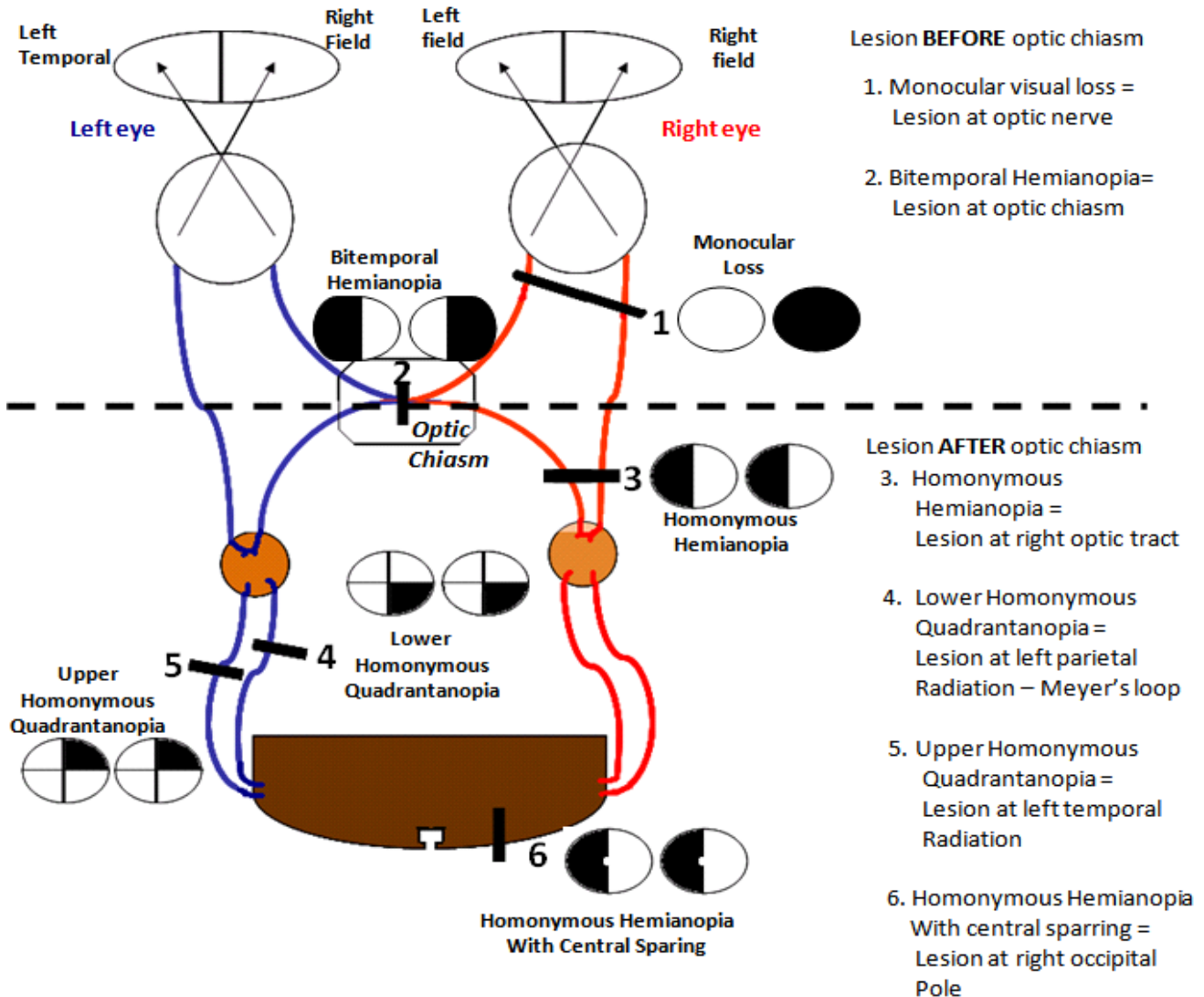
Visual pathway:



First order neuron	Bipolar cells in retina
Second order neuron	Ganglionic cells till lateral geniculate body
Third order neuron	Optic radiations to occipital lobe

- Rods and cones → bipolar cells → ganglionic cells → optic nerve → optic chiasma → optic tract → lateral geniculate body → optic radiations through temporal lobe (loop) and parietal lobe → occipital cortex

VISUAL FIELD DEFECTS



- *The anatomic organization of the visual pathway from the retina to the visual cortex. Lesions of the visual pathway (a-g) produce defects in the visual fields as indicated at the right*

Quick Summary Table

Defect	Location
Loss of vision in one eye	Ipsilateral Optic Nerve
Bitemporal Hemianopia	Optic chiasm at the centre
Binasal hemianopia	Optic chiasm at the periphery
Incongruous homonymous hemianopia	Optic tract
Congruous homonymous hemianopia	Optic radiation
Homonymous quadrantanopia	Contralateral optic radiation <ul style="list-style-type: none"> • Upper – temporal region(Pie in the sky) • Lower – parietal region(Pie on the floor)
Congruous homonymous hemianopia with central sparing	Occipital cortex

Visual field changes

Visual field changes due to neurologic diseases generally respect the vertical meridian*.

Field defect	Disease
Centrocaecal scotoma	Optic neuritis Toxic amblyopia Leber's optic neuropathy
Arcuate scotoma	Glaucoma Migraine Temporal arteritis
Altitudinal defect	Anterior ischaemic optic neuropathy (AION)
Tubular field	Retinitis pigmentosa Glaucoma Bilateral occipital lobe infarction Quinine toxicity Syphilitic perineuritis Chronic disc edema

Optic Nerve

Second order neuron
Optic nerve lesion: red green colour perception first to be lost, exception is glaucoma where blue yellow perception is lost early

Anatomy: ~ 50mm long
 Intraocular - 1mm
 Intraorbital - 30mm
 Intracanalicular - 6mm
 Intracranial - 10mm

Sheaths continuous with brain meninges.

Nerve fibres proximal to optic disc are myelinated.

Blood supply of Optic nerve head:

- 1) Disc Surface - by retinal arterioles + vessels from short post ciliary arteries
- 2) Prelaminar - by peripapillary choroidal vessels
- 3) Laminar - by branches of posterior ciliary arteries
- 4) Retrolaminar - by CRA + ophthalmic artery + choroidal arteries

Optic nerve function assessed by VEP - visually evoked potential or response

- It helps to assess the whole visual pathway mainly the optic nerve
- Latency and amplitude of the response is measured.
- Useful in cases of optic neuritis: Earliest sign- latency is increased and the amplitude is decreased

PAPILLEDEMA

Pathogenesis→Impairment of slow Axoplasmic Flow

- Normally IOP > Sub Arachnoid Pressure (SAP)--> augments flow of axoplasm out of eye or
- When ICT SAP > 10P CSF diffuse in Optic Nerve, Impairs Axoplasmic Flow →Swelling of optic nerve head
- ↑ICT →↑SAP & Optic Nerve Tissue pressure - Interferes with drainage of Central Retinal Vein
- Venous stasis - Passive oedema of Optic Nerve Head

Aetiology→

1. Intracranial Tumour- Posterior tumors worst; Ant cranial fossa tumors- papilledema is rare/occurs late

2. Beningn intracranial hypertension
 3. Intra cranial abscess / Cavernous sinus Thrombosis/ Subarachnoid Haem.
 4 . Aneurysm
 5. Malignant H.T.
General Symptoms→ Headache (worse on coughing, straining), vomiting altered consciousness.
Visual Symptoms →VA -Normal; Transient obscurations of Vn for 5-10 sec. on standing

- Pupils — Normal unless sec. optic atrophy
- Visual fields Normal; enlargement of Blind spot in some cases.

Fundus →

1. Early → Indistinctness of superior,inferior & nasal disc margins. Temporal involved last. - Blurring of peripapillary N.F. Layer
2. Established →
 - Veins dilated, tortous and engorged
 - Disc surface elevated & Indistinct Disc margins
 - Physiologic cup → Obliterated
 - Multiple flame shaped Haem, cotton wool spots. Hard Exudates at fovea in shape of incomplete star with temporal side missing (macular star)

Unilateral disc edema – causes		
Ocular	Orbital	Intracranial
<ul style="list-style-type: none"> • CRVO • Optic neuritis • Anterior ischaemic optic neuropathy • Ocular hypotony 	<ul style="list-style-type: none"> • Optic nerve meningioma or glioma • Thyroid eye disease 	<ul style="list-style-type: none"> • <u>Foster Kennedy syndrome</u>: Optic atrophy + papilloedema on the other side - seen in tumors of frontal lobe and olfactory groove

OPTIC NEURITIS→ Inflammatory / Demyelinating disorder of optic nerve
 Etiology →

1. **Demyelination: Multiple Sclerosis**
2. Post Viral → Measles, Mumps, Chickenpox in children, B/L
3. Granulomatous Inflammation → Sarcoidosis, T.B., Syphilis
4. Adjacent Infection → of Meninges, Sinuses, Orbit
5. Metabolic diseases → D.M., Anemia, Pre nanc , Starvation, Avitaminosis
6. Other CNS diseases → Devics disease, Acute Disseminated Encephomyelitis, Herpes Zoster, Epidemic Encephalitis, Poliomyelitis, Leber's disease

2 Types → Papillitis /Retrobulbar Neuritis (RBN) /Neuroretinitis
Symptoms → Most common in young females

- Visual Loss → U/L, sudden, progressive- maximum by end of 2nd week
- May be preceded by pain- painful ocular movements in retrobulbar neuritis
- Uhtoff s phenomenon →Impairnment of neuritis with increased body Temp.
- Visual Recovery → 4-6 wks, 90% recover normal vision
- Defects in Light Brightness appreciation (contrast sensitivity) and color vision.

Signs → Pupillary reflex is lost, APD

- Field defect → Central / centrocecal scotoma. .
- Fundus →Papillitis →Swelling of optic nerve head (Not > 2-3D). Blurring of disc margins. Dilatation and tortuosity of the vessels
 In RBN fundus is Normal

Rx→ Corticosteroids - Systemic- IN methylprednisolone/Dexamethasone. Initial treatment with oral steroids is contraindicated.

Anterior Ischaemic Optic Neuropathies (AION)

- Common cause of severe visual loss in middle aged and elderly
- Infarction of ant. part of optic nerve due to occlusion of short post. Ciliary arteries.

Non Arteritic AION

- -45-65 yrs, healthy individuals; Atherosclerosis/ HT the common cause. Rarely SLE, PAN or Migraine
- Symptoms Visual Loss →U/L sudden. Painless, no premonitory visual symptoms

Signs → VA and color vision reduced; Field defect → Altitudinal or central scotoma Fundus →Diffuse / sectoral oedema with pale/ hyperemic disc, splinter haem around disc.'

Rx →No.effective Rx

Arteritic AION →>60 yrs

- Giant cell arteritis →Large & Medium sized vessels →superficial Temporal, ophthalmic, ciliary, proximal part of vertebral.
- Symptoms → visual loss →Sudden, profound, permanent, accompanied by periocular pain Preceded by →Amaurosis Fugax, Flashing lights lasting few sec/min

Signs →VA severely impaired. Optic Disc →Swollen, Pale, splinter shaped hemorrhages.

Associated systemic features→

- Headache →Frontal, Occipital, Temporal and Scalp Tenderness
- Jaw claudication
- Polymyalgia Rheumatica

Investigation →

1. ESR → Very High > 100 mm/h.
2. C — Reactive protein →Raised
3. Temporal artery biopsy though diagnostic is invasive. Skip areas are common.

Rx → IV Hydrocortisone + oral prednisolone, High doses 60-80 mg/day, Then tapered

Leber's hereditary optic neuritis

- Retrobulbar neuritis presenting around 20 years of age
 - X linked. Transmitted from female to male**; some females also affected
 - Presents as B/L decreased vision
 - Self limiting, however recovery never complete
 - Fields show central or centrocaecal scotoma
 - Optic disc shows atrophy

Toxic amblyopia

Tobacco toxicity with deficiency of Vitamin B₁₂
 Optic disc shows temporal pallor
 Field - Centrocaecal scotoma
 Due to degeneration of ganglionic cells of retina
 Treatment –inj. hydroxycobalamine 1000 units weekly for 10 weeks

Ethyl alcohol Central scotoma
 Cause avitaminosis

Methyl alcohol absolute central scotoma with constriction of fields,
 Later causes blindness due to degeneration of ganglionic cells

Quinine Idiosyncretic reaction
 Max safe dose - 150mg/24 hours
 Pupil dilated and fixed
 Associated deafness, tinnitus
 Retinal vessels constricted, retinal edema, pale disc
 Central vision preserved. Causes constriction of field - tube vision

Ethambutol Central scotoma
 Reversible
 Max safe dose 15mg/kg/day
 Optic nerve affected by INH, streptomycin also

Deficiency amblyopia specially thiamine

Optic atrophy

Optic atrophy may be primary or secondary

Primary and secondary just denote the morphological appearance of the disc and denote whether there was disc edema before optic atrophy set in.

Primary	Secondary
<ul style="list-style-type: none"> • Disc chalky white • Sharp well defined margins • Surrounding retina normal • Seen in syphilis (tabes), multiple sclerosis, leber's 	<ul style="list-style-type: none"> • Disc dirty white • Blurred margins • Sheathing of blood vessels around the disc • Seen following chronic papilloedema, papillitis, AION

Kestenbaum sign looked for in Optic atrophy.

Causes of Optic atrophy:

Consecutive	Due to disease of retina Seen in retinitis pigmentosa, CRAO
Glaucomatous	
Primary	Traumatic, Toxic, Compressive etc
Secondary	Post Optic neuritis, Papilloedema, AION

Pupil

Sphincter and dilator pupillae are muscles of ectodermal origin.

Sphincter tone is more than the dilator.

Innervation:

Parasympathetic: Cholinergic supply to sphincter pupillae.

Start in Edinger Westphal nucleus → III Nerve → inferior division → branch to inferior oblique → → Ciliary ganglion → short ciliary nerves → sphincter pupillae

Sympathetic: Adrenergic supply to dilator pupillae. Only alpha receptors present in dilator pupillae.

Start in hypothalamus → Preganglionic sympathetic part starts from Cilio spinal centre of Budge → cervical sympathetic chain → superior cervical ganglion → Post ganglionic sympathetic part starting from carotid plexus → cavernous sinus → along V1 → nasociliary nerve → long ciliary nerves → dilator pupillae

Miosis physiologically seen in : senile age group

Hypermetropes

Blue eyes

Mydriasis physiologically seen in Myopes

Pupillary reflexes

- 1 Light: Direct and consensual
- 2 Near reflex
- 3 Psycho-sensory reflexes

Pupillary reflex pathways:

LIGHT falls on Retina → optic nerve→ optic chiasma→ optic tract →Pre Tectal Nuclei →B/L EW Nucleus→ 3rd Nerve → inferior div to IO muscle → ciliary ganglion → Short Ciliary nerves → Sphincter pupillae→ constriction

Near reflex initiated in medial rectus→ probably through III N→ to mesencephalic nucleus of V Nerve→ Edinger Westphal nucleus→ sphincter pupillae
Near reflex consists of convergence, accommodation and miosis

Psycho-sensory reflexes initiated by stimulation of any sensory nerve or by emotional stress or excitement.
Sympathetic supply dilates the pupil.

Constricted pupil	Dilated pupil
<ul style="list-style-type: none"> • Miotics • Iritis • Horner’s syndrome • Argyll Robertson pupil • Iatrogenic 	<ul style="list-style-type: none"> • III Nerve palsy • Sphincteric tear • Adie’s pupil

Horner’s syndrome

Features:

- Ptosis
- Enophthalmos
- Anhidrosis
- Miosis
- Heterochromia - present only if Horner’s is congenital. Is due to abnormal sympathetic supply to chromatophores

Pharmacologic testing

Type	Cocaine 4%	Adreline 1 : 1000	Hydroxyamphetamine 1%
Pre ganglionic	No dilatation	No dilatation	Dilate
Postganglionic	No dilatation	Dilate	No dilatation

Cocaine inhibits active uptake of noradrenaline into the post synaptic ganglionic sympathetic nerves.

The test is -ve in all types of Horner’s pupils. As there is no adr present in both pre n post ganglionic

Adrenaline : denervation sensitivity of nerve endings in case of post ganglionic (3rd order)

Hydroxyamphetamine 1% - Hydroxyamphetamine causes release of noradrenaline from the post ganglionic sympathetic nerves. in 3rd order neuron disease Horner’s has no noradrenaline, so hydroxyamphetamine ineffective.

Argyll Robertson pupil

- It is light near dissociation seen in tertiary syphilis
- Pupil irregular & **small**
- Reacts poorly or not at all to light
- Accommodation reflex present
- Though bilateral, a little anisocoria often present

Adie’s pupil – tonic pupil

Seen in young females. 80% unilateral

*Deep tendon reflexes (knee and ankle) often absent - Holmes Adie Syndrome Pupil

- Irregular
- **Dilated**
- Irregularly (segmental) reacts to light
- Slowly reacts to convergence
- **Supersensitive to weak cholinergics as pilocarpine 0.125%**
- Unilateral
- Long standing Adie’s pupil may be constricted

Marcus Gunn Pupil – (RAPD) relative afferent papillary defect

- Afferent pupillary defect demonstrated by **swinging flashlight test**.
- **Seen in unilateral Optic Nerve disease**
- Marcus Gunn pupil is a very sensitive sign, may be present even in the presence of normal vision, if optic neuritis is present.
- When light falls on the normal eye, both pupils contract.
- When light falls on the abnormal eye, both pupils dilate

Amaurotic pupil

No light perception
No direct light reaction
No consensual reaction in the other eye, but present in this eye

Light near dissociation

Pupillary Light reflex absent or diminished, but accommodation reflex normal.

No clinical condition is there when the situation is vice versa.

Seen in

- Diabetes mellitus- cause unknown. Maybe selective neuropathy
- Argyll Robertson pupil
- Mid brain lesion - compressing third ventricle as pinealoma
- Aberrant regeneration of III nerve
- Perinaud Syndrome
- Encephalitis
- Afferent conduction defect
- Adie pupil

Hemianopia

Lesion Site	Field defect
Optic nerve	Ipsilateral blindness
Proximal Optic nerve	Ipsilateral blindness + contralateral temporal hemianopia (Junctional Scotoma of Traquir)
Mid chiasmal lesion	1) <u>Bitemporal hemianopia</u> Pituitary tumor, craniopharyngioma, suprasellar meningitis, chiasmal arachnoiditis. 2) <u>Binasal hemianopia</u> by a lesion compressing the chiasma from both the sides. Seen in cases of III ventricle distension
Optic tract	<u>Incongruous homonymous hemianopia</u> Syphilitic meningitis, gumma, tubercular, tumor etc Associated with other features like contr III N involvement and ipsilateral hemiplegia
Temporal lobe	Upper homonymous quadrantanopia or ' <u>Pie in the sky</u> ' Chordoma, temporal lobe glioma, basilar or post cerebeller or superior cerebeller artery Associated olfactory and visual hallucinations
Optic radiations	<u>Congruous homonymous hemianopia</u>
Occipital lobe	<u>Congruous homonymous hemianopia with sparing of the macula</u> (due to lesion of <u>Posterior cerebral artery</u>) Macula spared as it is supplied by middle cerebral arteries <u>Riddoch phenomenon present</u> . Pupillary reactions normal Extremely congruous Seen in cases of injury, gunshot, tumor, infarction

Night blindness seen in

- Retinitis pigmentosa
- Xerophthalmia (vit A def.)
- Cirrhosis
- Congenital
- Malingering
- High myopia

Colour vision testing Pseudoisochromatic plates of Ishihara
HRR plates
Farnsworth Munsell 100 hue test
Nagel's anomaloscope
City university test
Holmgreen's wool matching test

CAUSES OF OCULAR MOTILITY DISTURBANCES - NERVE PALSIES

Nuclei	Fascicular part	Basilar part	Intracavernous and intraorbital part
III Nerve In midbrain: <ul style="list-style-type: none"> • Levator: Single unpaired • SR: paired and contralateral • □MR, IR, IO: paired and ipsilateral 	Lesions <ul style="list-style-type: none"> • Benedikt • Weber's • Nothnagel • Claude 	Isolated III N palsy by <ul style="list-style-type: none"> • □Posterior communicating artery aneurysm 	Lesions associated with others nerve lesions, sp IV, VI, V ₁ Nerve supplies all extraocular muscles except SO (IV) and LR (VI), levator, sphincter pupillae, ciliary muscle
IV Nerve Midbrain, caudal to III N nuclei	Decussate		Supplies SO
VI Nerve Pons Closely associated with VII N fasciculus	Lesions <ul style="list-style-type: none"> □Millard Gubler Foville's syndrome 	Lesions <ul style="list-style-type: none"> Acoustic neuroma Bilateral palsy by raised ICT or posterior fossa tumor 	Supplies LR

III Nerve palsy

<p>Surgical lesions: Pupillomotor fibres are present superficially. Therefore, any pressure on the nerve, by tumor, aneurysm or uncal herniation, affects these fibres and pupil dilates. The corollary is that, a III N palsy involving pupil, must be a lesion requiring surgery.</p> <p>Medical lesions: On the other hand medical lesions, such as diabetes and hypertension, affect the microvasculature; and the superficial pupillomotor fibres, which are supplied by pial vessels, are spared. Since these lesions are managed medically, any III N palsy sparing pupil is got to have a medical cause.</p> <p>Clinically: Ptosis Restriction of adduction, elevation, depression, dilated pupil, defective accommodation Normal abduction present due to LR, therefore eye becomes exotropic</p>

IV Nerve palsy

<p>Clinically: Eye hypertropic Contralateral head tilt to compensate for unopposed Extorsion of eye by Inferior oblique</p>

VI Nerve palsy

Clinically: Eye esotropic due to unopposed MR action with limitation of abduction

Gaze palsies

A. Horizontal Gaze Palsy: Lesion in ipsilateral PPRF

B. Internuclear Ophthalmoplegia: Lesion in Medial Longitudinal Fasciculus (MLF)

- Ipsilateral gaze is normal
- During contralateral gaze :Abduction is normal but the abducting eye suffers from ataxic nystagmus. Adduction is defective.
- Convergence is normal

C. Vertical:

1) Perinaud’s dorsal midbrain Syndrome

- Seen in pinealoma or other mid brain abnormality
- **Vertical gaze palsy** - conjugate elevation restricted
- **Normal downgaze**
- Light near dissociation
- Convergence - retraction nystagmus
- Lid retraction
- Bilateral mid dilated pupil that reacts poorly to light
- Near reflex is normal

2) Progressive supranuclear palsy (opposite of Perinaud): Primary downgaze palsy

- Steel Richardson Syndrome

Nystagmus: Rhythmic, repetitive, regular, involuntary movement

Ataxic nystagmus	Internuclear ophthalmoplegia
Downbeat nystagmus	Arnold Chiari malformation, lesion at level of foramen magnum Drug: lithium, phanytoin etc Demyelination, hydrocephalus etc
Upbeat nystagmus	Post fossa lesions, Wernicke’s encephalopathy
Convergence retraction nystagmus	Pinealoma, vascular accidents
Sea-saw nystagmus	Paraseller tumors, Brain stem stroke, syringobulbia

LACRIMAL SYSTEM

Aqueous component of tears is secreted by main & accessory lacrimal glands.

Anatomy

A. **Main lacrimal gland** :Response for reflex tear secretion

(a) Orbital/superior portion: lies in anterolateral part of roof of orbit

(b) Palpebral/inferior portion: lies in superior fornix and palpebral conjunctiva

Excretory ducts – 10-12 – open in lateral part of superior fornix, 1-2 – in lateral part of lower fornix.

B. **Accessory lacrimal glands** – glands of Krause and Wolfring. Provide basal tear secretion

Lymphatics: pre auricular nodes

Nerves: great superficial petrosal nerve (parasympathetic; causes tear secretion)

Lacrimal Drainage System

1. Lacrimal Puncta: Located on papilla lacrimalis on the medial part of lower lid
2. Canaliculi
Vertical portion – 2mm
Horizontal portion – 8 mm
Common canaliculus, **guarded by valve of Rosenmuller**
3. Lacrimal Sac: Lies in lacrimal fossa b/w anterior and post lacrimal crests formed by lacrimal bone & frontal process of maxilla.
4. Nasolacrimal duct (NLD) : 18 mm long. Upper 12mm is osseous, lower 6mm is membranous .
Direction is **downwards, backwards and laterally**
It opens in inferior meatus of nose. Opening is guarded by the **valve of Hasner**

Tear Film

Components of tear film:

- Mucin layer (Innermost): secreted by Goblet cells of the conjunctiva. Function is to allow the tear film to spread over the hydrophobic cornea by making it hydrophilic
- Aqueous layer (middle) : secreted by Lacrimal gland
- Lipid layer (outermost): secreted by Meibomian glands. It prevents the evaporation of the aqueous layer

DRY EYE

1. Evaporative Dry Eye- Meibomian gland disease, Posterior blepharitis
 - Proptosis
 - Lagophthalmos
 - Prolonged stay in air-conditioned rooms
2. Aqueous Layer Deficiency: Keratoconjunctivitis sicca (KCS)
 - Primary Sjogren's syndrome = KCS + Xerostomia
 - Secondary Sjogren's syndrome = KCS + Xerostomia + Rheumatoid Arthritis
3. Mucin deficiency:
 - Goblet cell deficiency / damage eg in Vitamin A def, trachoma, SJ syndrome
 - chemical burns, ocular cicatricial pemphigoid

Tests for Dry eye:

- 1 Schirmer's test : After 5 min- Normal >10mm Impaired <5mm.
2. Tear film break up time (BUT) : : Value less than 10 sec for appearance of dry spot.
3. Fluorescein staining/Rose Bengal Staining test
4. Tear osmolality
5. Conjunctival impression cytology
6. Conjunctival biopsy

Treatment of dry eye :

- Supplementation by tear substitutes. Eg HPMC, CMC , Hypromellose etc
- Preservation of existing tears : punctual occlusion.
- Steroids/Cyclosporine
- Buccal mucosa graft/ Amniotic membrane graft.

WATERING EYE

- **Hyperlacrimation** : Excessive secretion of tears. Eg conjunctivitis, corneal ulcers, uveitis etc.
- **Epiphora** Obstruction to outflow: Most common cause can be due to obstruction anywhere in Lacrimal passages

Clinical Evaluation :

- Regurgitation test
- Lacrimal Syringing: most definitive & reliable test.
- Fluorescein dye disappearance test
- Jones dye test
- DCG - dacryocystography

DACRYOCYSTITIS**It is the Inflammation of Lacrimal sac**

- **Congenital Dacryocystitis** : Mostly due to membranous occlusion at valve of Hasner
Epiphora Seen in infants less than 1 month
Mucopurulent discharge

Treatment of Blockage:

1. Sac massage with antibiotic drops = opens up 98% of cases
- Probing & Syringing
 - DCR after 5 yrs of age

2. Adult Dacryocystitis

It may be acute / chronic: Epiphora, sac swelling, muco-purulent discharge

Treatment:

1. **Dacrocystorhinostomy (DCR)**: sac opened into middle meatus.
2. **Dacryocystectomy (DCT/DCY)** : removal of sac – extremes of ages, failed dcr, fibrotic sac, sac tumors.

Tumors of Lacrimal Gland:

- Pleomorphic Adenoma (benign mixed tumor) : most common , occurs in young age
Removed with its Pseudocapsule. Good prognosis
- Adenocarcinoma(Malignant mixed tumor) : in older ages, painfull swelling, poor prognosis

Mikulicz's syndrome: B/L enlargement of salivary & Lacrimal glands associated with Leukemias, hodgkins disease TB , Sarcoidosis etc

EYE LIDS**Structure of lids**

1. Skin
2. Subcutaneous areolar tissue
3. Layer of muscle
 - a) Orbicularis – supplied by Facial nerve.
 - b) LPS – supplied by Oculomotor Nerve
3. Fibrous layer –
 - a) Tarsal plate. Upper tarsus – 11 mm height, lower tarsus – 5 mm height.
 - b) Orbital septum: Thinner peripheral portion attached to orbital margin
4. Muller's muscle : origin from fibres of LPS and inserts in upper border of tarsus. Supplied by sympathetic.
Action – elevator of UL
5. Conjunctiva –

Glands of lids

1. Meibomian Glands : Sebaceous glands. Present in Tarsal plates 20-30 for UL & 10-15 for LL
2. Zeis's Glands : Sebaceous glands, open into follicles of lashes
3. Gland of Moll : Modified sweat gland, opens in Lash follicle/on lid margin b/w lashes

Stye/ Hordeolum Externum – Small abscess caused by acute staphylococcal infection of lash follicle and associated gland of Zeis
Rx – 1. Epilation 2. Hot fomentation 3. Antibiotics

Hordeolum Internum : Painful abscess caused by acute staphylococcal infection of meibomian glands
Rx – Hot Formentation, Oral Antibiotics.

Chalazion – Chronic granulomatous inflammation of meibomian glands.

- Rx- a) Small – Disappear spontaneously or inject Triamcinalone steroid directly in it.
b) Big – Incision and curettage

INFLAMMATION OF LIDS**Blepharitis**a) Seborrhoeic (squamous) blepharitis

Associated with seborrhoeic dermatitis
Disorder of glands of Zeis
Dry dandruff like or wet greasy scales on lids and cilia..

b). Staphylococcal/Ulcerative Blepharitis

Chronic staph. Infection of bases of lashes.
Ant. Lid margins shows , fibrinous, brittle scales, mixed with pus.
on removal of crusts— small bleeding ulcers
Sequeale: trichiasis, madarosis, poliosis, tylosis,
Recurrent styes & bacterial conjunctivitis

c). Posterior Blepharitis (meibomitis) – Disorder of meibomian glands. White frothy discharge with
Irritation, stinging, burning, blocked orifices of meibomian glands.d). Parasitic Blepharitis : caused by Phthiriasis palprebraum (Crab louse)

Rx of Blepharitis : 1. Lid Hygiene – Hot Formentation, Scrub lid margins with cotton bud

- 2.Rx of dandruff flakes with medicated shampoo
3.Antibiotics if staph infection

Anomalies in Position of Lashes & Lid Margin

1. **Congenital coloboma of lids:** full thickness triangular gap near the nasal border of upper lip.
Treatment is by surgical repair.
2. **Epicanthus:** fold of skin covering inner canthus, occurs normally in human new borns, disappears with development of bridge of nose. Seen in some races and in blepharophimosis.
3. **Trichiasis** – Inward, misdirection of lashes.
Symptoms – Irritation, pain, lacrimation, blepharospasm.
Rx –
 - a) Epilation – Temporary
 - b) Electrolysis
 - c) Cryotherapy
4. **Distichiasis** – Extra row of lashes situated in the opening of meibomian glands.
5. **Symblepharon** : Adhesion of lid to globe.
Causes : Burns from heat/caustics, Ulcers, Surgeries, Steven Johnson's syndrome.
Raw surfaces and subsequent joining of palpebral & bulbar conjunctiva.
Rx – Prophylaxis : break early adhesions with glass rod & lubricants & Therapeutic Contact lens
Once formed : surgical excision with Conjunctive/Buccal mucosal graft on raw surfaces
6. **Ankyloblepharon** – Adhesion of margin of upper and lower lids associated along with symblepharon
7. **Blepharophimosis** – Horizontally small palpebral fissure. Treated with canthoplasty.
8. **Lagophthalmos** - Inability to voluntarily close the eyelids.
Causes : Paralysis of Orbicularis Oculi, symblepharon, Cicatrization of lids,
Severe Ectropion & Proptosis
9. **Blepharospasm** – Involuntary, sustained & forceful eyelid closure
Essential – occur spontaneously, without stimulus in 45-65 yrs age group.
Reflex – Precipitated by sensory stimuli
Rx- Botulinum toxin injection into Orbicularis.
10. **Entropion** – In turning of eyelid margin. It may be classified into :
 1. Congenital
 2. Cicatricial entropion: due to Scarring of palpebral conjunctiva. More common in Upper lid.
 - Ocular cicatricial pemphigoid
 - Stevens Johnson syndrome
 - Trachoma
 - Chemical burns
 Rx- Mild cases : Wedge resection of tarso-conjunctiva.
Moderate cases : modified burrows, jaesche-Alt's/ modified Ketssey'
Severe cases : Mucous Membrane graft of posterior lamina
 3. Spastic: Due to spasm of Orbicularis in essential blepharospasm or ocular irritation.
Rx – Remove the cause. Temporary taping of lids or everting sutures
 4. Involitional (Senile) entropion: More common in LL
Causes – a) Old age: skin atonic, redundant, less firmly adherent to orbicularis
b) Weak L.L. Retractors

- Rx – a. Mild – Skin – Muscle spindle removal
 b. Moderate – Modified Wheeler's / Bick's / Weiss Operation – Orbicularis muscle overlapped & anchored to tarsal plate.
 c. Severe – Jones Procedure – Inferior lower lid retractors are tucked & plicated.

**Epiblepharon – involves medial aspect of LL lid. Medial part of lid inturned due to poorly developed posterior lamina. Resolves spontaneously in 1-2yrs

11. Ectropion – Outward turning of eyelid.

Classification:

1. Involuntional (Senile) Ectropion : most common type , involves the lower lid.

Due to loss of Orbicularis muscle tone & Laxity of Medial & Lateral Canthal tendons

Rx – In order of severity:

- a) Medical Conjunctivoplasty – Diamond shaped piece removed inferior to canaliculus
- b) Horizontal Lid Shortening
 - i. Bick's procedure – Excision of full thickness wedge of lid at outer canthus
 - ii. Fox procedure – Excision of Base Up wedge of tarsus & conjunctiva
- c). Lazy T procedure: Combination of conjunctivoplasty and wedge resection as above.
- d) Bryon smith's Modified Kuhnt Szymanowski procedure – For severe ectropion

2. Ciatricial Ectropion : cused by chemical burns,, trauma, tumors, . Rx – Z. plasty, VY plasty, skin grafts

3. Paralytic Ectropion – Due to Facial N. Palsy

Rx- To prevent exposure keratopathy -.Artificial tears,Lubricating ointment & tarsorrhaphy

4. Mechanical Ectropion: due to pulling down of lower lid by tumors , swelling etc

5. Spastic Ectropion : Seen in children & young people – spasm of Orbicularis

12. Ptosis

Abnormal drooping of upper eyelid.

Elevators of upper lid :

- Leavator muscle (3rd Nerve)
- Mullers muscle (Sympathetic supply).

Classification

1. Congenital Ptosis: Common cause of ptosis in children

- Simple congenital : not associated with any other anomaly
- Congenital Ptosis with associated weakening of SR muscle
- Blepharophimosis syndrome- Bilateral ptosis, telecanthus, epicanthus inversus, lateral ectropion.
- Synkinetic Ptosis – Also called Marcus Gunn Jaw Winking Phenomenon.
 - Unilateral congenial Ptosis + retraction of affected lid in conjunction with stimulation of ipsilateral pterygoid muscle
 - Lid winking/retraction on opening mouth, chewing
 - Cause is cross connection of III & V N due to aberrant regeneration of III. N.

2. Acquired Ptosis:

A. Neurogenic

1. Due to 3rd Nerve. Palsy
2. Horner's Syndrome (Oculosympathetic palsy) :

B Myogenic:

Myasthenia Gravis, Dystrophia Myotonica, Oculopharyngeal Muscular Dystrophy,

C. Aponeurotic:

Due to defect / trauma in LPS aponeurosis

1. Involutional/Senile (B/L) - High/absent lid crease.
2. Postoperative : Cat surgery, R.D. surgery.
3. Blepharochalasis – Recurrent episodes of odema of lids

D. Mechanical: Due to heavy upper lid. Eg. Tumours – Neurofibromas, chalazion Dermatochalsis

Clinical Evaluation –

- Levator Function – Berke's Method

Normal	15mm
Good	8mm
Fair	5-7 mm
Poor	4mm
- Amount of Ptosis – Ptosis measured by amt of cornea covered with lid and subtract by 2 mm

Mild	- 2 mm
Moderate	- 3-4mm
Severe	- > 4mm

3. Bell's Phenomenon – If absent – exposure keratopathy Absent Bell is a contraindication for surgery.

4. Tensilon Test : Myaesthesia Gravis

5. Phenylephrine Test – Phenylephrine 10% - if within 10-15 min Ptosis improves – ptosis is due to mullers muscle underaction as in Horner's Syndrome.

Choice of Surgery –

1. Fasanella Servat Surgery : (Transconjunctival resection)

- a. Mild congenital Ptosis (2mm) with levator action > 10mm
- b. Horner's syndrome ptosis not responding to removal of primary cause.

2. LPS Resection: Everbusch or Blaskowicz surgery

- a. Moderate congenital Ptosis

3. Frontalis/Fascial Lata Sling Surgery:

- a. Severe congenital Ptosis with levator action <4mm

LID TUMOURS

A. Basal Cell Carcinoma (Rodent ulcer) :

- Most common primary malignant tumor of lid (95%)**
- Age – 60-70yrs
- Site- LL and Medial canthus
- Locally malignant
- Noduloulcerative is the most common type.**
- Symptoms And Signs – Slowly growing, locally, invasive, does not metastasize

B. Squamous Cell Carcinoma

- 2nd commonest lid malignancy
- Grows faster than BCC – metastasis to regional LN
- Types – Nodular, Ulcerative, Papilloma

C. Sebaceous Gland Carcinoma

- From meibomian glands, more common in UL, 60 – 70 yrs
- Discrete yellow firm nodule.
- Present as non treatable & recurrent chalazion
- Poor prognosis

Treatment :

- Local Surgical Excision – with 3 mm clean margin.
Moh's micrographic technique – Excise affected tissue in successive layers – Microscopic Evaluation of Frozen section.
- Cryotherapy – 30 C, freeze thaw technique.
- Radiotherapy – Recurrence common, multiple sittings needed..
- Exenteration – If orbit invaded.

ORBIT

ANATOMY

- Apex at optic foramen and Base at orbital margin
- 7 Bones take part in formation of orbit

- | | |
|-------------|--------------|
| 1. Maxilla | 5. Zygomatic |
| 2. Palatine | 6. Ethmoid |
| 3. Frontal | 7. Lacrimal |
| 4. Sphenoid | |

Nasal bone does not contribute to orbit formation**.

Medial walls are parallel, lateral walls make an angle of 90 with each other.

Volume of orbit=30 cc

Volume of Eyeball = 6 cc

WALLS OF ORBIT

	Roof	Medial Wall	3.Floor	Lateral Wall
1.	Lesser wing of sphenoid	Frontal process of Maxilla	Zygomatic	Greater wing of Sphenoid
2.	Orbital plate of Frontal	Ethmoid	Maxillary	Zygomatic
3.		Lacrimal	Palatine	
4.		Body of Sphenoid		

Floor is the most frequently fractured wall of orbit in trauma. **

Optic Canal/Optic Foramen

Formed by Lesser Wing and Greater wing of sphenoid.

Vertically oval. Length 6-11 mm, Diameter 4-6 mm

Transmits :

1. Optic Nerve with its covering of Dura, Arachnoid and pia mater
2. Ophthalmic Artery with its dural sheath with few twigs of Sympathetic nerves.

Superior Orbital Fissure

Lies between lesser and greater wing of sphenoid

Situated lateral to Optic foramen at the orbital apex.

Comma shaped, approx. 22 mm long.

Narrow Lateral portion and Wider Medial portion.

Common Tendinous Ring (for origin of recti) divides the structures passing through SOF in 3 compartments

A. Structures passing above Tendinous ring	B. Structures passing within Tendinous ring
1. Lacrimal Nerve 2. Frontal Nerve (both are br of ophthalmic div of V Nerve) 3. Trochlear (IV) Nerve 4. Superior ophthalmic vein 5. Recurrent branch of Ophthalmic artery.	1. Superior Division of III Nerve 2. Inferior Division of III Nerve 3. Abducens (VI) Nerve 4. Naso Ciliary nerve (br. of Ophthalmic div of V nerve) 5 Sympathetic Root of Ciliary ganglion

C. The lowest part transmits: Inf. Ophthalmic Vein

Surgical Spaces of Orbit

1. Subperiosteal Space: Between Bones of orbital wall and periorbita
2. Peripheral/Extraconal Space: Between periorbita and Extra Ocular Muscles
3. Central/Intraconal Space: in the Muscle cone, enclosed by muscles
4. Tenon’s Space: Connective tissue around the eyeball

PROPTOSIS

Defined as forward displacement of eyeball beyond the orbital margin

BIRTH – 2 YEARS	CHILDHOOD	ADULTS
<ul style="list-style-type: none"> • Pseudoproptosis • Crania synostosis • Cephalocele • Microphthalmia with cyst • Teratoma • Capillary hemangioma • Juvenile xanthogranuloma • Metastatic Neuroblastoma • Orbital Retinoblastoma 	<ul style="list-style-type: none"> • Dermoid/Epidermoid • Glioma of O.N • Hemangioma • Rhabdomyosarcoma • Orbital cellulitis • Leukemia • Orbital varices 	<ul style="list-style-type: none"> • Thyroid • Pseudo tumor • Cavernous hemangioma • Orbital cellulitis • Meningioma • Non Hodgkins lymphoma • Metastasis • Lacrimal gland Tumors • Osteoma • Orbital varices • Carotid cavernous fistula

Axial Proptosis (Intraconal)

- Thyroid Exophthalmos
- Optic nerve Glioma
- Meningioma
- Cavernous Hemangioma
- Retinoblastoma
- Pseudo tumor

Non Axial Proptosis (Extraconal)

- Larimal gland tumor – Inero Nasal
- Ethmoidal Mucocele – Lateral/Infero-Lateral
- Frontal Mucocele – Downwards/Inferolateral
- Naso pharyngeal Tumors – Lateral proptosis
- Maxillary tumors – Superior proptosis

Measurement of Proptosis

1. Nafziger Test – Inspection from behind the patient, looking over his forehead
2. Hertel Exophthalmometer – Apex of cornea from Lateral orbital Rim
 Normal 14 to 20 mm, Abnormal > 21mm
 Difference of 2 mm b/w 2 eyes – suspect; Difference of > 2 mm = proptosis
3. Luedde Exphthalmometer – transparent scale. Useful in children.
4. Weiss & Mutch
4. Gormez Exphthalmometer
5. Davanger Exphthalmometer.
6. Topometer – for Non Axial Proptosis**

Special Investigations

- 1.Plain X-Rays
- 2.C.T.Scanning – Axial & Coronal Views.
- 3.USG

Pseudoproptosis

1. Enlargement of eye due to –High Axial Myopia, Buphthalmos.
2. Enophthalmos / Ptosis of other eye.
3. Shallow orbit – craniofacial synostosis.

Enophthalmos

- Post traumatic – Blow out #
- Microphthalmia
- Congenital defects – Maxillary hypoplasia, Absence of greater wing of sphenoid in Neurofibromatosis
- Post irradiation -Atrophy Of Orbital Contents
- Pseudo- enophthalmos: if there is other eye proptosis, Horner's syndrome.

THYROID OPHTHALMOPATHY

Also called Ophthalmic Graves' disease (OGD).

May be present in either hypo, hyper or even euthyroid pt.

Generally presents in both eyes BUT Ocular features may be Unilateral to start, then progress to other eye.

1. Eyelid Signs

Mechanism –

- a. Muller's Muscle over action: Due to sympathetic over stimulation
- b. Over action of LPS-SR complex: to compensate for IP Fibrosis
- c. Contraction of Levator

- **Dalrymple's sign** : upper lid retraction (generally the 1st sign to appear)
- **Von graefe's sign** : upper lid lag on down gaze
- **Griffith sign**: lower lid lag on up gaze.
- **Enroth sign**: lid edema & puffiness.
- **Kocher sign** : staring & frightened look.
- **Rosenbach sign** : tremor of closed lids.
- **Stellwag sign** : infrequent blinking
- **Gifford sign** : difficulty in eversion of upper lid.
- **Geoffroy sign** : absent forehead crease on up gaze.
- **Mobius sign** : poor convergence

2. Infiltrative Ophthalmopathy – Due to in mucopolysaccharides content

- a. Enlargement of EOM : almost 8 times their normal size
- b. Proliferation of orbital fat and connective tissue

3. Proptosis – U/L or B/L. Commonest cause of adult Proptosis.

4. Dysthyroid Optic Neuropathy –

- Due to direct compression of O.N. and its blood supply at orbital apex by raised intraorbital pressure.

-Symptoms and Signs – Slow impairment of central vision, Central scotoma, APD

5. Restrictive Thyroid Myopathy: IR is Most commonly involved. Causing Elevator palsy

NOSPECS classification (By Werner (1969) and later modified by American Thyroid Association)

- Class 0: No sign & Symptoms
- Class 1: Only Sign & No symptoms
- Class 2: Soft tissue involvement
- Class 3: Proptosis

- Class4: Extra Ocular muscle involvement
 Class 5: Corneal involvement
 Class 6: Sight loss (due to Optic nerve involvement)

TREATMENT

1. Lubricants – Artificial Tears/Ointment.
2. Guanethidine 5% - (adrenergic blocker) drops. For Lid Retraction due to Muller's over action
3. Steroids
 - Oral steroids (Prednisolone – 80-100 mg/d for 2 wks then tapered) in mild to moderate proptosis.
 - I/V steroids – For Optic Neuropathy and rapid progressing and severe proptosis.
4. Radiotherapy – Total 2000 rads given over 10 days.
5. Cytotoxic Agents – Azathioprine/cyclophosphamide (rarely used).
6. Orbital Decompression Surgery: In severe proptosis and compressive optic Neuropathy.
7. EOM Surgery – In Diplopia. Aim Binocular single vision in primary, down gaze.

Fracture of Orbital Floor

Most commonly occurs along the thin floor.

Caused by sudden increase in Intraorbital pressure by an object > 5 mm diameter e.g. Fist, Tennis ball

Clinical Features

- Periocular ecchymosis and edema.
- Nasal bleeding: due to Hemorrhage in Maxillary sinus
- Subcutaneous Emphysema/lower lid crepitus
- Infraorbital N. anesthesia: Involves Lower Lid, side, of nose, upper Lid, upper teeth.
- Enophthalmos : seen after 2 wks when edema subsides
- Diplopia: Due to entrapment of IR muscle in the fracture, diplopia occurs both in upgaze and downgaze. This is called double diplopia

Investigations –

1. X-Ray – Water's view – Tear Drop/Hanging drop sign
2. C.T. scan – true Extent of #, muscle entrapment.

Rx

1. Minor/ hair line fracture: No treatment
2. Indications for surgical repair:
 1. Enophthalmos more than 2 mm after 2 weeks.
 2. Fracture > ½ of orbital Floor
 3. Diplopia within 30° of primary gaze

Time of repair:

- Early - within 2 weeks
- Delayed : 2-6 weeks
- late : After 6 weeks

Periosteum is elevated, entrapped contents Removed – Floor Repaired by Bony grafts & synthetic material. Nowadays Teflon, Proplast, Titanium gauze, gelfoam, Supramid used besides autologous fascia, bone etc.

Carotid Cavernous Fistula

Formation of abnormal communication between cavernous sinus and internal carotid artery.

- Cause :
1. Trauma – Basal skull fractures
 2. Rupture of Intracavernous aneurysm

Clinical Features

1. Chemosis – Dilatation of episcleral blood vessels.
2. Proptosis – Pulsatile, Thrill & Bruit (abolished by compression of Carotid artery in neck)
3. Ophthalmoplegia – Commonly VI Nerve Palsy .

4. Anterior segment ischemia: epithelial edema. Flare, Iris atrophy.
 5. Diagnosed using contrast enhanced radiology.

Treatment : Balloon catheter embolization- most commonly done.
 Ligation of fistula at carotid artery
 Intracavernous Surgery to close the fistula.

Orbital Varices

- **Presents as intermittent proptosis** which is non pulsatile
- Not associated with Bruit
- Enlargement of orbital vascular channels
- Proptosis can be increased by valsalva's maneuver and in dependent head position.
- X-Ray may show presence of phlebolith,

ORBITAL CELLULITIS

It is the suppurative inflammation of fat and cellular tissues of orbit.

- Exogenous infection
- Extension from neighbouring structures : nose , sinus, teeth, lids , face
- Endogenous infection from a distant foci

Orbital cellulitis can be clinically divided into:

1. Preseptal cellulitis : Anterior to orbital septum.

Symptoms And Signs – Pain, Periorbital swelling, Tenderness;

Treatment – Oral antibiotics

2. Postseptal Orbital cellulitis : Post to orbital septum

Clinical Features – Sudden onset of pain, fever

Chemosis, lid edema

Proptosis, restriction of ocular movements (Ophthalmoplegia)

Complications – Meningitis, Brain Abscess, cavernous sinus thrombosis, Optic neuritis

Treatment 1. Systemic antibiotics – I/V, Oral

2. Surgery – to drain any orbital abscess

Cavernous Sinus Thrombosis

Initially starts as U/L then progresses to B/L condition in almost 50% of cases.

Patient is seriously ill, high fever, vomiting and headache.

Symptoms and Signs –

1. Proptosis :Rapidly progressive
2. Lid edema, Chemosis, APD Pupil
3. Restriction of ocular movements, External ophthalmoplegia
4. Fundus – Dilated veins, Disc edema
5. Edema in Mastoid Region – due to thrombosis of Emissary

Treatment – IV Antibiotics. Prognosis poor.

INFLAMMATORY ORBITAL DISEASE (Pseudotumor)

These are space occupying lesion of orbit, presenting clinically as tumors but histologically proved to be chronic inflammations.

Clinical Features

Affects 40 – 50 yrs, most cases are U/L, Both sides involved at different times

Onset – Abrupt with Pain, Redness, Lid edema, chemosis, Limitation of EOM

Treatment

Mild cases : Spontaneous Remission after few weeks with/without treatment

Severe cases :Systemic steroids 60-80 mg/d for 2 wks

Recalcitrant cases : Cytotoxic agents may be used.

TUMOURS OF THE ORBIT**1 Developmental Tumors**

- Dermoid : External Angular in Infants. Firm, round, localized in upper temporal / nasal quadrant
- Epidermoid
- Lipodermoid

2. Vasular tumorsa) Caillary Hemangioma (strawberry' nevus)

Typically present at birth in anterior part of orbit.

Also present on skin of eyelids.

Undergoes growth during first year of life

May undergo spontaneous Regression – Disappears by the age of 5 yrs

Treatment: Injectable steroids, Systemic corticosteroids, Radiation, surgical excision

b) Cavernous Hemangioma (in Muscle cone)

Benign, In middle age Adults

Slowly progressive, U/L, axial proptosis

Commonest retro bulbar mass lesion causing proptosis in adults

Treatment – Surgical excision

c) Lymphangioma

Benign aggressive tumor

Slowly progressive proptosis in young person.

Intermittent Proptosis

Sometimes Rapidly progressive and associated with pain due to bleeding in the tumor

`chocolate cysts`**

Regress spontaneously with time. If not than drain the cyst.

3. Myomatous tumors :Rhabdomyosarcoma

Most common primary malignant orbital tumor in children**

Present typically at 5-10 yrs as rapidly progressive proptosis.

Typically presents as a mass in superonasal quadrant

3 histological types embryonal – commonest variety.

alveolar – most malignant

pleomorphic – best prognosis but rarest

CTscan – tumor arising from extra ocular muscles.

Bony involvement associated with poor prognosis

Treatment : chemotherapy + radiation

4. Tumors of Optic nerve and its sheaths:

	OPTIC NERVE GLIOMA	O.N. SHEATH MENINGIOMA
1	Presents b/w 4-8 years	Affect middle-aged 30-50 yrs Women > man
2	Benign Astrocytic tumor from within O nerve	Arises from meninges
3	Optic nerve compression much earlier than proptosis is the rule	Optic nerve compression late
4	55% have Neurofibromatosis	
5	Vision loss early	Vision loss Late
6	Never infiltrate the Orbit	Infiltrate the Orbit
7	X-Ray (Rhese view): uniform, rounded, enlargement of optic foramen	Irregular enlargement(moth eaten) of optic canal
8	C.T. Fusiform enlargement of optic Nerve seen.	Segmental/diffuse enlargement

5. Lymphomas : Hodgkins & Non Hodgkins

6. Histiocytosis – X

1. Hand schuller Christian disease
2. Letter siwe disease
3. Eosinophilic granuloma

7. Metastatic tumors

A. In Children

- a. Neuroblastoma – 40% children have orbital metastases
Abrupt onset of Proptosis + Lid ecchymosis
- b. Retinoblastoma – Extrocular spread
- c. Ewings’s Sarcoma – Malignant/Abrupt Hemorrhagic proptosis.
- d. Leukemia
- e. Wilm’s Tumor

B. In Adults : From Bronchus, Breast, Prostate, Kidney, GIT, Lymphomas

Some clinical terms:

Lateral displacement (Large gap) of Medial Canthi – **Telecanthus**

Soft tissue displacement – Primary Telecanthus

If Telecanthus is due to increased Bony distance – **Hypertelorism** (Secondary Telecanthus)

Anti mongoloid slant seen in :

- Trecher colin syndrome (Mandibulofacial dysostosis)
- Apert’s syndrome (Oxycephaly- syndactyle)

Systemic Disease and Eye

Table: Ocular and systemic feature of immunological disorder

Systemic diagnosis	Extraocular features	Intraocular feature
Rheumatoid arthritis	‘Dry eye’ episcleritis, scleritis	Iridocyclitis, corneal melting cataract
Systemic lupus erythematosus	Episcleritis	Iritis, retionopathy
Giant cell arteritis	Extraocular muscle palsies	Anterior ischaemic optic neuropathy
Sarcoidosis	Enlargement of the lacrimal	Iridocyclitis, retinal periphlebitis

	glands	
Reiter syndrome	Conjunctivitis	Uveitis, retinal vasculitis
Periarteritis nodosa	Episcleritis, extraocular muscle palsy	Uveitis, retinal haemorrhage, papilledema
Vogt-Koyanagi-Harada syndrome	Poliosis	Uveitis, choroiditis, exudative retinal detachment
Multiple endocrine neoplasia (MEN IIb)	Mucosal neuromas of the lid and conjunctiva	Medullated nerve fibres in the cornea

Table: Ocular and systemic features of hematological disease

Systemic diagnosis	Extraocular features	Intraocular features
Lymphocytic leukaemia	Proptosis	Iris nodules, retinal oedema, haemorrhages, leukaemic infiltrates, Roth spots
Myeloid leukaemia	Orbital chloroma	Retinal oedema, haemorrhages, peripheral retinal neovascularization
Lymphomas	Lid/orbital deposits	Uveitis
Sickle cell anaemia	Dilated conjunctival Vessels	Retinal capillary occlusion, neovascularization, chorioretinal scars

Table: Ocular and systemic features of infectious diseases

Systemic diagnosis	Extraocular feature	Intraocular feature
Viral		
Herpes simplex	Vesicles on the lids	Dendritic keratitis, uveitis, acute retinal necrosis
Congenital rubella		Microphthalmos, cataract, glaucoma, chorioretinitis
Measles	Keratoconjunctivitis, xerophthalmia precipitates	Optic neuritis
Infectious Mononucleosis	Conjunctivitis	Uveitis, retinal phlebitis, papillitis
Cytomegalovirus	Microphthalmos	Necrotizing chorioretinitis, optic atrophy
Acquired immune deficiency syndrome	Kaposi sarcoma	Cotton-wool spots on retina, cytomegalovirus retinitis
Fungal		
Candida Cryptococcus	Conjunctivitis	Keratitis, retinitis, endophthalmitis Papilledema, optic atrophy
Bacterial		
Tuberculosis	Phlyctenular conjunctivitis	Granulomatous uveitis, juxtapapillary choroiditis
Leprosy	Facial palsy, madarosis	Iritis, secondary glaucoma, cataract

Table: Ocular and systemic features of parasitic diseases

Systemic diagnosis	Extraocular features	Intraocular features
Toxoplasmosis		Macular scarring, retinochoroiditis, vitritis
Toxocariasis		Vitritis, choroiditis, vitreoretinal granuloma
Cysticercosis	Subconjunctival cysticerci	Subretinal or vitreous cysticerci
Onchocerciasis		Sclerosing keratitis, uveitis, cataract

Table: Ocular and systemic feature of endocrines disorder nd disorders of metabolism

Systemic diagnosis	Extraocular features	Intraocular features
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Homocystinuria		Subluxation of the lens
Mucopolysaccharidoses	Corneal opacification	Pigmentary retinopathy glaucoma, optic atrophy
Wilson disease	Kayser-Fleischer ring	Sunflower cataract
Diabetes mellitus	Xanthelasma, extraocular muscle palsies, infections	Cataract, iris neovascularization, retinopathy, vitreous haemorrhage, tractional retinal detachment, optic neuropathy
Hyperthyroidism	Exophthalmos, lid retraction, lid lag	Superior limbic keratitis, disc oedema
Hypoparathyroidism,	Fasciculation	Cataract, disc oedema

Table: Ocular and systemic features of muscular disorder

Systemic diagnosis	Extraocular features	Intraocular features
Myasthenia gravis*	Ptosis, diplopia	
Muscular dystrophy	Ptosis, exophthalmoplegia, dry eye	Cataract, pigmentary retinopathy

Table: Ocular and systemic features of inherited disorders

Systemic diagnosis	Extraocular features	Intraocular features
Down syndrome	Mongoloid slant of eyes, epicanthic folds keratoconus	Cataract, iris sports
Sturge-Weber syndrome	Arteriovenous malformations of episclera	Choroidal haemangioma glaucoma
Neurofibromatosis	Ptosis, pulsating exophthalmos	Optic nerve glioma, neurofibromas of he iris, albinotic fundus, foveal hypoplasia
Marfan syndrome		Subluxation of the lens myopia, retinal detachment
Von-Hippel-Lindau disease		Retinal angiomas

MCQ'S**EMBRYOLOGY:**

1) The following ocular structure is not derived from surface ectoderm:

- a) Crystalline lens
- b) Sclera
- c) Corneal epithelium
- d) Epithelium of lacrimal glands

Ans: 1.B

LENS AND CATARACT

1) Equatorial diameter of the lens is

- a) 7 mm
- b) 9 mm
- c) 8 mm
- d) 10 mm

2) Which continues to grow in a lifetime:

- a) Cornea
- b) Lens
- c) Iris
- d) Retina

3) All of the following lead to the formation of complicated cataract, except:

- a) Pigmentary retinal dystrophy
- b) Progressive hypermetropia
- c) Progressive myopia
- d) Iridocyclitis

4) Maximum refractive index in eye is of

- a) Cornea
- b) Anterior capsule of lens
- c) Posterior capsule of lens
- d) Centroid of lens

5) Dislocation of the lens is seen in:

- a) Retinoblastoma
- b) Medulloblastoma
- c) Neuroblastoma
- d) None of these

6) Which is the most important complication of anterior chamber IOLs:

- a) Glaucoma
- b) Hyphema
- c) Subluxation
- d) Retinal detachment

7) A 55 years old patient complains of decreased distant vision. However, now he does not require his near glasses for near work. The most likely cause is:

- a) Posterior subcapsular cataract
- b) Zonular cataract
- c) Nuclear sclerosis
- d) Anterior subcapsular cataract

8) Complication cataract is seen in

- a) Blunt trauma
- b) Diabetes mellitus
- c) Neovascular glaucoma

d) Myopic chorioretinitis

9) Ectopia lens is not seen in

- a) Homocystinuria
- b) Down's syndrome
- c) Pseudoexfoliation
- d) Marfans syndrome

10) Christmas-Tree cataract is seen in

- a) Myotonic dystrophy
- b) Irradiation cataract
- c) Diabetes
- d) Traumatic cataract

11) Anterior lenticonus is found in:

- a) Lowes syndrome
- b) Willium syndrome
- c) Alports syndrome
- d) Down's syndrome

12) Vossius ring is seen on

- a) Cornea
- b) Anterior capsule of lens
- c) Posterior capsule of lens
- d) Iris

13) Steroid-induced cataract is:

- a) Posterior subcapsular
- b) Anterior subcapsular
- c) Nuclear cataract
- d) Cupuliform cataract

14) Which of the following is the most important factor for prevention of endophthalmitis in cataract surgery:

- a) Preoperative preparation with povidone iodine
- b) One week antibiotic therapy prior to surgery
- c) Trimming of the eyelashes
- d) Use of intravitreal antibiotics

15) The crystalline lens derives its nutrition from :

- a) Blood vessels
- b) Connective tissue
- c) Aqueous
- d) Zonules

16) Which laser is used in the management of after-cataracts:

- a) Argon
- b) Krypton
- c) Nd-YAG
- d) Excimer

17) A 55 years old patient complains of decreased distance vision. However now he does not require his near glasses for near work. The most likely cause is:

- a) Posterior subcapsular cataract
- b) Nuclear sclerosis
- c) Zonular cataract
- d) Anterior subcapsular cataract

18) A 56- year old patient presents after 3 days of cataract surgery with a history of increasing pain and diminution of vision after a initial improvement. The most likely cause would be:

- a) Endophthalmitis
- b) After-cataract
- c) Central retinal vein occlusion
- d) Retinal detachment

- 19) Which morphological type of cataract is most visually handicapping:
- Cortical
 - Nuclear
 - Posterior subcapsular
 - Zonular
- 20) The standard suture less cataract surgery done with phaco-emulsification and foldable IOL has an incision of:
- 1mm – 1.5mm
 - 2-2.5mm
 - 3-3.5 mm
 - 3.5-4.5 mm
- 21) Oldes component of lens of the eye is:
- Anterior capsule
 - Posterior capsule
 - Nucleo-cortical junction
 - Nucleus
- 22) Ideal fluid for irrigation during ECCE is:
- Normal saline to dextrose
 - Normal saline
 - Balanced salt solution
 - Balanced salt solution + glutathione
- 23) The most common complication of hypermature sclerotic cataract is:
- Dislocation of the lens
 - Phacomorphic glaucoma
 - Uveitis
 - Neovascularization of retina
- 24) A 60 year old male patient operated for cataract 6 months back now complains of floaters and sudden loss of vision. The diagnosis is:
- Vitreous haemorrhage
 - Retinal detachment
 - Central retinal artery occlusion
 - Cystoids macular edema
- 25) Most common senile cataract causing glaucoma is :
- Incipient type
 - Nuclear type
 - Morgagnian hypermature
 - Sclerotic hypermature
- 26) A diabetic patient gets cataract because of accumulation of sorbitol in lens. The enzyme responsible for this is:
- Glucokinase
 - NADPH+ dependent aldolase
 - Phosphofructoisomerase
 - Hexokinase
- 27) In Finchams test – there is breakup of halo and rejoining (patient present with coloured halo and giddiness). Diagnosis is:
- Open angle glaucoma
 - Cataract
 - Mucopurulent conjunctivitis
 - Acute angle closure glaucoma
- 28) All are methods of intracapsular extraction of lens, except:
- Phacoemulsification
 - Cryosurgery
 - Forceps delivery
 - Erisophake
- 29) Snow flake cataract is a pathognomic feature of:
- Chalcosis
 - Diabetes mellitus
 - Wilson's disease
 - Trauma
- 30) Chalcosis is associated with:
- Copper
 - Zinc
 - Lead
 - Gold
- 31) Polychromatic lustre is seen in
- Zonular cataract
 - Posterior subcapsular cataract
 - Nuclear cataract
 - Anterior subcapsular cataract
- 32) Cataract is seen in all, except
- Rheumatoid arthritis
 - Glucocorticoid administration
 - Galactosemia
 - Hypoparathyroidism
- 33) Sunflower cataract is seen in
- Injury
 - Laurence Moon Biedel syndrome
 - Wilson's disease
 - Galactosemia
- 34) Before IOL implantation the following are done for the estimation of refractory power of IOL:
- Keratometry
 - Axial length
 - Lens thickness
 - Corneal thickness
 - Corneal diameter
- 35) Most common cause of cataract is:
- Age related changes
 - Hereditary
 - Diabetes mellitus
 - Trauma induced
 - Myxoedema
- 36) Treatment of cataract in infant is:
- Lensectomy
 - ICCE
 - Dissicision
 - ECCE
 - Phaco-emulsification
- 37) Cataract is evaluated by:
- Gonioscopy
 - Tonometry
 - Stereoacuity
 - Contrast
 - Colour vision
- 38) Modern IOL is made up of:
- Acrylic acid
 - PMMA
 - PML
 - Glass
 - Silicon
- 39) Leaving the capsule behind in cataract surgery is advantageous because it:
- Prevents cystoids macular edema

- b) Decrease endothelial damage
c) Progressively improves vision
d) Decrease chance of retinal detachment
e) Decrease change of endophthalmitis
- 40) infective complication in cataract operation can be decreased by:**
a) Antibiotic eye drops
b) Intracameral instillation of antibiotic at the end of the operation
c) Intraoperative antibiotics
d) Preoperative antibiotics
e) Postoperative oral antibiotics
- 41) Cataract is caused by all except:**
a) Ultraviolet radiation
b) MRI
c) Infrared radiation
d) Microwave radiation
e) Ionizing radiation
- 42) Best site for IOL implantation:**
a) Iris
b) Capsular bag
c) Anterior chamber
d) Sulcus
- 43) Common complication of IOLs are all except:**
a) Corneal dystrophy
b) Glaucomas
c) Anisocoria
d) Macular edema
- 44) Rosette shape cataract is seen in:**
a) Trauma
b) Radiation
c) DM
d) Iridocyclitis
- 45) Christmas tree cataract is seen in:**
a) Down's syndrome
b) Rubella
c) Myotonic dystrophy
d) Diabetes
- 46) Good vision in dim light and clumsy in day lights, seen in:**
a) Cortical cataract
b) Morgagnian cataract
c) Nuclear cataract
d) Steroid induced cataract
- 47) Commonest type of cataract is:**
a) Blue dot
b) Zonular
c) Cupuliform
d) Cuneiform
- 48) the complication of extracapsular extraction of lens is:**
a) Cystoids macular oedema
b) Opacification of capsule
c) Iritis
d) Glaucoma
e) None of the above
- 49) Factor leading to raised intraocular pressure after cataract extraction:**
a) Vitreous touch syndrome
b) Use of alpha chymotrypsin
c) Choroidal detachment
d) Epithelial ingrowths
e) Residual lens cortex
- 50) Lens develops from:**
a) Surface ectoderm
b) Neuroectoderms
c) Visceral mesoderm
d) Paraxial mesoderm
- 51) Downward and nasal subluxation of lens is typically seen in:**
a) Homocystinuria
b) Marfans syndrome
c) Weil marchesani syndrome
d) Ehler-Danlos syndrome
- 52) Congenital cataract is seen in:**
a) Lowes syndrome
b) Tyrosinemia
c) Maple syrup urine disease
d) Beckwith Weidman's syndrome
- 53) Cataract can be caused by prolonged ingestion of which drug:**
a) Phenothazines
b) Methotrexate
c) Ethambutol
d) Chloroquine
- 54) Statement not true about rubella cataract is**
a) Pearly white
b) Bilateral
c) Stationary
d) Associated with subluxation
- 55) Cataract is caused by all except:**
a) Systemic corticosteroids
b) Busulphan
c) Thioridanzie
d) Metronidazole
- 56) Organism most commonly isolated from the vitreous following endophthalmitis developing 4 days after cataract surgery is:**
a) Staph epidermidis
b) Bacillus subtilis
c) Pseudopyocyanea
d) Propionobacterium
- 57) All are risk factors for cataract except:**
a) Diabetes mellitus
b) Hypertension
c) Smoking
d) Recurrent diarrhea
- 58) After phacoemulsification, suture applied are:**
a) Continuous
b) Interrupted
c) No sutures needed
d) None of the above
- 59) Increased lactic acid in aqueous humour is found in:**
a) Aphakia
b) Ectopia lentis
c) Traumatic dislocation of lens
d) Senile cataract
- 60) Earliest visual rehabilitation occurs with**

- a) ICCE+IOL
b) ECCE+IOL
c) ICCE alone or laser
d) Phacoemulsification
- 61) Lens has a respiratory quotient of**
a) 1
b) 0.6
c) 0.7
d) 0.9
- 62) True about complicated cataract is all except**
a) Axial involvement
b) Sutural involvement
c) Polychromatic luster
d) Posterior subcapsular involvement
- 63) Hypermature cataract leads to:**
a) Phacomorphic glaucoma
b) Phacotoxic glaucoma
c) Phacolytic glaucoma
d) None of the above
- 64) Scan used to calculate power of intraocular lens is:**
a) A scan
b) C scan
c) S scan
d) None
- 65) Lens capsule is thinnest at:**
a) Anterior pole
b) Posterior pole
c) Equator
d) Papillary margin
- 66) Spontaneous absorption of the lenticular material is seen in:**
a) Myotonic dystrophy
b) Hallerman streif syndrome
c) Aniridia
d) Persistent hyperplastic primary vitreous
- 67) Anterior cortical cataract is caused by:**
a) Perforating injury to eye
b) Radiation
c) Steroid
d) Senile
- 68) Traumatic dislocation of lens is diagnosed by:**
a) Direct ophthalmoscopy
b) Indirect ophthalmoscopy
c) Distant direct ophthalmoscopy
d) Slit lamp examination
- 69) Constantly changing refractory error is seen in**
a) Traumatic cataract
b) Diabetic cataract
c) Morgagnian cataract
d) Intumescent cataract
- 70) What is the most important complication of Anterior chamber lenses:**
a) Glaucoma
b) Hyphema
c) Subluxation
d) Retinal detachment
- 71) The biochemistry of cataract formation is:**
a) Hydration intumescence
b) Denaturation of lens proteins
c) Slow sclerosis
d) All of the above
- 72) Which is not associated with zonular cataract**
a) Diabetes
b) IUGR
c) Rickets
d) Dental abnormalities
- 73) Uniocular diplopia is seen in which stage of cataract:**
a) Incipient
b) Intumescent
c) Mature
d) Hypermature
- 74) Modern criteria for cataract operation is:**
a) Maturation of cataract
b) Loss of vision
c) Complications
d) All of the above
- 75) Vossius ring is seen in:**
a) Chalcosis
b) Siderosis
c) Lens concussion
d) Pseudomonas infection
- 76) Most common complication of extracapsular cataract surgery is:**
a) Retinal detachment
b) Opacification of posterior capsule
c) Vitreous haemorrhage
d) None
- 77) Zonular cataract is**
a) Bilateral
b) Stationary
c) Autosomal dominant
d) Associated with hypocalcemia
e) None of the above
- 78) The commonest type of cataract in adults:**
a) Nuclear cataract
b) Cortical cataract
c) Morgagnian cataract
d) Hypermature nuclear sclerotic cataract
- 79) Cataract is associated with:**
a) Pseudomuscular hypertrophy
b) Myotonic dystrophy
c) SLE
d) Rheumatoid arthritis
e) All
- 80) Which of the following is not correct about the cataract in cases of galactosemia**
a) It is most often central
b) It is zonular or lamellar
c) Involve the embryonal and foetal nuclei
d) Is polar
- 81) Transport of ascorbic acid to lens is done by:**
a) Myoinositol
b) Choline
c) Taurine
d) Na/K ATPase
- 82) Which of the following does not handle the free radicals in the lens**
a) Vitamin A
b) Vitamin E

- c) Vitamin C
d) Catalase
- 83) Typical bilateral inferior subluxation of lens is seen in:**
- Marfans syndrome
 - Homocystinuria
 - Hyperinsulinemia
 - Ocular trauma
- 84) In which of the following uveitic conditions is it contraindicated to put intraocular lens after cataract extraction:**
- Funch's heterochromic cyclitis
 - Juvenile rheumatoid arthritis
 - Psoriatic arthritis
 - Reiters syndrome
- 85) A two-week old child presents with unilateral cataract, which of the following statement represent the best management advice:**
- The best age to operate him to get the best visual results is four weeks.
 - The best age to operate him to get the best visual results is four months
 - The best age to operate him to get the best visual results is four years
 - The eye is already lost, only cosmetic correction is required.
- 86) Which prominent ocular manifestation is associated with Marfan's syndrome :**
- Microcornea
 - Microspherophakia
 - Megalocornea
 - Ectopia lentis
- 87) A child has got a congenital cataract involving the visual axis, which was detected by the parents right at birth. This child should be operated.**
- Immediately
 - At 2 months of age
 - At 1 year of age when globe becomes normal sized.
 - After 4 years when entire ocular and orbital growth become normal
- 88) Dislocation of lens is seen in all the following conditions except:**
- Congenital rubella
 - Weil Marchesnai syndrome
 - Marfans syndrome
 - Homocystinuria
- 89) After cataract surgery, glasses are prescribed after:**
- 2 weeks
 - 6 weeks
 - 12 weeks
 - 20 weeks
- 90) Sunflower cataract is caused by:**
- Siderosis
 - Chalcosis
 - Lead intoxication
 - Silicosis
- 91) Which is not a cataract surgery-**
- Lenectomy
 - Goniotomy
 - Phacoemulsification
 - SICS
- 92) Which of the following is the only reversible cataract-**
- senile cataract
 - cataract in galactosemia
 - congenital cataract
 - sunflower cataract
- 93) Congenital cataract commonly associated with visual defect-**
- Punctuate cataract
 - Blue dot cataract
 - Zonular cataract
 - Fusiform cataract
- 94) Late onset endophthalmitis after cataract surgery is most often caused by:**
- Staphylococcus Epidermidis
 - Pseudomonas
 - Streptococcus Pyogenes
 - Propionobacterium Acnes
- 95) Endophthalmitis involves inflammation of all of the following, EXCEPT:**
- Sclera
 - Uvea
 - Retina
 - Vitreous

LENS AND CATARACT

ANSWER KEY

1. B
2. D
3. A
4. A
5. C
6. D
7. B
8. A
9. C
10. B
11. A
12. A
13. C
14. C
15. B
16. A
17. C
18. C
19. D
20. D
21. A
22. B
23. C
24. B
25. B
26. A
27. B
28. A
29. B
30. A
31. C
32. A, B
33. A
34. A,D,E
35. A,B,C,E
36. A,B,E,
37. A,D,E
38. A,D
39. B
40. B
41. A
42. A
43. C
44. C
45. A
46. A,B,C,D
47. A,B,D
48. A
49. A
50. A
51. A
52. D
53. D
54. A
55. B
56. C
57. D
58. D
59. A
60. B
61. C
62. A
63. B
64. B
65. A
66. D
67. D
68. A
69. D
70. A
71. B
72. B
73. C
74. B
75. A,B,C,D
76. B
77. B
78. D
79. A
80. A
81. B
82. B
83. A
84. C
85. A
86. A
87. B
88. B
89. B
90. C
91. B
92. B
93. C
94. D
95. A

OPTICS**OPTICS****ANSWER:**

- 1) **The refractive power of eye is:**
 - a) 15 D
 - b) 29 D
 - c) 58 D
 - d) 100D
- 2) **Fixation of visual reflex is accomplished by :**
 - a) 6 months
 - b) 1 year
 - c) 2 years
 - d) 3 years
- 3) **The following are grades of binocular single vision except;**
 - a) Simultaneous perception
 - b) Fusion
 - c) Retinal correspondence
 - d) Stereopsis
- 4) **All of the following are associated with squint except;**
 - a) Diplopia
 - b) Stereopsis
 - c) Confusion
 - d) Deviation
- 5) **All are used for macular function test except:**
 - a) Maddox rod test
 - b) Two point discrimination test
 - c) Electroretinogram
 - d) Laser interferometry
- 6) **Uncrossed diplopia is seen in:**
 - a) Exotropia
 - b) Exophoria
 - c) Esophoria
 - d) Exotropia
- 7) **Refractive index of cornea is:**
 - a) 1.33
 - b) 1.37
 - c) 1.41
 - d) 1.43
- 8) **Contact lens is best used in:**
 - a) High myopia
 - b) Aphakia
 - c) Irregular astigmatism
 - d) High astigmatism
- 9) **Indirect ophthalmoscopy is done for assessing all, except:**
 - a) Ora serrata
 - b) Vitreous base
 - c) Retinal periphery
 - d) Fovea

1. C
2. A
3. C
4. B
5. C
6. D
7. B
8. C
9. D

GLAUCOMA

- 1) **Phacomorphic glaucoma is an example of:**
 - a) Primary open angle glaucoma
 - b) Secondary open angle glaucoma
 - c) Primary angle closure glaucoma
 - d) Secondary angle closure glaucoma
- 2) **Shallow anterior chamber is seen in all except:**
 - a) Old age
 - b) Steroid – induced glaucoma
 - c) Hypermetropia
 - d) Angle closure glaucoma
- 3) **Ratio of incidence of open angle to closed angle glaucoma is:**
 - a) 1:1
 - b) 2:1
 - c) 3:1
 - d) 4:1
- 4) **Gonioscopy is used to study:**
 - a) Anterior chamber
 - b) Posterior chamber
 - c) Angle of anterior chamber
 - d) Retina
- 5) **Secondary glaucoma following corneal perforation is due to:**
 - a) Anterior synechiae formation
 - b) Peripheral synechiae
 - c) Intraocular haemorrhage
 - d) Angle disruption
- 6) **100 day glaucoma is seen in:**
 - a) Central retinal artery occlusion
 - b) Central retinal vein occlusion
 - c) Neovascular glaucoma
 - d) Steroid induced glaucoma
- 7) **The most reliable provocative test for angle closure glaucoma:**
 - a) Homatropine –mydriatic test
 - b) Mydriatic-Miotic test
 - c) Water drinking test
 - d) Dark room test
- 8) **The technique of goniotomy includes all except:**
 - a) Anterior chamber air injection
 - b) Use of contact lens
 - c) Dilatation of the pupil
 - d) Diamox preoperatively
 - e) Insertion of knife posterior to the descemet's membrane
- 9) **Argon laser trabeculoplasty is used in:**
 - a) Closed angle glaucoma
 - b) Primary open glaucoma
 - c) Neovascular glaucoma
 - d) Aphakic glaucoma
- 10) **Pain in the eye, while sitting in cinema is due to:**
 - a) Prodromal angle closure glaucoma
 - b) Intermittent angle closure glaucoma
 - c) Acute congestive angle closure glaucoma
 - d) Chronic angle closure glaucoma
- 11) **The following antiglaucoma drug decreases the uveo-sclera outflow:**
 - a) Latanoprost
 - b) Timolol
 - c) Pilocarpine
 - d) Acetazolamide
- 12) **Photophobia in an infant could be due to:**
 - a) Buphthalmos
 - b) Congenital cataract
 - c) NLD obstruction
 - d) None of the above
- 13) **Following trabeculectomy, all these changes occur except:**
 - a) Haemorrhage
 - b) Malignant glaucoma
 - c) Shallow anterior chamber
 - d) Choroidal degeneration
- 14) **Schwalbe's line corresponds to:**
 - a) Corneal endothelium
 - b) Descemet's membrane
 - c) Schlemm's canal
 - d) Ciliary body
- 15) **Normally the cup disc ration is:**
 - a) Below 0.5
 - b) Below 1.0
 - c) Below 1.5
 - d) Below 0.1
- 16) **A patient came to the casualty with acute bronchial asthma after treatment for glaucoma. The probable drug may be:**
 - a) Timolol
 - b) Betaxolol
 - c) Latoprost
 - d) Anticholinesterase
- 17) **Which of the following antiglaucoma medications can cause drowsiness:**
 - a) Latanoprost
 - b) Timolol
 - c) Brimonidine
 - d) Dorzolamide
- 18) **Latanoprost used topically in glaucoma primarily acts by:**
 - a) Decreasing aqueous humor formation
 - b) Increasing Uveo-scleral outflow
 - c) Releasing papillary block
 - d) Increasing trabecular outflow
- 19) **Which of following drugs is not used topically for the treatment of Open angle glaucoma:**
 - a) Latanoprost
 - b) Brimonidine
 - c) Acetazolamide
 - d) Dorzolamide
- 20) **Tonography helps you to determine:**
 - a) The facility of outflow of aqueous
 - b) Diurnal variation
 - c) The levels of intraocular pressure at different times
 - d) None of the above
- 21) **Kusumlata presents with acute painful red eye and mild dilated vertically oval pupil. Most likely diagnosis is:**
 - a) Acute retrobulbar neuritis

- b) Acute angle closure glaucoma
c) Acute anterior uveitis
d) Severe kerato-conjunctivitis
- 22) You have been referred a middle aged patient to rule out open angle glaucoma. Which of the following findings will help in the diagnosis:
a) Cupping of the disc
b) Depth of anterior chamber
c) Visual acuity and refractive error
d) Angle of the anterior chamber
- 23) In a case of hypertensive uveitis, most useful drug to reduce intraocular pressure is:
a) Pilocarpine
b) Latanoprost
c) Physostigmine
d) Dipivefrine
- 24) A patient having glaucoma develops blepharoconjunctivitis after instilling some anti glaucoma drug. Which of the following drug can be responsible for it:
a) Timolol
b) Latanoprost
c) Dipivefrine
d) Pilocarpine
- 25) Treatment of choice in acute congestive glaucoma:
a) Pilocarpine
b) Laser iridotomy
c) Timolol
d) Trabeculoplasty
- 26) Secondary glaucoma is seen in all except:
a) Intraocular lens implantation
b) Epidemic dropsy
c) CRVO
d) Interstitial keratitis
- 27) Most common complication of topical steroid is :
a) Glaucoma
b) Cataract
c) Ptosis
d) Iritis
- 28) Iridocorneal endothelial syndrome is associated with:
a) Progressive atrophy of iris stroma
b) B/L symmetrical stromal edema of iris and cornea
c) Deposition of collagen in descemets membrane
d) Deposition of glycosaminoglycans in the descemets membrane
- 29) Painless sudden visual loss is seen in all except:
a) CRAO
b) Retinal detachment
c) Vitreous haemorrhage
d) Angle closure glaucoma
- 30) The conversion of CO₂ and H₂O into carbonic acid during the formation of aqueous humour is catalysed by which one of the following enzymes:
a) Carboxylase
b) Carbamylase
c) Carbonic anhydrase
d) Carbonic deoxygenase
- 31) Which of the following drugs is contra indicated in a patient with history of sulphallergy presenting with an acute attack of angle closure glaucoma
a) Glycerol
b) Acetazolamide
c) Mannitol
d) Latanoprost
- 32) A 55 yrs old female comes to the eye casualty with history of severe eye pain, redness and diminution of vision. On examination the visual acuity is 6/60, there is circumferential congestion, corneal oedema and a shallow anterior chamber. Which of the following is the best drug of choice.
a) Atropine ointment
b) I.V. mannitol
c) Ciprofloxacin eye drops
d) Betamethasone eye drops
- 33) In which of the following condition, aniridia and hemihypertrophy are most likely present:
a) Neuroblastoma
b) Wilm's tumour
c) Non-Hodgkin's Lymphoma
d) Germ-cell tumour
- 34) All of the following conditions are contraindicated or likely to worsen in a case of primary open angle glaucoma when treated with timolol maleate 0.5% eye drops, except:
a) Hypertension
b) Hypercholesterolemia
c) Depression
d) Bronchial asthma
- 35) A male patient with a history of hypermature cataract presents with a 2 day history of ciliary congestion, photophobia, blurring of vision and on examination has a deep anterior chamber in the right eye. The left eye is normal. The diagnosis is:
a) Phacomorphic glaucoma
b) Phacolytic glaucoma
c) Phacotoxic glaucoma
d) Phacoanaphylactic uveitis
- 36) A 30 day old neonate was presented with a history of photophobia and excessive lacrimation. On examination, both the lacrimal duct systems are normal, but there was a large cornea and corneal haziness. The diagnosis is :
a) Megalocornea
b) Keratoconus
c) Congenital glaucoma
d) Hunter's syndrome
- 37) All the following anatomical changes will predispose to primary angle closure glaucoma, except:
a) Small corne
b) Flat cornea
c) Anterior chamber shallow
d) Short axial length of eye ball
- 38) A patient complains of evening halos and occasional headache for some months. On examination anterior chamber of both the eyes are

- shallow and the intra ocular pressure is normal.
This condition represents what stage of glaucoma:
- Constant instability
 - Prodrome
 - Absolute
 - Acute
- 39) In a patient predisposed to glaucoma, the drug contraindicated is:
- Pilocarpine
 - Atropine
 - Echothiophate
 - Timolol
- 40) A lady with chronic simple glaucoma with bronchial asthma took anti glaucoma drug which exaggerated her asthma. The likely drug is:
- Timolol
 - Brimonidine
 - Pilocarpine
 - Latanoprost
- 41) All are side effects of pilocarpine, except:[
- Shallow anterior chamber
 - Folliculosis
 - Posterior synechiae
 - Punctal stenosis
- 42) Epinephrine is used in all, except
- Aphakic glaucoma
 - Open angle glaucoma
 - Secondary glaucoma
 - Neovascular glaucoma
- 43) Earliest field defect in primary open angle glaucoma is :
- Seidel's scotoma
 - Arcuate scotoma
 - Nasal spur
 - Scotoma in Bjerrum field
- 44) Which examination is of least value in open angle glaucoma:
- Tonometry
 - Perimetry
 - Indirect ophthalmoscopy
 - Direct ophthalmoscopy
- 45) Pilocarpine is not used in young adults as it causes:
- Retinal detachment
 - Myopia
 - Iris cysts
 - Shallow anterior chamber
- 46) True about acute angle closure glaucoma
- Pupil vertically oval
 - Increased IOP
 - AC deep
 - AC shallow
 - Painful eye
- 47) True about buphthalmos
- Large cornea
 - Haab's stria
 - Shallow AC
 - Glaucoma
 - Medical treatment helps
- 48) Buphthalmos is associated with:
- Epiphora
 - Shallow anterior chamber
 - Megalocornea
 - Surgery is used for treatment
 - KF ring is pathognomic
- 49) Which of the following causes least increase in IOP :
- Fluoromethalone]Triamcinolone
 - Triamcinolone
 - Dexamethasone
 - Hydrocortisone
- 50) In angle closure glaucoma, treatment given to the fellow eye is :
- Pilocarpine eye drops
 - Atropine
 - Laser iridotomy
 - Trabeculectomy
 - Physostigmine eye drops
- 51) Regarding aqueous humor, which of these are correct:
- It is secreted at rate of 2.3 ml/min
 - Secreted by ciliary processes
 - Provides nutrition
 - Normal pressure is 5-15 mm Hg
- 52) Haab's striae are seen in:
- Angle closure glaucoma
 - Infantile glaucoma
 - Stargardt's disease
 - Disciform keratitis
- 53) Malignant glaucoma is seen in: [
- Malignancy
 - After surgery for cataract or glaucoma
 - Trauma
 - Thrombosis
- 54) A 30 year old woman with sudden right sided painful red eye associated with nausea, vomiting and headache, The diagnosis is :
- Acute congestive glaucoma
 - Endophthalmitis
 - Eales disease
 - Trachoma
- 55) Which should not be used in raised IOT associated with uveitis:
- Timolol
 - Pilocarpine
 - Atropine
 - Acetazolamide
- 56) Coloured halos is seen in all except:
- Open angle glaucoma
 - Closed angle glaucoma
 - Cataract
 - Any of the above
- 57) In buphthalmos, seen are all except:
- Subluxated lens
 - Large cornea
 - Small cornea
 - Big eye ball
- 58) In buphthalmos, lens is :
- Antero-posteriorly flat
 - Small
 - Large

- d) None of the above
- 59) Treatment of malignant glaucoma is :
- Topical atropine
 - Topical pilocarpine
 - IV mannitol
 - Vitreous aspiration
- 60) Treatment of primary open angle glaucoma:
- Timolol maleate
 - Atropine
 - Acetazolamide
 - Prostaglandin analogue
- 61) The canal of schlemm possesses the following anatomic characteristics:
- Contains red cells
 - Contains aqueous
 - Lined by endothelium
 - Contains partitions resembling the dural venous sinuses.
- 62) In a patient of bronchial asthma with open angle glaucoma, drug of choice is :
- Pilocarpine drops
 - Timolol drops
 - Ipratropium bromide drops
 - Betaxolol drops
- 63) Normal intra-ocular tension is
- 0-10 mmHg
 - 10-20 mmHg
 - 20-30 mmHg
 - 100-120 cm H₂O
- 64) Applanation tonometry is more useful than indentation tonometry
- In cases where corneal ulcer is present.
 - It eliminates the factor of sclera rigidity
 - It accurately measures tension in uncooperative patient
 - None of the above
- 65) Increased intra-ocular tension is seen in all except
- Epidemic dropsy
 - Branch vein occlusion
 - Malignant melanoma
 - Pthisis bulbi
- 66) Drug useful in open angle glaucoma with uncorrected myopia is :
- 2% Pilocarpine
 - 0.5% Timolol
 - 10% Phenylephrine
 - None of the above
- 67) Pathognomic of open angle glaucoma is :
- Pulsation of retinal arterioles
 - Arcuate scotoma
 - Enlargement of blind spot
 - Spiral field defect
- 68) Coloured halos in acute congestive glaucoma is due to:
- Raised IOP
 - Corneal edema
 - Raised ICT
 - Mydriasis
- 69) Not given in glaucoma:
- Beta blocker
 - Cyclopentolate
 - Ecothiophate
 - Urea
- 70) Glaucoma causes:
- Secondary optic atrophy
 - Cavernous optic atrophy
 - Pressure optic atrophy
 - No optic atrophy
- 71) Campimetry measures:
- Field of vision
 - Acuity of vision
 - Colour vision
 - Includes all
- 72) All are changes in chronic glaucoma except:
- Cupping of disc
 - Cavernous optic atrophy
 - Scotomas of various types
 - Synechia
- 73) Aqueous as compared to plasma has all more except:
- Higher glutathione
 - Higher pH
 - Higher ascorbate
 - Higher lactate
- 74) Following are important in production and release of aqueous except:
- Pigmented epithelium
 - Ultrafiltration and diffusion
 - Adenylcyclase
 - Carbonic anhydrase
- 75) Acute congestive glaucoma all are present except:
- Ciliary congestion
 - Shallow anterior chamber
 - Edematous cornea
 - Miosis
- 76) Broadest neuroretinal rim is seen in-
- Sup pole
 - Inf pole
 - Nasal pole
 - Temporal
- 77) False about phacolytic glaucoma-
- Due to contact of iris to lens
 - Open angle glaucoma
 - Seen in hypermature stage of cataract
 - Lens induced glaucoma

GLAUCOMA

ANSWER KEY

- | | |
|-------|-----------|
| 1. D | 41. D |
| 2. B | 42. A |
| 3. D | 43. D |
| 4. C | 44. C |
| 5. A | 45. B |
| 6. B | 46. Abde |
| 7. B | 47. Abd |
| 8. C | 48. D |
| 9. B | 49. A |
| 10. B | 50. C |
| 11. C | 51. Bd |
| 12. A | 52. B |
| 13. D | 53. B |
| 14. B | 54. A |
| 15. A | 55. B |
| 16. A | 56. A |
| 17. C | 57. C |
| 18. B | 58. A |
| 19. C | 59. A,C,D |
| 20. A | 60. A,C,D |
| 21. B | 61. B,C,D |
| 22. A | 62. D |
| 23. D | 63. B |
| 24. C | 64. B |
| 25. A | 65. D |
| 26. D | 66. B |
| 27. A | 67. B |
| 28. A | 68. B |
| 29. D | 69. B |
| 30. C | 70. B |
| 31. B | 71. A |
| 32. B | 72. D |
| 33. B | 73. B |
| 34. A | 74. A |
| 35. B | 75. D |
| 36. C | 76. D |
| 37. B | 77. A |
| 38. A | |
| 39. B | |
| 40. A | |

CONJUNCTIVA

- 1) Which of the following is not a feature of vernal conjunctivitis?
- Maxwell Lyon sign
 - Tranta's spots
 - Follicies
 - Perilimbal papillary hypertrophy
- 2) Acute conjunctivitis is cause by all except:
- Adenovirus
 - CMV
 - Entero-virus -70
 - Cox-sackie -24
- 3) Nodule at limbus, hyperaemia of conjunctiva and photophobia. Diagnosis is :
- Scleritis
 - Koeppe's nodule
 - Conjunctivitis (Phlyctenular)
 - Bussaca's nodule
- 4) All of the following viruses involve eye except:
- Herpes zoster
 - Herpes simplex
 - Echo
 - Adeno
- 5) WHO grading (X 3a) for Xerophthalmia indicates:
- Corneal xerosis
 - Keratomalacia
 - Corneal ulcer
 - Conjunctival xerosis and Bitots spot
- 6) Complication of trachoma:[DPG]
- Trichiasis
 - Corneal opacity
 - Cataract
 - Vitreous hemorrhage
- 7) Following are embryological remnant except:
- Bergmeister's papilla
 - Epicapsular stars
 - Mittendorf's dot
 - Posterior Embryotoxon
- 8) Artificial tears is produced by:
- Methyl cellulose
 - Polyvinyl alcohol
 - Hyaluronate
 - All
- 9) Night blindness is due to
- Vitamin A deficiency
 - Myopia
 - Retinitis pigmentosa
 - All
- 10) The following is not a feature of conjunctivitis:
- Irritation
 - Discharge
 - Redness
 - Pain
- 11) Steroids are used in all except:
- Vernal conjunctivitis
 - Phlyctenular conjunctivitis
 - Acute dacryocystitis
 - Acute iridocyclitis
- 12) Trachoma causes
- Mechanical ptosis
 - Trichiasis
 - Entropion
 - All of the above
- 13) Blindness in a child is most commonly due to:
- Keratomalacia
 - Congenital cataract
 - Glaucoma
 - Injuries
- 14) Percentage of silver nitrate used in Credes method
- 0.5%
 - 1%
 - 1.5%
 - 2%
- 15) H.P. inclusion bodies in trachoma are seen in:
- Extracellular
 - Intracytoplasmic
 - Intranuclear
 - None
- 16) Type IV hypersensitivity to Mycobacterium tuberculosis antigen may manifest as:
- Iridocyclitis
 - Polyarteritis nodosa
 - Phlyctenular
 - Giant cell arteritis
- 17) Subconjunctival haemorrhage occurs in all conditions except:
- Passive venous congestion
 - Pertusis
 - Trauma
 - High intraocular tension
- 18) The normal pH of tear is:
- 5.7
 - 7.5
 - 6.5
 - 7.9
- 19) All are seen in stage III trachoma except:
- Tarsal epithelioidfibrosis
 - Herberts pits
 - Disappearance of Bowmans membrane
 - Trichiasis
- 20) A child of 8 kg has Bitot sports in both eyes. Which of the following is the most appropriate schedule to prescribe vitamin A to this child?
- 2 Lakh units IM on day 0, 14
 - 1 Lakh units IM on day 0, 14
 - 2 Lakh units IM on day 0, 1 and 14
 - 1 Lakh units IM on day 0, 1 and 14
- 21) Maximum density of goblet cells is seen in: [AIPG]
- Superior conjunctiva
 - Inferior conjunctiva
 - Temporal conjunctiva
 - Nasal conjunctiva
- 22) Arlt's line is seen in:[AIPG]
- Vernal keratoconjunctivitis
 - Pterygium
 - Ocular pemphigoid
 - Trachoma
- 23) A recurrent bilateral conjunctivitis occurring with the onset of hot weather in young boys with

- symptoms of burning, itching and lacrimation with polygonal raised areas in palpebral conjunctiva is:**
- Trachoma
 - Phlyctenular conjunctivitis
 - Mucopurulent conjunctivitis
 - Vernal kerato conjunctivitis
- 24) The vitamin A supplement administered in Prevention of Nutritional Blindness in children programme contain:**
- 25000 IU/ml
 - 1 lakh IU/ml
 - 3 lakh IU/ml
 - 5 lakh IU/ml
- 25) Unilateral watery discharge from the eye of a newborn with no edema or chemosis is due to :**
- Chlamydia
 - Gonococcus
 - Sticky eye
 - Chemical conjunctivitis
- 26) Horner-trantas spots are seen in:**
- Vernal conjunctivitis
 - Phlyctenular conjunctivitis
 - Angular conjunctivitis
 - Follicular conjunctivitis
- 27) Which microorganism does not cause haemorrhagic conjunctivitis:**
- Adenovirus
 - Coxsackie -24
 - Enterovirus – 70
 - Papilloma virus
- 28) Herbert's pits are seen in :**
- Trachoma
 - Spring catarrh
 - Phlyctenular conjunctivitis
 - Sarcoidosis
- 29) Pterygium is:**
- An inflammatory response
 - A connective tissue disorder
 - An infection
 - Associated with vitamin-A deficiency
- 30) True about chalazion:**
- Chronic non-specific inflammation
 - Lipogranulomatous inflammation
 - Acute inflammation
 - Suppurative inflammation
- 31) In the grading of trachoma, trachomatous inflammations follicular is defined as the presence of :**
- Five or more follicles in the lower tarsal conjunctiva
 - Three or more follicles in the lower tarsal conjunctiva
 - Five or more follicles in the upper tarsal conjunctiva
 - Three or more follicles in the upper tarsal conjunctiva
- 32) Chlamydia trachomatis serovars D-K cause:**
[AIIMS]
- Arteriosclerosis
 - Trachoma
 - Lymphogranuloma venereum
 - Urethritis
- 33) Cobble stone appearance is seen in:**
- Spring catarrh
 - Viral conjunctivitis
 - Phlyctenular conjunctivitis
 - Bacterial conjunctivitis
- 34) All are features of trachoma, except:**
- Circumcorneal congestion
 - Follicle
 - Cicatrization
 - Keratitis
- 35) Tear film is absent in :**
- Herpes keratitis
 - Keratoconjunctivitis sicca
 - Dacryoadenitis
 - Acute conjunctivitis
- 36) Features of vernal keratitis are :**
- Rapillary hypertrophy
 - Follicular hypertrophy
 - Herberts pits
 - Trantas spots
 - Ciliary congestion
- 37) Epithelial lining of conjunctiva**
- Sq keratinized
 - Sq non-keratinized
 - Pseudo – stratified
 - Columnar
 - Transitional
- 38) Ophthalmia neonatorum is caused by:**
- Gonorrhoea
 - H.Influenzae
 - Chlamydia
 - Pseudomonas
 - Staph aureus
- 39) Parenchymatous xerosis of conjunctiva is caused by:**
- Trachoma
 - Vitamin A deficiency
 - Vernal catarrh
 - Phlyctenular keratoconjunctivitis
 - Alkali burns
- 40) Staphylococcal conjunctivitis is associated with all except:**
- Corneal margin infiltration
 - Vernal conjunctivitis
 - Hordeolum
 - Follicular conjunctivitis
- 41) Keratomalacia is associated with :**
- Measles
 - Mumps
 - Rubella
 - Diarrhoea
 - Chicken pox
- 42) Seen in Vernal Catarrh are:**
- Papillary hypertrophy
 - Follicles
 - Pannus formation
 - Fascicular ulcer
 - Ropy discharge

43) Keratomalacia:

- a) Occurs due to vitamin A deficiency
- b) Relatively benign condition
- c) First feature of vitamin A deficiency
- d) Also seen in retinitis pigmentosa

44) Seen in trachoma are/is:

- a) Papillary hypertrophy
- b) Follicles
- c) Pannus formation
- d) Herberts pits
- e) Ropy discharge

45) Angular conjunctivitis is caused by:

- a) Moraxella
- b) Virus
- c) Bacteroides
- d) Fungus

46) Phlycten is due to:

- a) Exogenous allergy
- b) Endogenous allergy
- c) Viral keratitis
- d) Fungal keratitis

47) Stocker's line is seen in.

- a) Pinguicula.
- b) Pterygium.
- c) Congential Ocular Melanosis.
- d) Conjunctival epithelial melanosis.

Conjunctiva answers

- 1. C
- 2. B
- 3. C
- 4. C
- 5. B
- 6. B
- 7. D
- 8. D
- 9. D
- 10. D
- 11. C
- 12. D
- 13. A
- 14. B
- 15. B
- 16. C
- 17. D
- 18. B
- 19. D
- 20. D
- 21. D
- 22. D
- 23. D
- 24. B
- 25. D
- 26. A
- 27. D
- 28. A
- 29. A
- 30. B
- 31. C
- 32. C
- 33. A
- 34. A
- 35. B
- 36. A,D
- 37. B
- 38. A,C,E
- 39. A,E
- 40. C,E
- 41. A,D
- 42. A,E
- 43. A
- 44. A,B,C,D
- 45. A
- 46. B
- 47. B

CORNEA

- 1) **Treatment of photophthalmia**
 - a) Flush with saline
 - b) Apply pad and bandage
 - c) Topical antibiotics
 - d) Steroid eye drops
- 2) **In Keratoconus all are seen except**
 - a) Munson's sign
 - b) Thinning of cornea in center
 - c) Distortion of corneal reflex at center
 - d) Hypermetropic refractive error found
- 3) **Avascular coat in eye is**
 - a) Scler
 - b) Cornea
 - c) Retina
 - d) Choroid
- 4) **Keratometer is used to assess**
 - a) Thickness of cornea
 - b) Refractive power
 - c) Astigmatism
 - d) Curvature of cornea
- 5) **Brown skin cornea is seen in**
 - a) Siderosis
 - b) Mustard gas exposure
 - c) Chalcosis
 - d) Argyrosis
- 6) **Contact lens wear is proven to have deleterious effects on the corneal physiology. Which of the following statements is incorrect in connection with contact lens wear:**
 - a) The level of glucose availability in the corneal epithelium is reduced
 - b) There is reduction in hemidesmosomes density.
 - c) There is increased production of CO₂ in the epithelium
 - d) There is reduction in glucose utilization by corneal epithelium
- 7) **A 12 year old girl with tremors and emotional liability has a golden brown discoloration of descemet's membrane. The most likely diagnosis is:**
 - a) Fabry's disease
 - b) Wilson's disease
 - c) Glycogen storage disease
 - d) Acute rheumatic fever
- 8) **Which of the following will be the most important adjuvant therapy in a case of fungal corneal ulcer:**
 - a) Atropine sulphate eye ointment
 - b) Dexamethasone eye drops
 - c) Pilocarpine eye drops.
 - d) Lignocaine eye drops
- 9) **Snow blindness is caused by**
 - a) Ultraviolet rays
 - b) Infrared rays
 - c) x-rays
 - d) microwaves
- 10) **Corneal sensation is lost in**
 - a) Herpes simplex
 - b) Conjunctivitis
 - c) Fungal infection
 - d) Trachoma
- 11) **Steroids are contraindicated in**
 - a) Phlyctenular conjunctivitis
 - b) Vernal conjunctivitis
 - c) Moorens ulcer
 - d) Dendritic ulcer
- 12) **Dendritic ulcer is caused by**
 - a) Mycetoma
 - b) Herpes simplex
 - c) Staphylococcus
 - d) Pneumococcus
- 13) **Satellite nodule on corneal ulcer is seen due to**
 - a) Fungal
 - b) Bacteria
 - c) Viral
 - d) Mycoplasma
- 14) **Corneal transparency is maintained by all except:**
 - a) Hydration of corneal epithelium
 - b) Wide separated collagen fibres
 - c) Unmyelinated nerve fibres
 - d) Mitotic figures in the central cornea
- 15) **Corneal endothelium ion-exchange pumps are inhibited by:**
 - a) Inhibition of anaerobic glycolysis
 - b) Activation of anaerobic glycolysis
 - c) Activation of cAMP phosphodiesterase inhibitors
 - d) Interference with electron chain transport
- 16) **Band-shaped keratopathy is caused by:**
 - a) Amyloid
 - b) Calcium
 - c) Monopolysaccharides
 - d) Lipid
- 17) **In human corneal transplantation, the donor tissue is:**
 - a) Synthetic polymer
 - b) Donated human cadaver eyes
 - c) Donated eyes from live human beings
 - d) Monkey eyes
- 18) **A 56-year-old man has painful weeping rashes over the upper eyelid and forehead for the last 2 days along with ipsilateral acute punctate keratopathy. About a year back, he had chemotherapy for non-Hodgkin's lymphoma. There is no other abnormality. Which of the following is the most likely diagnosis:**
 - a) Impetigo
 - b) Systemic lupus erythematosus
 - c) Herpes zoster
 - d) Pyoderma gangrenosum
- 19) **A young man aged 30 years, presents with difficulty in vision in the left eye for the last 10 days. He is immunocompetent, a farmer by occupation, comes from a rural community and gives history of trauma to his left eye, with vegetative matter, 10-15 days back. On examination, there is an ulcerative lesion in the cornea, whose base has raised soft creamy infiltrates, ulcer margin is feathery and hypaemic.**

- There are a few satellite lesions also. The most probable aetiological agent is:**
- Acathamoeba
 - Corynebacterium diphtheria
 - Fusarium
 - Streptococcus pneumoniae.
- 20) A 17 year old girl with keratitis and severe pain in the eye came to the hospital and acanthamoeba keratitis was suspected. The patient gave the history of following four points. Out of these which is not a risk factor for acanthamoeba keratitis :**
- Extended wear contact lens\
 - Exposure to dirty water
 - Corneal trauma
 - Squamous blepharitis
- 21) Chandresh kumar, 15 year old boy has history of injury to the eye resulting in vegetative foreign body in the eye. Standard plating media did not yield any growth, but required addition of E col. Microscopic examination showed macrophage like structure. Culture did not yield any bacteria. Most likely cause is**
- Acanthamoeba
 - Virus
 - Chlamydia
 - Aspergillus
- 22) Recurrent corneal erosion is a feature of**
- Keratoglobus
 - Keratoconus
 - Glaucoma
 - Corneal dystrophy
- 23) Causes of corneal vascularisation**
- Transplant rejection
 - Infection
 - Contact lens use
 - Corneal dystrophy
- 24) Feature of fungal ulcer**
- Symptoms more than signs
 - Dry ulcer
 - Diffuse corneal oedema
 - Hypated margins
- 25) Features of Vernal keratitis are**
- Papillary hypertrophy
 - Follicular hypertrophy
 - Herbert's pits
 - Trantas's spots
 - Ciliary congestion
- 26) Clinical features of vitamin A deficiency**
- Colour blindness
 - Bitot's spots
 - Xerophthalmia
 - Corneal opacity
 - Accommodation defects
- 27) Corneal nerves are visible in**
- Diabetes
 - Leprosy
 - Corneal ulcer
 - Keratoconus
- 28) Corneal epithelium consist of**
- Columnar epithelium
 - Stratified epithelium and keratinized
 - Pseudostratified and non keratinized
 - Stratified and non keratinized
 - Transitional epithelium
- 29) Herpes zoster ophthalmicus is a predictor of**
- Leukemia
 - Lymphoma
 - HIV
 - Disseminated
- 30) Rx of dendritic ulcer**
- Acyclovir
 - Idoxuridine
 - Steroid
 - Tetracycline
 - Trychophyton
- 31) Ophthalmia neonatorum is commonly caused by**
- H. influenza
 - Staphylococcus
 - TRIC
 - Gonococcus
- 32) True about keratoconus**
- Munson sign seen
 - Protrusion of anterior cornea
 - Protrusion of posterior corena
 - Fleisher's sign positive
- 33) Which of the following organism can penetrate the normal cornea**
- Gonococcus
 - Pseudomonas
 - Diphtheria
 - Streptococcus
 - Staphylococcus epidermidis
- 34) True about keratoconus**
- Increased curvature of cornea
 - Astigmatism
 - K.F. ring
 - Thick cornea
 - Soft contact lens in used
- 35) Which of the following is true about dendritic ulcer**
- Caused by herpes simplex virus
 - Topical corticosteroid given suppresseste symptoms
 - Oral acyclovir is effective in treatment
 - Topical acyclovir is effective in treatment
 - Heals spontaneously
- 36) Which of the following is the drug of choice for treatment of corneal ulcers caused by filamentous fungi**
- Itraconazole
 - Natamycin
 - Nystatin
 - Fluconazole
- 37) Which of the following stromal dystrophy is a recessive condition**
- Lattice dystrophy
 - Granular dystrophy
 - Macular dystrophy
 - Fleck dystrophy

38) Afferent component of corneal reflex is mediated by:

- a) Vagus nerve
- b) Facial nerve
- c) Trigeminal nerve
- d) Glossopharyngeal nerve

39) Enlarged corneal nerves may be seen in all of the following except:

- a) Keratoconus
- b) Herpes simplex keratitis
- c) Leprosy
- d) Neurofibromatosis

40) Which of the following statement is true regarding Acanthamoeba keratitis:

- a) For the isolation of the causative agent corneal scraping should be cultured on a nutrient agar plate
- b) The causative agent, Acanthamoeba is a helminth whose normal habitat is soil
- c) Keratitis due to Acanthamoeba is not seen in the immunocompromised host
- d) Acanthamoeba does not depend upon a human host for the completion of its life-cycle

41) Ionic pump in corneal endothelium is necessary for maintaining deturgescence of the cornea and thus transparency. It can be blocked by:

- a) Inhibition of anaerobic glycolysis.
- b) Activation of anaerobic glycolysis.
- c) Inhibition of Krebs's cycle.
- d) Inhibition of HMP pathway

42) Corneal endothelium is embryologically derived from :

- a) Neural crest.
- b) Ectoderm.
- c) Mesoderm.
- d) Endoderm

43) Corneal endothelial cell count is done by-

- a) Specular microscopy
- b) Keratometry
- c) Gonioscopy
- d) Slit lamp

44) A person with prolonged usage of contact lenses presented with irritation of left eye. After examination a diagnosis of keratitis was made and corneal scrapings revealed growth of pseudomonas aeruginosa. The bacteria were observed to be multidrug resistant. Which of the following best explains the mechanism of antimicrobial resistance in these isolated pseudomonas aeruginosa strains

- a) Ability to transfer resistance genes from adjacent commensal flora
- b) Improper contact lens hygiene
- c) Frequent and injudicious use of topical antibiotics
- d) Ability of Pseudomonas to produce biofilms

45) Which of the following statements regarding corneal transplantation is true

- a) Whole eye needs to be preserved in tissue culture
- b) Donor not accepted if age > 60 years
- c) Specular microscopy analysis is used to assess endothelial cell count

d) HLA matching is mandatory

46) In Herpes Zoster Keratitis all occurs except :

- a) Pseudodendritic keratitis.
- b) Anterior endothelial keratitis/ uveitis.
- c) Sclerokeratitis.
- d) Endothelitis.

CORNEA ANSWER KEY

- 1. BC
- 2. D
- 3. B
- 4. CD
- 5. ACD
- 6. A
- 7. B
- 8. A
- 9. A
- 10. A
- 11. D
- 12. B
- 13. A
- 14. A
- 15. B
- 16. B
- 17. B
- 18. C
- 19. C
- 20. D
- 21. D
- 22. D
- 23. ABC
- 24. BD
- 25. AD
- 26. BC
- 27. BD
- 28. AD
- 29. ABCD
- 30. AB
- 31. BCD
- 32. ABCD
- 33. AC
- 34. AB
- 35. AD
- 36. B
- 37. C
- 38. C
- 39. A
- 40. D
- 41. A
- 42. A
- 43. A
- 44. D
- 45. C
- 46. C

SCLERA

- 1) **The most common systemic association of scleritis:**
 - a) Ehler-Danlos syndrome
 - b) Disseminated systemic sclerosis
 - c) Rheumatoid arthritis
 - d) Giant cell arteritis
- 2) **Scleromalacia perforans is a complication of:**
 - a) Rheumatoid arthritis
 - b) Sarcoidosis
 - c) Tuberculosis
 - d) Herpes zoster
- 3) **Commonest cause of posterior staphyloma is:**
 - a) Glaucoma
 - b) Retinal detachment
 - c) Iridocyclitis
 - d) High myopia
- 4) **Blue sclera is seen in:**
 - a) Alkaptonuria
 - b) Ehler-Danlos syndrome
 - c) Osteogenesis imperfecta
 - d) Kawasaki syndrome
- 5) **Sclera is thinnest at:**
 - a) Limbus
 - b) Insertion of recti
 - c) Posterior pole
 - d) Equator
- 6) **Weakest area of sclera:**
 - a) Behind insertion of rectus muscle
 - b) Equator
 - c) Limbus
 - d) Infront insertion of rectus
- 7) **Blue sclera is seen in all of the following conditions except:**
 - a) Keratoconus
 - b) Marfans syndrome
 - c) Osteogenesis imperfect
 - d) Rheumatoid arthritis

SCLERA**ANSWERS KEY**

1. C
2. A
3. D
4. B,C
5. B
6. A
7. A

UVEITIS

- 1) **Acute retinal necrosis can be caused by:**
 - a) Staphylococcus aureus
 - b) Cytomegalovirus
 - c) Streptococcus pyogenes
 - d) Adenovirus
- 2) **Headlight in Fog Appearance of retina is seen in:**
 - a) Toxoplasmosis
 - b) Toxocara
 - c) Herpes
 - d) Tractional retinal detachment
- 3) **Which of the following is not a feature of granulomatous uveitis:**
 - a) Mutton fat keratic precipitates
 - b) Koeppe's nodules
 - c) Involves usually anterior uvea
 - d) Marked impairment of vision
- 4) **All of the following cause panuveitis except:**
 - a) Ankylosing spondylitis
 - b) Toxoplasmosis
 - c) Sarcoidosis
 - d) Sympathetic ophthalmitis
- 5) **Salt and pepper fundus occurs in:**
 - a) Toxoplasma
 - b) Toxocara
 - c) Rubella
 - d) Scurvy
- 6) **Nodule in iris not found in:**
 - a) Sarcoidosis
 - b) Neurofibromatosis
 - c) Tuberos sclerososis
 - d) SLE
- 7) **Iris is thinned at:**
 - a) Root of iris
 - b) Pupillary border
 - c) Collarette
 - d) Ciliary body junction
- 8) **Cysts are associated with repeated use of:**
 - a) Pilocarpine
 - b) Eserine
 - c) Adrenaline
 - d) Timolol
- 9) **All of the following are true regarding sympathetic ophthalmia except:**
 - a) Approximately 65% of cases occur after perforating injury
 - b) Most of the cases occur within 2 weeks of injury
 - c) Uveal antigen has been implicated as the responsible exciting agent
 - d) First symptom is loss of accommodation
- 10) **Ocular complication of ulcerative colitis:**
 - a) Uveitis
 - b) Conjunctivitis
 - c) Keratitis
 - d) All
- 11) **Sympathetic ophthalmitis affects:**
 - a) Injured eye
 - b) Sound eye
 - c) Both the eye
 - d) Eye with past history of injury
- 12) **Iris nodules are noted in all except;**
 - a) Hansen's disease
 - b) Neurofibromatosis
 - c) Fuch's heterochromic Iridocyclitis
 - d) Tuberculosis
- 13) **Ocular lesion in toxocariasis may be:**
 - a) Posterior pole granuloma
 - b) Retinal detachment
 - c) Low grade Iridocyclitis
 - d) All of the above
- 14) **Smooth muscle of iris is developed from**
 - a) Surface ectoderm
 - b) Mesoderm
 - c) Neural crest
 - d) Neural ectoderm
- 15) **Same between sympathetic ophthalmitis and VKH syndrome is:**
 - a) Both are bilateral granulomatous panuveitis
 - b) Either of them can be unilateral
 - c) Both have autoimmune etiology
 - d) Both A and C
- 16) **Mutton fat keratic precipitates are seen in:**
 - a) Granulomatous Iridocyclitis
 - b) Non-granulomatous Iridocyclitis
 - c) Granulomatous choroiditis
 - d) Non-granulomatous choroiditis
- 17) **Iris bombe is due to:**
 - a) Anterior synechiae
 - b) Posterior synechiae
 - c) Peripheral synechiae
 - d) Ring synechiae
- 18) **All of the following are true regarding acute anterior uveitis in ankylosing spondylitis except:**
 - a) More common in females
 - b) Recurrent attacks occur
 - c) Fibrous reaction in anterior chambers
 - d) Narrowing of joint spaces and sclerosis of the sacroiliac joints
- 19) **All are causes of chronic granulomatous uveitis except:**
 - a) Sarcoidosis
 - b) Tuberculosis
 - c) Brucellosis
 - d) Fuchs heterochromic cyclitis
- 20) **One of the most common complication of Iridocyclitis is :**
 - a) Scleritis
 - b) Secondary glaucoma
 - c) Band shaped keratopathy
 - d) Corneal ulcer
- 21) **In which of the following condition, iridectomy is indicated**
 - a) Prolapsed iris
 - b) Closed angle glaucoma
 - c) As part of cataract extraction
 - d) Threatening ring synechiae
 - e) All of the above
- 22) **Total posterior synechia causes:**

- a) Deep anterior chamber
b) Shallow anterior chamber
c) Funnel shaped anterior chamber
d) Festooned pupil
- 23) Bilateral blindness can result from:**
a) Corneal ulcer
b) Open globe injuries
c) Steven johnson's syndrome
d) Optic neuritis
- 24) Ciliary staphylocoma can occur in:**
a) Corneal ulcer
b) Myopia
c) Scleritis
d) Interstitial keratitis
- 25) Treatment of uveitis with raised intraocular tension:**
a) Timolol
b) Pilocarpine
c) Atropine
d) Glucocorticoids
- 26) Which of the following statements is incorrect about pthisis bulbi:**
a) The intraocular pressure is increased
b) Calcification of the lens is common
c) Sclera is thickened
d) Size of the globe is reduced
- 27) An 18-year old boy comes to the eye casualty with history of injury with a tennis ball. On examination there is no perforation but there is hyphema. The most likely source of the blood is:**
a) Iris vessels
b) Circulus iridis major
c) Circulus iridis minor
d) Short posterior ciliary arteries
- 28) In a patient with AIDS, chorioretinitis is typically caused by:**
a) Cytomegalovirus
b) Toxoplasma gondii
c) Cryptococcus neoformans
d) Histoplasma capsulatum
- 29) A 26 years old male has miotic pupil, intraocular pressure is 25 mmHg, normal anterior chamber, hazy cornea with shallow anterior chamber of fellow eye. The likely diagnosis is:**
a) Acute anterior uveitis
b) Acute angle closure glaucoma
c) Senile cataract
d) Acute open angle glaucoma
- 30) All the following diseases are associated with HLA-B27 and uveitis except:**
a) Behcets' syndrome
b) Psoriasis
c) Ankylosing spondylitis
d) Reiter's syndrome
- 31) Sauce and cheese retinopathy is seen in:**
a) CMV
b) Rubella
c) Toxoplasmosis
d) Congenital syphilis
- 32) For acute anterior uveitis, the treatment of choice is:**
a) Local steroids
b) Systemic steroids
c) Local NSAIDS
d) Systemic NSAIDS
- 33) First sign of sympathetic ophthalmia is:**
a) Retrolental flare
b) Aqueous flare
c) Dilated pupil
d) Constricted pupil
- 34) All drugs are used in acute anterior uveitis except:**
a) Pilocarpine
b) Atropine
c) Timolol
d) Propanolol
- 35) Dangerous area of eye is:**
a) Retina
b) Sclera
c) Ciliary body
d) Optic nerve
- 36) The laser procedure most often used for treating iris neovascularisation is:**
a) Goniophotocoagulation
b) Laser trabeculoplasty
c) Panretinal photocoagulation
d) Laser iridoplasty
- 37) A 25-year old male gives a history of redness, pain and mild diminution of vision in one eye for past 3 days. There is also a history of low backache for the past one year. On examination there is circumcorneal congestion, cornea is clear apart from a few fine keratic precipitates on the corneal endothelium, there are 2+ cells in the anterior chamber and the intraocular pressure is within limits. The patient is most likely suffering from:**
a) Acute attack of angle closure glaucoma.
b) HLA B-27 related anterior uveitis.
c) JRA associated uveitis.
d) Herpetic keratitis
- 38) Which of these does not feature eye manifestations in association with a seronegative arthropathy :**
a) Psoriasis
b) Rheumatoid arthritis
c) Reiter's syndrome
d) Ankylosing spondylitis
- 39) What is the most common eye manifestation of allergy to tubercular bacilli:**
a) Koeppeles nodules
b) Posterior scleritis
c) Phlyctenular conjunctivitis
d) Optic neuritis
- 40) A 25 year old lady presents with severe congestion, photophobia and deep anterior chamber in the right eye. The left is normal X-ray pelvis shows sacroiliitis. The diagnosis is :**
a) Anterior uveitis
b) Posterior uveitis
c) Intermediate uveitis
d) Scleritis

- 41) Which of the following is the commonest infection which causes blindness in adult man:
- Toxocara
 - Toxoplasma gondii
 - Taenia solium
 - Plasmodium falciparum
- 42) A boy presents two weeks after an injury of his left eye. He complains of bilateral pain and redness and watering fro right eye. What is the probable diagnosis:
- Endophthalmitis
 - Optic neuritis
 - Sympathetic irritation
 - Sympathetic ophthalmitis
- 43) In hypertensive patient having acute uveitis to decrease the IOP which drug is used:
- Pilocarpine
 - Latanoprost
 - Iodine
 - Timolol
- 44) Atropine is used in uveitis to:
- Give rest to ciliary body and iris
 - Increase vascularity that provides antibodies
 - Prevent posterior synechiae formation
 - None
- 45) All of the following features are seen in pauciarticular JRA except:
- Cataract
 - Keratopathy
 - Scieritis
 - Uveitis
- 46) All are complications of acute anterior uveitis, except:
- Glaucoma
 - Cataract
 - Macular oedema
 - Retinal detachment
- 47) Skin depigmentation, bilateral uveitis and tinnitus are features of:
- Vogt – Koyanagi-Harada syndrome
 - Waardenburg syndrome
 - Apert syndrome
 - Werner's syndrome
- 48) Iridocyclitis is a feature of:
- Juvenile rheumatoid arthritis with systemic involvement
 - Seropositive, pauciarticular, juvenile rheumatoid arthritis
 - Seronegative, pauciarticular, juvenile rheumatoid arthritis
 - Seropositive, polyarticular, juvenile rheumatoid arthritis
- 49) All are features of acute anterior uveitis, except:
- Aqueous flare
 - Shallow anterior chamber
 - Circumcorneal congestion
 - Miosis
- 50) Dallen Fuch's nodule is seen in:
- Bacterial Endophthalmitis
 - Mycotic Endophthalmitis
 - Sympathetic ophthalmia
 - Phacotoxic endophthalmitis
- 51) River blindness is caused by:
- Oncocerca volvulus
 - Lymphogranuloma venereum
 - Chlamydia trachomatis
 - Acanthamoeba
- 52) First symptom of sympathetic ophthalmitis is:
- Retrolental flare
 - Circumciliary congestion
 - Difficulty in accommodation
 - Photophobia
- 53) In acute anterior uveitis pupil is:
- Large and fixed
 - Semidilated
 - Irregular and constricted
 - Oval and fixed
- 54) Sympathetic ophthalmia is:
- B/L suppurative uveitis
 - Semidilated
 - Irregular and constricted
 - Oval and fixed
- 55) Signs of uveitis:
- Generalised conjunctival congestion
 - Circumciliary congestion
 - Cells and flare in aqueous
 - Keratic precipitates
- 56) Common features between sympathetic ophthalmitis and VKH syndrome [PGI]
- Autoimmune etiology
 - Injury
 - Uveitis
 - Vitiligo
- 57) Uveitis is caused by
- TB
 - Staphylococcus
 - Streptococcus
 - E coli
 - Klebsiella
- 58) The investigations of anterior uveitis for a 25 years old boy are :
- HLA B27
 - X-ray sacroiliac joint
 - TORCH agent
 - USG abdomen
- 59) All are seen in acute Iridocyclitis except:
- Pain
 - Ciliary congestion
 - Mucopurulent discharge
 - Small pupil
- 60) Snow banking is typically seen in :
- Pars planitis
 - Endophthalmitis
 - Coat's disease
 - Eales disease
- 61) A young adult presented with diminished vision. On examination he has anterior uveitis, vitritis, focal necrotizing granuloma, macular spot. What is the most probable diagnosis?
- Proteus syndrome

- b) White dot syndrome.
- c) Multifocal chorioiditis.
- d) Ocular toxoplasmosis.

62) Recurrent anterior uveitis with increased intraocular tension is seen in-

- a) Posner schlossman syndrome
- b) Foster Kennedy syndrome
- c) Vogt-koyanagi –harada syndrome
- d) Ankylosing spondylitis

63) Which of the following indicates activity of anterior uveitis-

- a) Cells in anterior chamber
- b) Circumcorneal congestion
- c) Keratic precipitate
- d) Corneal edema

64) In patients with anterior uveitis, decrease in vision due to posterior segment involvement can occur because of :

- a) Visual floaters.
- b) Inflammatory disc edema.
- c) Exudative retinal detachment.
- d) CME.

UVEITIS ANSWERS

1. B

- | | |
|-------|-----------|
| 2. A | 34. A |
| 3. C | 35. C |
| 4. A | 36. C |
| 5. C | 37. B |
| 6. D | 38. B |
| 7. A | 39. C |
| 8. A | 40. A |
| 9. B | 41. B |
| 10. A | 42. D |
| 11. C | 43. D |
| 12. C | 44. A |
| 13. D | 45. C |
| 14. B | 46. D |
| 15. D | 47. A |
| 16. A | 48. C |
| 17. D | 49. B |
| 18. A | 50. C |
| 19. D | 51. A |
| 20. B | 52. C |
| 21. E | 53. C |
| 22. C | 54. B |
| 23. D | 55. B,C,D |
| 24. C | 56. A,C |
| 25. C | 57. A,B,C |
| 26. A | 58. A,B,C |
| 27. B | 59. C |
| 28. A | 60. A,B |
| 29. A | 61. D |
| 30. A | 62. A |
| 31. A | 63. A |
| | 64. D |

RETINA

32. A
33. A

- 1) **Treatment of choice in proliferative diabetic retinopathy is:**
- Pan retinal photocoagulation
 - Shift the patient to insulin
 - Scleral buckling operation
 - Vitreotomy
- 2) **Most characteristic retinal feature of diabetic retinopathy is:**
- Cotton wool spots
 - Neovascularization
 - Soft exudates
 - Microaneurysms
- 3) **All of the following changes are seen in eclamptic retinopathy except:**
- Cotton wool spots
 - Flame shaped hemorrhages
 - Microaneurysms
 - Neovascularization
- 4) **Commonest cause of vitreous haemorrhage is:**
- Coat's disease
 - Eale's disease
 - Retinal detachment
 - Cataract
- 5) **Which of the following is investigation of choice in a 50 years old male diabetic presenting with sudden appearance of black floaters in the eye:**
- Retinoscopy
 - Fluorescein angiography
 - Direct ophthalmoscopy
 - Indirect ophthalmoscopy
- 6) **Cotton wool spots are seen in all except:**
- Diabetes mellitus
 - Hypertension
 - Polyarteritis nodosa
 - Coats disease
- 7) **All are indications for pan retinal laser photocoagulation in diabetic retinopathy**
- Optic disc neovascularisation
 - Pre retinal haemorrhage
 - Retinal neovascularisation
 - More than 10 cotton wool spots
- 8) **Most significant risk factor in retinal vein occlusion is;**
- Hypertension
 - Diabetes mellitus
 - High cholesterol levels
 - Smoking
- 9) **Moderate loss of vision in diabetes mellitus is due to:**
- Vitreous hemorrhage
 - Presenile cataract
 - Arterio sclerotic retinopathy
 - Background retinopathy
- 10) **Retinal changes in diabetes are due to:**
- Sorbitol
 - Glucose
 - Glycosylated end products
 - Aldol condensation
- 11) **Cystoid macular edema not seen in:**
- Aphakia
 - CSR
 - Diabetic retinopathy
 - Retinitis Pigmentosa
- 12) **Following is pathognomic finding of retinal detachment:**
- Fluid shift
 - Black shadow
 - Line
 - Hole
- 13) **Angiography is diagnostic in:**
- Retinoschisis
 - Rhegmatogenous retinal detachment
 - Central serous retinopathy
 - Vitreous detachment
- 14) **Sudden increase in blood sugar in diabetics cause:**
- Myopic shift
 - Hypermetropic shift
 - Presbyopia
 - Anisometropia
- 15) **All are used in the treatment of diabetic retinopathy except;**
- Removal of epiretinal membrane
 - Vitreotomy
 - Retinal reattachment
 - Exo photocoagulation
- 16) **Which of the following is best to differentiate CRVO from carotid artery occlusion :**
- Dilated retinal vein
 - Retinal artery pressure
 - Tortuous retinal vein
 - Ophthalmodynamometry
- 17) **ICG angiography is primarily indicated in:**
- Minimal classical CNV
 - Occult CNV
 - Angioid streak with CNV
 - Polypoidal choroidal vasculopathy
- 18) **In the fetus angiogenesis in eye all are involved except:**
- TNF α
 - IL -8
 - BFGF
 - VEGF
- 19) **True about juxta foveal telangiectasia is all except:**
- Variant of coat's disease
 - Macular telangiectasia
 - Peripheral telangiectasia
 - Structural abnormality seen in vessels
- 20) **All are true about Lambert Eaton syndrome except:**
- Spare ocular muscle
 - Tensilon test positive
 - Proximal muscle involvement
 - Repeat nerve stimulation improve muscle strength
- 21) **All are true about visual cycle except:**
- Condensation of opsin with aldehyde of retinal
 - NADP is reduced
 - NAD is reduced
 - Opsin combines with retinal to form visual purple
- 22) **Which of the following conditions have autosomal dominant inheritance:**
- Gyrate atrophy

- b) Best disease
c) Lawrence moon biedl syndrome
d) Bassen kornzweig syndrome
- 23) **Cherry red spot is seen in all of the following conditions except:**
a) GM1 gangliosidosis
b) Niemann pick disease
c) Krabbes disease
d) Sandoff's disease
- 24) **A case of Non-insulin dependent diabetes mellitus with a history of diabetes for one year should have an ophthalmic examinations:**
a) As early as feasible
b) After 5 years
c) After 10 years
d) Only after visual symptoms develop
- 25) **Which drug can cause macular toxicity when given intravitreally:**
a) Gentamycin
b) Vancomycin
c) Dexamethasone
d) Ceftazidime
- 26) **The average distance of the fovea from the temporal margin of the optic disc is;**
a) 1 disc diameter
b) 2 disc diameter
c) 3 disc diameter
d) 4 disc diameter
- 27) **Diabetic retinopathy is common in:**
a) NIDDM of 2 years duration
b) IDDM of 2 year duration
c) Juvenile onset diabetes before puberty
d) Pregnancy induced gestational diabetes
- 28) **Lattice degeneration is seen in:**
a) Myopia
b) Hypermetropia
c) Presbyopia
d) Pheumatoid arthritis
- 29) **Most sensitive part of retina is:**
a) Optic disc
b) Fovea centralis
c) Macula lutea
d) Peripheral retina
- 30) **Neovascularisation is seen in:**
a) Central retinal vein obstruction
b) Branch retinal artery obstruction
c) Branch retinal vein obstruction
d) All of the above
- 31) **Cherry red spot over retina is seen in all except:**
a) Tay sach's disease
b) Neimann pick disease
c) CRAO
d) Battern Mayo syndrome
- 32) **Ring scotoma is feature of:**
a) Embryonal nuclear cataract
b) Diabetic retinopathy
c) Blue dot cataract
d) Retinitis pigmentosa
- 33) **Floater can be seen in all, except:**
a) Uveitis
b) Acute congestive glaucoma
c) Retinal detachment
d) Vitreous haemorrhage
- 34) **Treatment of diabetic retinopathy :**
a) Phacoemulsification
b) Retinal laser photocoagulation
c) LASIK
d) Pars plana vitrectomy
- 35) **Diabetic retinopathy is treated by:**
a) Strict Glycemic control
b) Panphotocoagulation
c) Antihypertensive
d) Antioxidants
e) Cyclophotocoagulation
- 36) **Snow ball opacity in vitreous is seen in:**
a) Pars planitis
b) Sarcoidosis
c) Juvenile RA
d) Toxoplasmosis
e) Fuch's lesion
- 37) **RD is diagnosed by:**
a) + 90 D
b) Hruby lens
c) 3 mirror contact lens
d) Direct ophthalmoscopy
e) Indirect ophthalmoscopy
- 38) **In a young patient presenting with recurrent vitreous haemorrhage, diagnosis is:**
a) Eale's disease
b) CRVO
c) Proliferative retinopathy
d) Coat's disease
e) Episcleritis
- 39) **Eye changes in diabetes mellitus include**
a) Paralysis of 3rd 4th , 6th nerve palsy
b) Rubeosis iridis
c) Proliferative retinopathy
d) Subconjunctival haemorrhage
e) Hypermetropia
- 40) **Periphery of retina is visualized by:**
a) Indirect ophthalmoscope
b) Direct ophthalmoscope
c) Gonioscopy
d) Contact lens
- 41) **Regarding fovea, which of the following statement is true:**
a) Has the lowest threshold for light
b) Contains lonely cones
c) Contains only rods
d) Maximum visual acuity
e) Is located at apex of optic nerve
- 42) **Cotton wool spots are commonly seen in:**
a) AIDS
b) DM
c) Hypertension
d) CMV
- 43) **Black floaters in a diabetic patient indicates:**
a) Vitreous haemorrhage
b) Maculopathy
c) Vitreous infarction

- d) Posterior vitreous detachment
- 44) Amsler grid is used in:**
- Detection maculopathy
 - Optic disc examination
 - Squint
 - Retinal examination
- 45) Retinopathy in neonate is due to:**
- Prematurity <1500 gm
 - O₂ toxicity
 - Trauma
 - Diabetes
- 46) In retinitis pigmentosa, following are true except:**
- Pigment present
 - Pale waxy disc
 - Narrowing of vessels
 - ERG-normal
- 47) Rubeosis iridis is not seen in:**
- CRVO
 - CRAO
 - Diabetic retinopathy
 - Neovascularization
- 48) Enlarging dot sign in fundus fluorescein scanning is seen in:**
- Cystoid macular edema
 - Central serous retinopathy
 - Significant macular edema
 - Coat's disease
- 49) Bull's eye retinopathy is seen in:**
- Chloroquine
 - Methanol
 - Ethambutol
 - Steroids
- 50) Following are seen in CRA occlusion except:**
- Chloroquine
 - Methanol
 - Ethambutol
 - Steroids
- 51) Cherry red spot is seen in:**
- Retinitis pigmentosa
 - Retinopathy of prematurity
 - Metachromatic leukodystrophy
 - CRVO occlusion
- 52) Mucopolysaccharide hyaluronic acid is present in:**
- Vitreous humour
 - Synovial fluid
 - Cartilage
 - Cornea
- 53) The most common cause of vitreous hemorrhage in adults is:**
- Retinal hole
 - Trauma
 - Hypertension
 - Diabetes
- 54) A vitreous aspirate has been collected in an emergency at 9pm. What advice would you like to give to the staff n duty regarding the overnight storage of the sample:**
- The sample should be kept at 4 degree centigrade.
 - The sample should be incubated at 37 degree C.
 - The sample should be refrigerated at in deep freezer.
 - The sample should be refrigerated for the initial 3 hours and then 37 degree C
- 55) Which one of the following statements concerning persistent hyperplastic primary vitreous (PHPV) is not true:**
- It is generally unilateral
 - Visual prognosis is usually good
 - It may calcify
 - It is most easily differentiated from retinoblastoma by the presence of exophthalmos or cataract.
- 56) Snowball opacity in vitreous is seen:**
- Pars planitis
 - Sarcoidosis
 - Juvenile RA
 - Toxoplasmosis
 - Fuchs lesion
- 57) Vitreous opacities may be due to:**
- Herpetic keratouveitis
 - Posterior uveitis
 - Hyaloid asteroids
 - High myopia
- 58) Vitreous haemorrhage in young adult indicates:**
- Retinal detachment
 - Glaucoma
 - Eales disease
 - Chorioretinitis
- 59) Vitreous haemorrhage is not seen is:**
- Hypertension
 - Eales disease
 - Trauma
 - Diabetes mellitus
 - Vitreous degeneration
- 60) Vitreous haemorrhage is seen in:**
- Coats disease
 - Eales disease
 - CRVO
 - CRAO
- 61) Examination of vitreous is best done by:**
- Direct ophthalmoscope
 - Indirect ophthalmoscope
 - Slit lamp with contact lens
 - Oblique illumination
- 62) A child presents with unilateral proptosis which is compressible and increases on bending forwards. It is non-pulsatile and has no thrill or bruit. MRI shows retroorbital mass with echogenic shadows. The most probable diagnosis is:**
- Orbital mass
 - Orbital encephalocoele
 - Orbital A0V malformation
 - Neurofibromatosis
- 63) Which one of the following statements is incorrect about optic nerve glioma:**
- Has a peak incidence in first decade
 - Arises from oligodendrocytes
 - Causes meningeal hyperplasia
 - Is associated with type I neurofibromatosis

- 64) The most common second malignant in survivals of retinoblastoma:
- Thyroid cancer
 - Nasopharyngeal carcinoma
 - Optic glioma
 - Osteosarcoma
- 65) The most common retrobulbar mass in adults is:
- Neurofibroma
 - Meningioma
 - Cavernous Hemangioma
 - Schwannoma
- 66) The mother of a one and a half year old child gives history of a white reflex from one eye for the past 1 month. On computed tomography scan of the orbit there is calcification seen within the globe. The most likely diagnosis is:[AIPG]
- Congenital cataract
 - Retinoblastoma
 - Endophthalmitis
 - Coats disease
- 67) Vortex vein invasion is commonly seen in;
- Retinoblastoma
 - Malignant melanoma
 - Optic nerve gliomas
 - Medullo-epitheliomas
- 68) Hereditary retinoblastoma develop from the following chromosomal deletions:[AIPG]
- 13 q 14
 - 13 q 14
 - 14 q 13
 - 14 q 13
- 69) A one year old child having leucocoria was detected to be having a unilateral, large retinoblastoma filling half the globe. Current therapy would involve:
- Enucleation
 - Chemotherapy followed by local dyes
 - Direct laser ablation using photodynamic cryotherapy
 - Scleral radiotherapy followed by chemotherapy.
- 70) A patient is on follow up with you, after enucleating of a painful blind eye. After enucleating of the eyeball, a proper sized artificial prosthetic eye is advised after a postoperative period of:[AIPG]
- About 10 days
 - About 20 days
 - 6-8 weeks
 - 12-24 weeks
- 71) All of the following is associated with weakness of extra ocular muscle except:
- Fisher syndrome
 - Myasthenia gravis
 - EATON Lambert syndrome
 - Thyrotoxicosis
- 72) Most common ocular foreign body is :
- Chisel and Hammer
 - Glass
 - Plastic
 - Stone
- 73) Retinoblastoma differs from pseudoglioma by
- Decrease IOT
 - Blurring of Vision
 - Enlargement of optic foramen
 - All of the above
- 74) A mass present in muscle cone, encapsulated, presentation in 3rd to 4th decade with gradually increasing proptosis:[AIIMS]
- Capillary hemangioma
 - Cavernous hemangioma
 - Dermoid
 - Hemangioendothelioma
- 75) True about telecanthus is:
- Increase in intercanthal distance with normal interpupillary distance
 - Widely separated medial wall of orbits
 - Increased intercanthal distance with increased interpupillary distance
 - None of the above
- 76) In Neurofibromatosis -1 most common tumor is :
- Optic nerve glioma
 - Cerebral astrocytoma
 - Glioblastoma multiforme
 - Meningioma
- 77) In regards to intraocular retinoblastoma, which of the following statements is false
- 94% of cases are sporadic
 - Patients with sporadic retinoblastoma do not pass their genes to their off springs
 - Calcification in the tumour can be detected on USG.
 - Reese-Ellsworth classification is useful in predicting visual prognosis following radiotherapy
- 78) A 6-years old boy has been complaining of headache, ignoring to see the objects on the sides of four months. On examination he is not mentally retarded, his grades at school are good and visual acuity is diminished in both the eyes. Visual charting showed significant field defect. CT scan of the head showed suprasellar mass with calcification. Which of the following is the most probable diagnosis
- Astrocytoma
 - Craniopharyngioma
 - Pituitary adenoma
 - Meningioma
- 79) Baby born prematurely at 29 wks on examination at 42wks with ROP both eyes shows stage 2 zone 1 'plus' disease, how will u manage the patient?
- Examine the patient after 1 week.
 - Laser photocoagulation of both eyes.
 - Repeat macular grid photocoagulation.
 - Augmented macula photocoagulation.

RETINA ANSWERS

- A
- D
- C
- B

5. D
6. C
7. B
8. A
9. A
10. C
11. G
12. B
13. C
14. A
15. D
16. D
17. B
18. B
19. C
20. A
21. C
22. B
23. C
24. A
25. A
26. B
27. A
28. A
29. B
30. A
31. D
32. D
33. B
34. B
35. A,B,D
36. A,B
37. C,D,E
38. A
39. A,B,C
40. A,D
41. A,D
42. A,B,C
43. A,D
44. A
45. A,B
46. D
47. B
48. B
49. A
50. A,B

55. D
56. A,B
57. B,C,D
58. C
59. E
60. B
61. B
62. C
63. B
64. D
65. C
66. B
67. B
68. A
69. A
70. A
71. D
72. A
73. C
74. B
75. A
76. A
77. B
78. B
79. B

51. C
52. A
53. D
54. A

STRABISMUS:

- 1) **Function of superior oblique muscle is:**
 - a) Elevation with eye rotated outwards
 - b) Elevation with eye rotated inwards
 - c) Depression with inward rotation
 - d) Depression with outward rotation
- 2) **Direct distant ophthalmoscopy is done at a distance of:**
 - a) 10 cm

- b) 25 cm
c) 50 cm
d) 1 meter
- 3) In a 3 years old child mydriatic used for refraction is;**
a) 1% atropine drops
b) 1% atropine ointment
c) 1% homatropine drops
d) Tropicamide drops
- 4) Treatment of choice in aphakia:**
a) Contact lens
b) Spectacles
c) IOL
d) Laser therapy
- 5) True regarding lateral rectus palsy is:**
a) Crossed diplopia
b) Uncrossed diplopia
c) Divergent squint
d) Pupillary dilatation
- 6) Which of the following causes exclusively mydriasis**
a) Atropine
b) Cyclopentolate
c) Phenylephrine
d) Tropicamide
- 7) Most important factor to focus rays on retina:**
a) Lens
b) Corneal curvature
c) Axial length
d) Media of globe
- 8) Accommodative squint is managed by:**
a) Correction of refractive error
b) Surgery
c) Occlusion of affected eye
d) Convergent exercises
- 9) Which muscle is intortor of eyes:**
a) Superior rectus
b) Medial rectus
c) Inferior rectus
d) Inferior oblique
- 10) A 3 years old child with 15 degree esotropia, the management of the child will be:**
a) Refractive correction
b) Prism cover test
c) Surgical alignment
d) Wait and watch
- 11) True about amblyopia**
a) No organic cause
b) Correction should be done before 6 yrs
c) Spectacles
d) Exercise of affected eye
e) Surgery has a role
- 12) True about cross cylinder:**
a) Half of the curvature is cylindrical
b) Plus lens
c) Both plus and minus lens
- 13) In complete 3rd nerve palsy:**
a) Eye deviated medially
b) Superior and inferior recti affected
c) Dilated Pupil
d) Ptosis
- e) Convergence/Accommodation is lost
- 14) Amblyopia is treated by:**
a) Optical correction
b) Occlusion
c) Orthoptic exercise
d) Pleoptic exercise
- 15) Refractive power of eye depends upon mainly following factor /factors:**
a) Lens
b) Cornea
c) Vitreous humour
d) Aqueous humour
e) Axial length of the eye
- 16) Treatment of presbyopia:**
a) LASIK
b) Concave lens
c) Convex lens
d) Radial keratotomy
- 17) Refractive power of eye can be changed by:**
a) Radial keratotomy
b) Keratomileusis
c) IOL
d) LASIK
e) Photocoagulation
- 18) Periphery of retina is visualized by:**
a) Indirect ophthalmoscopy
b) Direct ophthalmoscopy
c) Gonioscopy
d) Contact lens
- 19) Treatment modalities for myopia are:**
a) Radial keratotomy
b) Laser keratomileusis
c) Epikeratophakia
d) Laser keratoplasty
- 20) Image seen by indirect ophthalmoscopy is:**
a) Inverted and virtual
b) Erect and virtual
c) Inverted and real
d) Erect and real
- 21) Complications of soft contact lens are a/e:**
a) Giant papillary conjunctivitis
b) Folliculosis
c) Corneal vascularisation
d) Cornea erosion
e) Acanthamoeba keratitis

STRABISMUS:

ANSWERS

1. C
2. B
3. B
4. C
5. B
6. C
7. B

8. A
9. A
10. ABC
11. ABC
12. D
13. BCDE
14. ABD
15. ABE
16. C
17. ABCD
18. AD
19. AB
20. C
21. B

NEUROPHTHALMOLOGY

1) All are features of optic nerve disease, except:

- a) Afferent papillary defect
- b) Sudden loss of vision
- c) Headache and vomiting
- d) Pain on movement of eye ball

2) Optic chiasma lesions will cause:

- a) Bitemporal hemianopia
- b) Superior quadrantanopia
- c) Unilateral blindness
- d) Inferior quadrantanopia
- e) Nasal blindness

3) Homonymous hemianopia is seen in lesion of:

- a) Optic tract
- b) Optic chiasma
- c) Optic radiation
- d) Optic nerve
- e) Occipital cortex

4) The visual pathway consists of all of these except:

- a) Optic tract
- b) Geniculocalcarine tract
- c) Inferior colliculus
- d) Lateral geniculate body
- e) Pretectal region

5) Components of papillary light reflex are:

- a) Retina
- b) Pretectal nucleus
- c) Lateral geniculate body
- d) Edinger Westphal nucleus
- e) Calcarine sulcus

6) Field defect seen in pituitary adenoma:

- a) Bitemporal hemianopia
- b) Binasal hemianopia
- c) Quadrantanopia
- d) Pie in sky defect

- e) Amaurosis in one eye and temporal hemianopia in other eye

7) Optic neuritis is seen in all except:

- a) DM
- b) Methanol poisoning
- c) Multiple sclerosis
- d) SLE

8) Loss of convergence with slight light reflex is seen in:

- a) ARP
- b) Holmes adie pupil
- c) Marcus Gunn pupil
- d) Wernickes pupil

9) All statements are true about papilloedema except:

- a) Extracellular edema
- b) Disruption of neurofilament
- c) Stasis of axoplasmic flow
- d) Axonal swelling

10) Lamina Cribosa is absent in:

- a) Morning-Glory syndrome
- b) Nanophthalmos
- c) Coloboma of retina
- d) Optic nerve agenesis

11) Paralysis of 3rd 4th and 6th nerves with involvement of ophthalmic division of 5th nerve, localizes the lesion to;[AIPG]

- a) Cavernous sinus
- b) Apex of orbit
- c) Brainstem
- d) Base of skull

12) Oculogyric crisis is known to be produced by all of the following drugs except:

- a) Trifluoperazine
- b) Atropine
- c) Perchlorperazine
- d) Perphenazine

13) The parvocellular pathway from lateral geniculate nucleus to visual cortex is most sensitive for the stimulus of:

- a) Colour contrast
- b) Luminance contrast
- c) Temporal frequency
- d) Saccadic eye movements

14) The fibers from the contralateral nasal hemiretina project to the following layers of the lateral geniculate nucleus:

- a) Layers 2, 3 and 5
- b) Layers 1, 2 and 6
- c) Layers 1, 4 and 6
- d) Layers 4, 5 and 6

15) Horner's syndrome is characterized by all of the following except:

- a) Miosis
- b) Enophthalmos
- c) Ptosis
- d) Cycloplegia

16) The most common condition of inherited blindness due to mitochondrial chromosomal anomaly is:

- a) Retinopathy of prematurity
- b) Leber's hereditary optic neuropathy

- c) Retinitis pigmentosa
d) Retinitis detachment
- 17) In the normal human right eye, the peripheral field of vision is usually least:
a) On the left side (nasally)
b) In the downward direction
c) In the upward direction
d) On the right side (temporally)
- 18) Any spectral colour can be matched by mixture of three monochromatic lights (red green, blue) in different proportions. If a person needs more of one of the colour for matching than a normal person, then he has a colour anomaly. More red colour is needed in the case of :
a) Deuteranomaly
b) Tritanomaly
c) Protanomaly
d) Tritanopes
- 19) The colour best appreciated by the central cones of our fovea macular are are:
a) Red and blue
b) Blue and green
c) Red and green
d) Blue and yellow
- 20) Oculomotor nerve palsy affects all of the following muscles, except:
a) Medial rectus
b) Inferior oblique
c) Lateral rectus
d) Levator palpebrae superioris
- 21) Wernicke's hemianopic papillary response is seen in lesions at:
a) Optic tract
b) Optic chiasma
c) Optic radiation
d) Lateral geniculate body
- 22) Chalky white optic disc on fundus examination is seen in all, except:
a) Syphilis
b) Lebers hereditary optic neuropathy
c) Post papilloedema optic neuritis
d) Traumatic injury to optic nerve
- 23) All of the following can cause optic neuritis except:
a) Rifampicin
b) Digoxin
c) Chloroquine
d) Ethambutol
- 24) A 40 years old lady presents with bilateral papilloedema. CT scan shows normal ventricles. Diagnosis is:
a) Benign intracranial hypertension
b) Malignant hypertension
c) Papillitis
d) Raised intra ocular pressure
- 25) Which of the following is not seen in increased intracranial tension:
a) Disc edema
b) Macular edema
c) Normal vision
d) Afferent papillary defect
- 26) All the following are caused by third nerve palsy except:
a) Ptosis
b) Mydriasis
c) Medial deviation of eye ball
d) Papillary reflex lost
- 27) In unilateral afferent papillary defect, when light is moved from normal to affected eye there is:
a) Dilatation in affected eye and constriction in normal eye
b) Dilatation in normal eye and constriction in affected eye
c) Dilatation in both eyes
d) Constriction in both pupils
- 28) Right eye superotemporal quadrantanopia, left eye centrocaecal scotoma with headache. Site of lesion is:
a) Left optic nerve + chiasma
b) Left optic tract + chiasma
c) Right optic nerve + chiasma
d) Right optic tract + chiasma
- 29) Functional defect of optic nerve can be diagnosed by:
a) Direct ophthalmoscopy
b) Indirect ophthalmoscopy
c) Perimetry and field charting
d) Retinoscopy
- 30) All of the following constitute Horner's syndrome except:
a) Ptosis
b) Exophthalmos
c) Anhydrosis
d) Loss of ciliospinal reflex
- 31) All are true about papilloedema except:
a) It is purely non inflammatory phenomenon
b) Transient loss of vision
c) 1st sign is blurring of nasal side of optic disc
d) Sudden painful eye movement.
- 32) The afferent pathway for light papillary reflex is:
a) Trigeminal nerve
b) Optic nerve
c) Abducent nerve
d) Ciliary nerve
- 33) Bitemporal hemianopic field defect is characteristic of:
a) Glaucoma
b) Optic neuritis
c) Pituitary tumour
d) Retinal detachment
- 34) A female presented with loss of vision in both eyes and on examination has normal papillary responses and normal fundus. Her visually evoked response (VER) examination shows extinguished responses. The most likely diagnosis is:
a) Hysteria
b) Cortical blindness
c) Optic neuritis
d) Retinal detachment
- 35) Idiopathic nyctalopia is due to a hereditary:
a) Absence of rod function

- b) Absence of cone function
c) Absence of both rod and cone function
d) Decrease of cone function
- 36) A patient has a right homonymous hemianopia with saccadic pursuit movements and defective optokinetic nystagmus. The lesion is most likely to be in the:**
- a) Frontal lobe
b) Parietal lobe
c) Occipital lobe
d) Temporal lobe
- 37) Which of the following best defines the saccade:**
- a) Voluntary slow eye movements
b) Involuntary slow eye movements
c) Abrupt, involuntary slow eye movements
d) Abrupt, involuntary rapid eye movements
- 38) Which one of the following extraocular muscles is served by a contra lateral brain stem sub nucleus:**
- a) Superior rectus
b) Medial rectus
c) Inferior oblique
d) Inferior rectus
- 39) A patient presented with normal eyesight and absence of direct and consensual light reflexes. Which of the following cranial nerves is suspected to be lessened:**
- a) Oculomotor
b) Trochlear
c) Optic
d) Abducent
- 40) A case of injury to right brow due to a fall from scooter presents with sudden loss of vision in the right eye. The pupil shows absent direct reflex but a normal consensual papillary reflex is present. The fundus is normal. The treatment of choice is:**
- a) Intensive intravenous corticosteroids as prescribed for spinal injuries to be instituted within six hours.
b) Pulse methylprednisolone 250 mg four times daily for three days.
c) Oral prednisolone 1.5 mg/kg body weight
d) Emergency optic canal decompression
- 41) An optic nerve injury may result in all of the following except:**
- a) Loss of vision in that eye
b) Dilatation of pupil
c) Ptosis
d) Loss of light reflex
- 42) Ophthalmoplegic migraine means:**
- a) When headache is followed by complete paralysis of the 3rd and 4th nerve on the same side as the hemicranias.
b) When the headache is followed by partial paralysis of the 3rd nerve on the same side as the hemicranias with out any scotoma.
c) Headache associated with 3rd and 4th and 6th nerve paralysis
d) Headache associated with optic neuritis
- 43) Horner's syndrome is best described by:**
- a) Miosis + ptosis
b) Miosis + anhydrosis
c) Anhydrosis + enophthalmos
d) Miosis + enophthalmos
- 44) Lesion in Meyers loop of optic radiation causes:**
- a) Upper homonymous quadrantanopia
b) Lower homonymous quadrantanopia
c) Unilateral anopia
d) Contralateral hemianopia
- 45) Protanopia is inability to see which colour:**
- a) Yellow
b) Green
c) Blue
d) Red
- 46) Internuclear ophthalmoplegia results due to involvement of:**
- a) Medial longitudinal bundle
b) Pontine reticular formation
c) Cerebellum
d) Motor nuclear sparing Edinger Westphal nucleus
- 47) Which of these is not useful in arriving at a diagnosis of moderate papilloedema in a patient of head injury:**
- a) Impaired papillary reflex
b) Hyperaemia
c) Filling of the physiological cup.
d) Blurring of the margins
- 48) Basanti, a 20 year old female presents with complaints of difficulty in reading near print on examination there is ptosis and diplopia in looking in all directions. What is the most probable diagnosis:**
- a) Lateral rectus palsy
b) Oculomotor palsy
c) Presbyopia
d) Myasthenia gravis
- 49) A patient with suprasellar extension of pituitary tumor presents with:**
- a) Bitemporal hemianopia
b) Binasal hemianopia
c) Pile in the sky
d) Right homonymous hemianopia
- 50) Homonymous quadrantanopia is seen in lesion of:**
- a) Temporal lobe
b) Frontal lobe
c) Occipital lobe
d) Parietal lobe
- 51) In a case of anisocoria, when 1 % pilocarpine is instilled into the eye with abnormally dilated pupil, no response occurs. Cause of anisocoria may be :**
- a) Adie's pupil.
b) Horner's syndrome.
c) Pharmacological blockage.
d) Uncal herniation.

- 36. B
- 37. D
- 38. A
- 39. A
- 40. D
- 41. C
- 42. B
- 43. A
- 44. A
- 45. D
- 46. A
- 47. A
- 48. D
- 49. A
- 50. A
- 51. C

**NEUROPHTHALMOLOGY
ANSWERS KEY**

- 1. C
- 2. A,B,D
- 3. A,C,E
- 4. C,E
- 5. A,B,D
- 6. A,C
- 7. A
- 8. B
- 9. B
- 10. A
- 11. A
- 12. B
- 13. A
- 14. C
- 15. D
- 16. B
- 17. C
- 18. C
- 19. C
- 20. C
- 21. A
- 22. C
- 23. A
- 24. A
- 25. D
- 26. C
- 27. C
- 28. A
- 29. C
- 30. A
- 31. D
- 32. B
- 33. C
- 34. B
- 35. A

- b) An epiphenomenon of a cerebral tumor
- c) An abnormal overflow of tears due to obstruction of lacrimal duct
- d) Eversion of lower eyelid following injury

8) A 60-year old man presented with watering from his left eye since one year. Syringing revealed a patent drainage system. Rest of ocular examination was normal. A provisional diagnosis of lacrimal pump failure was made. Confirmation of the diagnosis would be by:

- a) Dacryoscintigraphy
- b) Dacryocystography
- c) Pressure syringing
- d) Canaliculus irrigation test

9) Mucin layer deficiency occurs in:

- a) Keratoconjunctivitis
- b) Lacrimal gland removal
- c) Canalicular block
- d) Herpetic keratitis

10) Most common ocular finding in mumps is:

- a) Chorioretinitis
- b) Anterior uveitis
- c) Haemorrhagic conjunctivitis
- d) Dacryocystadenitis

11) Initial treatment of congenital dacryocystitis:

- a) Massaging
- b) Probing
- c) Ointment
- d) DCR
- e) No treatment required

LACRIMAL DRAINAGE SYSTEM

1) Crocodile tears are seen in:

- a) Frey's syndrome
- b) Conjunctivitis
- c) Lacrimal tumour
- d) Abnormal VII nerve regeneration

2) Most common cause of eye discharge in a 2 months old child is:

- a) Ectropion
- b) Congenital nasolacrimal duct blockage
- c) Ophthalmia neonatorum
- d) Vernal catarrh

3) Most common organism causing chronic dacryocystitis is:

- a) Staph aureus
- b) Pseudo pyocyanea
- c) Strep haemolyticus
- d) Mycotuberculosis

4) Tears are produced in the new born after:

- a) 1 week
- b) 2 weeks
- c) 6 weeks
- d) 4 weeks

5) In DCR the drainage is in:

- a) Superior meatus
- b) Inferior meatus
- c) Middle meatus
- d) Superior fontanelle

6) A two months old child presents with epiphora and regurgitation the most probable diagnosis is:

- a) Mucopurulent conjunctivitis
- b) Buphthalmos
- c) Congenital dacryocystitis
- d) Encysted mucocoele

7) Epiphora is:

- a) Cerebrospinal fluid running from the nose after fracture of anterior cranial fossa

ANSWERS

1. D
2. B
3. A
4. C
5. C
6. C
7. C
8. A
9. D
10. D
11. A

EYE LID:**1) Modified sweat glands**

- a) Henie's glands
- b) Zeiss glands
- c) Meibomian glands
- d) Moll glands

2) Painful lid margin is seen in:

- a) Style
- b) Hordeolum internum
- c) Eczema
- d) Basal cell carcinoma

3) The commonest fungal lesion of the eyelid is:

- a) Candida
- b) Aspergillosis
- c) Sporothrix
- d) Fusarium

4) Blaskovics operation is done for:

- a) Proptosis
- b) Ptosis
- c) Lagophthalmos
- d) Entropion

5) Wheelers operation is done in:

- a) Ectropion
- b) Entropion
- c) Ptosis
- d) None of the above

6) Sling operation should be avoided in cases of ptosis with:

- a) Very poor levator function
- b) Poor Bells phenomenon
- c) Weak mullers muscle
- d) Multiple failed surgeries

7) All are complications of chronic staphylococcal blepharconjunctivitis except:

- a) Chalazion
- b) Marginal conjunctivitis
- c) Follicular conjunctivitis
- d) Phlyctenular conjunctivitis

8) Which of the following is false:

- a) External hordeolum is an acute inflammation of the Zeis gland
- b) Internal hordeolum is an acute inflammation of the Zeis gland
- c) Internal hordeolum is an acute suppurative inflammation of meibomian gland
- d) Chalazion is a chronic granulomatous inflammation of the meibomian gland

9) A 2 year old child is found to have ptosis of one eye defective elevation of the eye. Opening the mouth causes elevation of the ptotic lid. The most likely clinical condition is:

- a) Partial 3 nerve palsy
- b) Congenital ptosis
- c) Ocular myasthenia
- d) Congenital ptosis with Marcus Gunn phenomenon

10) Lid separation of fetus in intrauterine life occurs at which month:

- a) 2 week
- b) 2 month
- c) 6 month
- d) 7 month

11) Coloboma of the lid is commonest in:

- a) Lateral half of lower lid
- b) Medial half of lower lid
- c) Lateral half of upper lid
- d) Medial half of upper lid

12) Adhesion of margins of two eyelid is called:

- a) Symblepharon
- b) Ankyloblepharon
- c) Blepharophimosis
- d) Blepharophimosis

13) Fasanella Servat operation is specifically indicated in:

- a) Congenital ptosis
- b) Steroid induced ptosis
- c) Myasthenia gravis
- d) Horners syndrome

14) The operation of placation of inferior retractors is indicated in:

- a) Senile ectropion
- b) Senile entropion
- c) Cicatricial entropion
- d) Paralytic entropion

15) Ptosis with weakness of orbicularis-oculi is seen in:

- a) Polymyositis
- b) Myasthenia gravis
- c) Eaton-Lambert syndrome
- d) Thyrotoxicosis

16) A recurrent chalazion should be subjected to histopathological examination to exclude possibility of:

- a) Squamous cell carcinoma
- b) Sebaceous cell carcinoma
- c) Malignant melanoma
- d) Basal cell carcinoma

17) Ptosis occurs due to:[AIIMS]

- a) Facial nerve palsy
- b) Oculomotor palsy

- | | |
|---|---------|
| c) Trigeminal palsy | 8. B |
| d) Trochlear palsy | 9. D |
| 18) Which of the following muscles is involved in ptosis:[PGI] | 10. D |
| a) Lateral rectus | 11. D |
| b) Levator palpebrae superioris | 12. B |
| c) Muller's muscle | 13. D |
| d) Orbicularis oculi | 14. B |
| 19) Treatment of chalazion is: | 15. B |
| a) Hot formentation | 16. B |
| b) Incision and curettage | 17. B |
| c) Antibiotics | 18. BC |
| d) Diathermy | 19. BE |
| e) Injection of steroids | 20. ACE |
| 20) Chalazion is /are:[PGI] | 21. B |
| a) True meibomian cyst | 22. C |
| b) Mucus cyst | 23. B |
| c) Sebaceous cyst | 24. A |
| d) Cyst of hair follicle | 25. B |
| e) Obstruction of meibomian gland | 26. B |
| 21) Lid lag on ptotic side is caused by:[PGI] | |
| a) Neurogenic ptosis | |
| b) Myogenic ptosis | |
| c) Metabolic ptosis | |
| d) Traumatic ptosis | |
| 22) Madarosis is seen in: | |
| a) T.B | |
| b) Diabetes mellitus | |
| c) Leprosy | |
| d) Waardenburg syndrome | |
| 23) Commonest malignant tumour of eyelid is: | |
| a) Squamous cell carcinoma | |
| b) Basal cell carcinoma | |
| c) Malignant melanoma | |
| d) Sebaceous cell carcinoma | |
| 24) Hordeolum internum is: | |
| a) Acute on chronic suppuration of Meibomian glands | |
| b) Acute suppuration of Molls gland | |
| c) Chronic granulation of tarsal glands | |
| d) Chronic granulation of Zeis glands | |
| 25) Tylosis is: | |
| a) Thickening of eyelid with ptosis | |
| b) Thickening of eyelid margin | |
| c) Ptosis | |
| d) Enophthalmos | |
| 26) Von-graefes sign: | |
| a) Lid retraction | |
| b) Lid lag | |
| c) Staring look | |
| d) Absence of convergence | |

ANSWERS

1. D
2. A
3. A
4. B
5. B
6. B
7. A

ORBIT

- 1) **Blow out fracture orbit involve:**
- Floor
 - Medial wall
 - Lateral wall
 - Roof
 - Apex
- 2) **Familial retinoblastoma:**
- Has autosomal recessive inheritance
 - More commonly bilateral
 - Due to mutation
 - More common than sporadic retinoblastoma
- 3) **Enucleation is done for:**
- Retinoblastoma
 - Malignant melanoma
 - Glaucoma
 - Phthisis bulbi
 - Vitreous hemorrhage
- 4) **Blow out # orbit is characterized by:**
- Diplopia
 - Tear drop sign
 - Forced duction test
 - Exophthalmos
- 5) **One year old male child with cat's eye reflex and raised IOT:**
- Toxoplasma gondi infection
 - Toxocara canis
 - Retinoblastoma
 - Retinopathy of prematurity
 - Noorie's disease
- 6) **Knudson's two hit hypothesis is for:**
- Glaucoma
 - Retinoblastoma
 - Optic glioma
 - Meningioma
- 7) **In waardenburg's syndrome, following are seen except:**
- Widening of the eyebrow
 - Short pappebral fissure
 - Interstitial keratitis
 - Heterochromia iridis
- 8) **A 50- year old man presented with orbital mass. Systemic examination revealed anaemia and investigations revealed hyper gammaglobulinema. The patient should be investigated to rule out:**
- Squamous cell carcinoma
 - Optic nerve glioma
 - Multiple myeloma
 - Malignant melanoma
- 9) **All the following signs could result from infection within the right cavernous sinus, except:**
- Loss of papillary light reflex
 - Loss of corneal blink reflex
 - Ptosis
 - Right ophthalmoplegia
- 10) **Sclerosis of bony orbit is seen in:**
- Neurofibroma
 - Retinoblastoma
 - Meningioma
 - Glioma
- 11) **Common ocular manifestation in trisomy 13 is:**
- Capillary hemangioma
 - Bilateral microphthalmos
 - Neurofibroma
 - Dermoid cyst
- 12) **The differential diagnosis of retinoblastoma would include all except:**
- Persistent hyperplastic primary vitreous
 - Coat's disease
 - Retinal astrocytoma
 - Retinal detachment
- 13) **Enucleation of the eyeball is contraindicated in:**
- Endophthalmitis
 - Panophthalmitis
 - Intraocular tumours
 - Painful blind eye
- 14) **8- year old boy presented with swelling in left eye of 3 months duration . Examination revealed proptosis of left eye with preserved vision. Right eye is normal. CT scan revealed intra orbital extraconal mass lesion. Bopsy revealed embryonal rhabdomyosarcoma. Metastatic work up was normal. The standard line of treatment is;**
- Chemotherapy only
 - Wide local excision
 - Enucleation
 - Chemotherapy and radiation therapy
- 15) **A 23-year old child presented with leucocoria in the right eye since 2 months. On examination, a total retinal detachment was present in the same eye. Ultrasound B scan revealed a heterogenous subretinal mass with calcification, associated with retinal detachment. The most likely clinical diagnosis is:**
- Coats disease
 - Retinoblastoma
 - Toxocariasis

- d) Retinal tuberculoma
- 16) Which wall is most often fractured in a blow out fracture of the orbit due to fist cuff injury?**
- Superior wall
 - Inferior wall
 - Medial wall
 - Lateral wall
- 17) Leukocoria is seen in all except:**
- Retinoblastoma
 - Congenital glaucoma
 - Persistent primary hyperplastic vitreous
 - Fungal Endophthalmitis
- 18) A five-year old child presents with mild proptosis and loss of vision of one eye. On examination direct papillary reflex is absent and consensual reflex is present. What is the most probable diagnosis:**
- Retinoblastoma
 - Optic disc angioma
 - Optic nerve glioma
 - Optic sheath meningioma
- 19) A 48-year old lady presents with unilateral mild axial proptosis. There is no history of redness or Pain. Which of the following is the most appropriate investigation:**
- CT scan to rule out meningioma
 - USG to rule out orbital pseudotumor
 - T3 and T4 measurement to rule out thyrotoxicosis
 - Doppler to rule out hemangioma
- 20) Traumatic eye with late presentation of unilateral proptosis and scleral hyperaemia I seen in:**
- Retrobulbar hematoma
 - Retrobulbar cellulitis
 - Carotico-cavernous fistula
 - Pneumo orbit
- 21) Concussion injuries to the eye will cause all of the following except:**
- Subluxation of lens
 - Soft exudates
 - Macular Hole
 - Berlin's Oedema
- 22) Best X-ray view to visualize superior orbital fissure is:[AIIMS]**
- Antero posterior
 - Basal
 - Towne's
 - Caldwell Luc's view
- 23) Commonest orbital tumour in children is:**
- Retinoblastoma
 - Rhabdomyosarcoma
 - Melanoma
 - Chloroma
- 24) Retinoblastoma can present with all, except**
- Leucocoria
 - Squint
 - Microphthalmos
 - Cataract
- 25) Which is not a complication of blunt trauma to eye:[AIIMS]**
- Hyphema
 - Retinal detachment
 - Double perforation of iris
 - Iridodialysis
- 26) Which of the following is not prognostic significance in choroidal melanoma:[AIIMS]**
- Presence of retinal detachment
 - Size of the tumor
 - Cytology of the tumor cells
 - Presence of extra ocular extension
- 27) Berlin's edema occurs due to:**
- Penetrating injury to eye
 - Blunt trauma to eye
 - Radiation injury to eye
 - Chemical injury to eye
- 28) Most common type of optic nerve glioma is:**
- Protoplasmic
 - Pilocytic
 - Gemistocytic
 - Fibrous
- 29) Following a RTA on fourth day, a person develop proptosis and pain over right eye. On examination there is bruise on the eye and forehead. What may be the diagnosis :**
- Fracture sphenoid.
 - Cavernous sinus thrombosis.
 - Internal carotid artery aneurysm.
 - Carotid cavernous fistula.
- 30) A patient developed proptosis and diplopia of 2 months duration following injury. On examination there is chemosis, conjunctival redness, and external ocular nerve palsy. Investigation of choice is :**
- MRI.
 - CECT.
 - MR angiography.
 - Intra arterial digital subtraction angiography.

ANSWERS

- A,B
- B,C
- A,B,C,D
- A,B,C
- C
- B
- C
- C
- C
- C
- B
- D
- A
- D
- B
- B
- B
- C
- C
- A
- B
- D

- 23. B
- 24. D
- 25. C
- 26. A
- 27. B
- 28. B
- 29. D
- 30. D

- c) 1000
- d) 1500

- 7) **all of the following are given global prominence in the vision 2020 goals, except:**
- a) Refractive errors
 - b) Cataract
 - c) Trachoma
 - d) Glaucoma
- 8) **For the filed diagnosis of trachoma, the WHO recommends that follicular and intense trachoma inflammation should be assessed in :**
- a) Women aged 15-45 years
 - b) Population of 10 to 28 year range
 - c) Children aged 0-10 years
 - d) Population above 25 years of age irrespective of sex.
- 9) **the eye condition for which the world bank assistance was provided to the national programme for control of blindness (1994-2001) is :**
- a) Cataract
 - b) Refractive errors
 - c) Trachoma
 - d) Vitamin A deficiency
- 10) **Under the school eye screening programme in India, the initial vision screening of school children is done by:**
- a) School teachers
 - b) Primary level health workers
 - c) Eye specialists
 - d) Medical officers
- 11) **Which is the commonest cause of ocular morbidity in community:**
- a) Cataract
 - b) Refractive error
 - c) Ocular injury
 - d) Vitamin A deficiency
- 12) **SAFE strategy is recommended for control of :**
- a) Trachoma
 - b) Glaucoma
 - c) Diabetes mellitus
 - d) Cataract
- 13) **46-year-old female presented at the eye OPD in a hospital, her vision in the right eye was 6/60 and left eye was 3/60. Under the National Programme for control of blindness, she will be classified as :**
- a) Socially blind
 - b) Low vision
 - c) Economically blind
 - d) Normal vision

COMMUNITY OPHTHALMOLOGY

- 1) **The visual acuity used as cut off for differentiating normal from abnormal children in the school vision screening programme in India is:**
- a) 6/6
 - b) 6/9
 - c) 6/12
 - d) 6/60
- 2) **WHO criteria for blindness is visual acuity of less than:**
- a) 1/60
 - b) 6/60
 - c) 6/18
 - d) 3/60
- 3) **Most common cause of blindness in India:**
- a) Trachoma
 - b) Vitamin-A deficiency
 - c) Cataract
 - d) Myopia
- 4) **All are common cause of childhood blindness except**
- a) Malnutrition
 - b) Glaucoma
 - c) Ophthalmia neonatorum
 - d) Congenital dacryocystitis
- 5) **Under the national programme for control of Blindness in India, medical colleges are classified as eye care center of:**
- a) Primary level
 - b) Secondary level
 - c) Tertiary level
 - d) Intermediate level
- 6) **Taking the definition of blindness as visual acuity less than 3/60 in the better eye, the number of blind persons per 100,00 population in India [according to older data] is estimated to be:**
- a) 500
 - b) 700

ANSWER

- 1. B
- 2. D
- 3. C
- 4. D
- 5. C
- 6. B
- 7. D
- 8. C

- 9. A
- 10. A
- 11. B
- 12. A
- 13. C

- a. Nerve sheath tumor
- b. Hemangioma
- c. Lymphoma
- d. Meningioma

- 7. Elevators of eye-
 - a. SR and IO
 - b. IO and SO
 - c. IR and S
 - d. SO SR
- 8. Keoppe nodules are present on-
 - a. Cornea conjunctiva
 - b. Iris
 - c. Retina
- 9. Infection of what is called sty-
 - a. Hair follicles
 - b. Tarsal glands
 - c. Conjunctiva
 - d. Zeis glands

DNB BASED QUESTIONS:**Section 1**

- 1. 1st sign of anterior uveitis-
 - a. Keratic precipitate
 - b. Aqueous flare
 - c. Hypopyon
 - d. Miosis
- 2. Posterior staphyloma, most common cause-
 - a. Trauma
 - b. Myopia
 - c. Iridocyclitis
 - d. Glaucoma
- 3. Which is not a cataract surgery-
 - a. Lensectomy
 - b. Goniotomy
 - c. Phacoemulsification
 - d. IOL
- 4. Not a symptom of angle closure glaucoma-
 - a. Blurring of vision
 - b. Coloured Halos
 - c. Metamorphosia
 - d. Headache
- 5. Eale's disease is-
 - a. Retinal hemorrhage
 - b. Vitreous hemorrhage
 - c. Conjunctival hemorrhage
 - d. Choroidal hemorrhage
- 6. MC orbital tumor-

Answer Key

- 1. B
- 2. B
- 3. B
- 4. C
- 5. B
- 6. B
- 7. A
- 8. C
- 9. D

Section 2

- 1. Vitamin B₁₂ deficiency causes-
 - a. Centrocaecal scotoma
 - b. Binasal hemianopia
 - c. Constriction of peripheral field
 - d. Bitemporal hemianopia
- 2. Intact cornea can be penetrated by-
 - a. Gonococcus
 - b. Pseudomonas
 - c. Streptococcus
 - d. Pneumococcus
- 3. Angle of squint is measured by-
 - a. Gonioscopy

- b. Prism
 - c. Retinoscopy
 - d. Keratometry
4. Sunflower type cataract is characteristically seen in-
- a. Chalcosis
 - b. Diabetes
 - c. Stragardt's disease
 - d. Congenital syphilis
5. Chalazion of lid is-
- a. Caseous necrosis
 - b. Chronic nonspecific inflammation
 - c. Chronic lipogranulomatous inflammation
 - d. Liposarcoma
6. To prevent keratoconus what is used-
- a. Antibiotics
 - b. Cycloplegics
 - c. Glasses
 - d. None
7. Earliest symptom of retinitis pigmentosaa-
- a. Ring scotoma
 - b. Night blindness
 - c. Tubular vision
 - d. None
8. Characteristic visual field defect I optic chiasma lesion-
- a. Homonymous hemianopia
 - b. Bitemporal hemianopia
 - c. Upper quadrantanopia
 - d. Lower quadrantanopia
9. All are seen in 3rd nerve palsy-
- a. Mydriasis
 - b. Loss of light reflex
 - c. Loss of abduction
 - d. Ptosis

- 7. B
- 8. B
- 9. C

Section 3

1. Swining light test is positive in-
- a. Conjunctivitis
 - b. Glaucoma
 - c. Retrobulbar neuritis
 - d. Keratoconus
2. Fusion of palpebral and bulbar conjunctiva is-
- a. Symblepharon
 - b. Trichiasis
 - c. Ectropin tylosis
3. Which of the following is the only reversible cataract-
- a. senile cataract
 - b. cataract in galactosemia
 - c. congenial cataract
 - d. none
4. Keratic precipitates are on which layer of cornea-
- a. Epithelium
 - b. Endothelium
 - c. Stroma
 - d. Bowman's membrane
5. Not true about herpetic keratitis-
- a. Stromal Keratitis
 - b. Dendritic Ulcer
 - c. Corneal guttata
 - d. Disciform Keratitis
6. 'S' component of SAFE
- a. Screening
 - b. Surgery
 - c. Steroids
 - d. None
7. Satellite nodules are seen in-
- a. Fungal corneal ulcer
 - b. Tuberculosis
 - c. Sarcoidosis
 - d. Viral ulcer
8. Primary action of superior oblique is-
- a. Intorsion

Answer Key

- 1. A
- 2. A
- 3. B
- 4. A
- 5. C
- 6. D

- b. Depresson
 - c. Adduction
 - d. Abduction
9. Conjunctival xerosis is seen in-
- a. Vitamin A deficiency
 - b. Herpetic keratitis
 - c. Glaucoma
 - d. None
- d. Bipolar cell
5. Optic tract lesion causes-
- a. Wernicke's hemianopic pupil
 - b. Amauratic pupil
 - c. Marcus Gunn pupil
 - d. None
6. Earliest symptom of retinitis pigmentosa-
- a. Ring scotoma
 - b. Night blindness
 - c. Tubular vision
 - d. None

Answer Key

- 1. C
 - 2. A
 - 3. B
 - 4. B
 - 5. C
 - 6. B
 - 7. A
 - 8. A
 - 9. A
7. Expulsive hemorrhage in cataract surgery is from-
- a. Vortex vein
 - b. Ciliary artery
 - c. Choroidal vein
 - d. None
8. Extra retinal fibrovascular proliferatio at ridge is-
- a. Normal
 - b. Stage I ROM
 - c. Stage II ROM
 - d. Stage III ROM
9. Cause of bilateral optic atrophy-
- a. Trauma
 - b. To optic nerve
 - c. Intracranial neoplasma
 - d. CRAO

Section 4

1. Most common cause of anterior uveitis-
- a. CMV
 - b. Ankylosing Spondylitis
 - c. Toxoplasma
 - d. None
2. Inclusion body conjunctivitis true is all except:
- a. Self limiting
 - b. Present only in infants
 - c. Occurs while passage from birth canal
 - d. Caused by Chlamydia
3. Angular conjunctivitis is caused by-
- a. H. influenza
 - b. Adenovirus type 32
 - c. Morax axenfield bacillus
 - d. Brahmella
4. A wave in ERG is due to activity of-
- a. Pigmented epithelium
 - b. Rods and cones
 - c. Ganglion cell

Answer Key

- 1. B
- 2. B
- 3. C
- 4. B
- 5. A
- 6. B
- 7. B
- 8. C
- 9. B

Section 5

1. Visual axis is-
- a. Center of cornea to retina
 - b. Object to fovea

- c. Center of lens to cornea
 - d. None
2. Treatment of traumatic cataract in children-
- a. ECCE + IOL
 - b. Lensectomy
 - c. Contact lens
 - d. Glasses
3. Mutton fat keratic precipitate is seen in –
- a. Posterior uveitis
 - b. Granulomatous uveitis
 - c. Non- granulomatous uveitis
 - d. Choroiditis
4. Vogt Koyanagi –Harada (VKH) syndrome is-
- a. Chronic granulomatous uveitis
 - b. Chronic non- granulomatous uveitis
 - c. Acute purulent uveitis
 - d. none
5. Treatment of after cataract-
- a. Argon laser
 - b. Nd- YAG laser
 - c. CO₂ laser
 - d. Krypton laser
6. Unilateral papilloedema with optic atrophy on the other side is a feature of-
- a. Foster kennedy syndrome
 - b. Fisher syndrome
 - c. Vogt-koyanagi harada syndrome
 - d. WAGR syndrome
7. Snow banking is typically seen in-
- a. Pars planitis
 - b. Endophthalmitis
 - c. Coat's disease
 - d. Eale's disease
8. Most common cause of ophthalmoplegia-
- a. Aneurysm
 - b. Infection
 - c. Myasthenia gravis
 - d. None
9. Irregular pupil is seen in-
- a. Glaucoma
 - b. Trauma
 - c. Oculomotor pulsy
 - d. Retinal detachment

- 1. B
- 2. A
- 3. B
- 4. A
- 5. B
- 6. A
- 7. A
- 8. A
- 9. B

Section-6

1. Munson's sign is seen in-
- a. Keratoconus
 - b. Keratoglobus
 - c. Keratomalacia
 - d. All of these
2. Shaffer's sign is seen in-
- a. Retinitis Pigmentosa
 - b. Retinal detachment
 - c. CRVO
 - d. CRAO
3. In concomitant squint-
- a. Primary deviation > Secondary deviation
 - b. Secondary deviation > Primary deviation
 - c. Primary deviation = secondary deviation
 - d. None
4. Treatment of choice for amblyopia is-
- a. Convergent exercises
 - b. Spectacles
 - c. Surgery
 - d. Conventional occlusion
5. Fundus in retinitis pigmentosa is-
- a. White spots with red disc
 - b. Jet- black spots with pale- waxy disc
 - c. No pigmentation
 - d. Dilation of arterioles
6. Christmas tree cataract is seen in-
- a. Down's syndrome
 - b. Rubella
 - c. Myotonic dystrophy

- d. Diabetes
7. Lens subluxates in homocystinuria-
- Inferotemporal
 - Inferonasal
 - Superonasal
 - Superotemporal
8. Laser iridotomy is done in-
- Angle closure glaucoma
 - Open angle glaucoma
 - Pigmentary glaucoma
 - None
9. After trauma, A person cannot move eye outward beyond mid point. The nerve injured is-
- 2nd
 - 3rd
 - 4th
 - 6th
- c. Separation of nuclear layer from plexiform layer
- d. None
3. True about heterochromic uveitis-
- Involves posterior surface of iris
 - Involves anterior part of iris
 - Involves posterior surface of cornea
 - Involves posterior surface of lens
4. Krukenberg spindles-
- Involves anterior surface of cornea
 - Involves anterior lens surface
 - Involves posterior surface of cornea
 - Involves posterior surface of lens
5. What is deposited in Kyser-Fleischer ring-
- Copper
 - Lead
 - Mercury
 - Heme
6. Ropy discharge is seen in-
- Trachoma
 - Vernal conjunctivitis
 - Corneal ulcer
 - Epidemic keratoconjunctivitis
7. Following corneal transplantation, most common infection occur-
- Staph epidermidis
 - Streptococcus
 - Klebsiella
 - Pseudomonas
8. Most common orbital tumor has its origin from-
- Blood vessels
 - Nerves
 - Muscle
 - Lymph node
9. Which component of the eye has maximum refractive index-
- Anterior surface of the lens
 - Posterior surface of the lens
 - Centre of the lens
 - Cornea

Answer Key

- A
- B
- C
- D
- B
- C
- B
- A
- D

Section7

1. Iritis in young patient with joint pain-
- Gout
 - RA
 - As
 - Toxoplasma
2. Retinal detachment is-
- Separation of sensory epithelium from pigmented epithelium
 - Separation of pigmented epithelium from choroid
3. C

Answer Key

- C

2. A
3. B
4. C
5. A
6. B
7. A
8. A
9. C

7. Fusion of palpebral and bulbar conjunctiva is-
 - a. Symblepharon
 - b. Trichiasis
 - c. Ectropion
 - d. Tylosis
8. Treatment of vernal keratoconjunctivitis includes all except-
 - a. Steroids
 - b. Chromoglycate
 - c. Olopatadine
 - d. Antibiotics
9. Superior orbital fissure syndrome include all except:
 - a. 3rd nerve
 - b. 4th nerve
 - c. 6th nerve
 - d. 2nd nerve

Section8

1. Most common malignant tumour of eyelid is –
 - a. Sebaceous gland carcinoma
 - b. Basal cell carcinoma
 - c. Squamous cell carcinoma
 - d. Malignant melanoma
2. In acute angle closure glaucoma, primary mechanism of pathogenesis is-
 - a. Increased secretion
 - b. Increased absorption but increased secretion
 - c. Outflow obstruction
 - d. None
3. Foster's fusch's spots are seen in-
 - a. Hypermetropia
 - b. Myopia
 - c. Astigmatism
 - d. None
4. Pigmentary glaucoma – findings seen is:
 - a. Fevy line
 - b. Flesscher's line
 - c. Hadson hauti line
 - d. Krukenberg's spindles
5. Roth spots are seen in-
 - a. Bacterial endocarditis
 - b. HTN retinopathy
 - c. DM retinopathy
 - d. None
6. Corneal endothelial cell count is done by-
 - a. Specular microscopy
 - b. Keratometry
 - c. Gonioscopy
 - d. Slit lamp

Answer Key

1. B
2. C
3. B
4. D
5. A
6. A
7. A
8. D
9. D

Section9

1. Vitamin B₁₂ deficiency causes-
 - a. Centrocaecal scotoma
 - b. Binasal hemianopia
 - c. Constriction of peripheral field
 - d. Bitemporal hemianopia
2. Cherry red spot is seen in-
 - a. CRAO
 - b. CRVO
 - c. BRAO
 - d. Retinitis pigmentosa
3. Most common tumor to extend from intracranial to orbit is-
 - a. Astrocytoma

- b. Pituitary adenoma
 - c. Craniopharyngioma
 - d. Sphenoidal wing meningioma
4. Duchrome test is for-
- a. Subjective verification of refraction
 - b. Subjective refinement of refraction
 - c. Subjective binocular balancing
 - d. None
5. Sun flower cataract is seen in-
- a. Galactosemia
 - b. Injuries
 - c. Laurence Moon Biedel syndrome
 - d. Wilson's disease
6. Retinoscopy is done for-
- a. Field of vision
 - b. Error of refraction
 - c. Curvature of retina
 - d. None
7. Corneal dystrophy, true is-
- a. Sjogren's syndrome
 - b. SLE
 - c. Dermatomyositis
 - d. RA
8. Keratoconjunctivitis sicca is-
- a. Sjogren's syndrome
 - b. SLE
 - c. Dermatomyositis
 - d. RA
9. Downward and outward movement of eye is effected in injury of-
- a. 3rd nerve
 - b. 4th nerve
 - c. 5th nerve
 - d. 6th nerve

9. B

Section10

1. Jack in box scotoma is seen after correction of Aphakia by-
- a. IOL
 - b. Spectacles
 - c. Contact lens
 - d. None
2. Glaucomflecken is-
- a. Acute uvetis due to glaucoma
 - b. Lens opacity due to glaucoma
 - c. Retinal detachment due to glaucoma
 - d. Corneal opacity due to glaucoma
3. Recurrent anterior uveitis with increased intraocular tension is seen in-
- a. Posner schlossman syndrome
 - b. Foster Kennedy syndrome
 - c. Vogt-koyanagi –harada syndrome
 - d. None
4. Most common carcinoma of conjunctiva-
- a. Squamous cell Ca
 - b. Basal cell ca
 - c. Melanoma
 - d. Lymphoma
5. Yoke muscle pair-
- a. Rt IR + Rt SR
 - b. Rt LR + Rt MR
 - c. Rt LR + Lt MR
 - d. Lt LR + Lt MR
6. Child with mild squint. Intrauterine, birth history, developmental history till date all normal. Corneal reflex normal. All other eye parameters normal except exaggerated epicanthal fold. Diagnosis-
- a. Pseudostrabismus
 - b. Accommodative squint
 - c. Exophoria
 - d. Esophoria
7. Snow banking is typically seen in-
- a. Pars palntis
 - b. Endophthalmitis

Answer Key

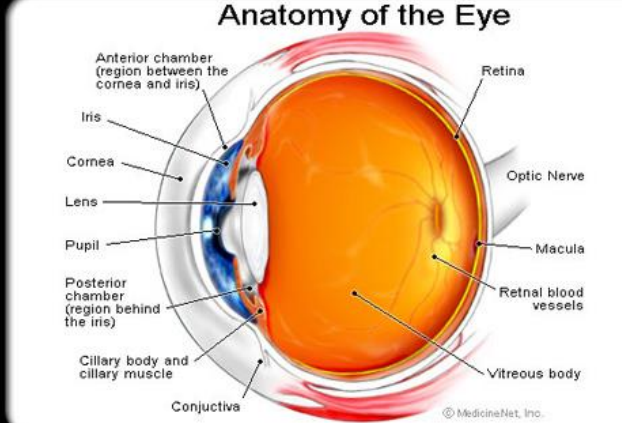

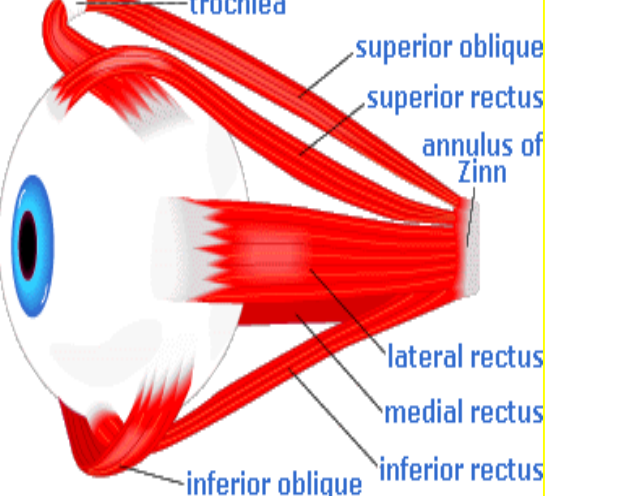

- 1. A
- 2. A
- 3. D
- 4. B
- 5. D
- 6. B
- 7. C
- 8. A

- c. Coat's disease
 - d. Eale's disease
8. Polychromatic lusture is seen in-
- a. Complicated cataract
 - b. Diabetes mellitus
 - c. Post radiation cataract
 - d. Congenital cataract
9. Second sight is seen in-
- a. Nuclear cataract
 - b. Cortical cataract
 - c. Zonular cataract
 - d. Punctate cataract

Answer Key

- 1. B
- 2. B
- 3. A
- 4. A
- 5. C
- 6. A
- 7. A
- 8. A
- 9. A

PICTURE BASED QUESTIONS:

 <p>Anatomy of the Eye</p> <p>Anterior chamber (region between the cornea and iris) Iris Cornea Lens Pupil Posterior chamber (region behind the iris) Ciliary body and ciliary muscle Conjunctiva Retina Optic Nerve Macula Retinal blood vessels Vitreous body</p> <p>© MedicineNet, Inc.</p>	 <p>DJO</p> <p>Cystoid Macular Oedema</p>
 <p>trochlea superior oblique superior rectus annulus of Zinn lateral rectus medial rectus inferior oblique inferior rectus</p>	 <p>IOL</p>
<p><u>Insertion of recti</u></p>	



Schiötz Indentation

Tonometer

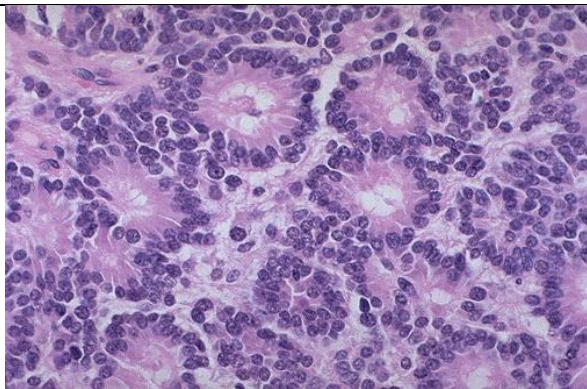
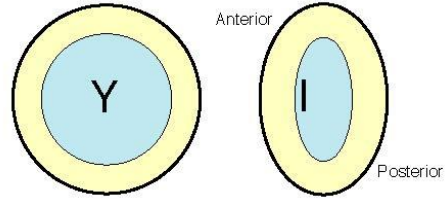


CONGENITAL GLAUCOMA

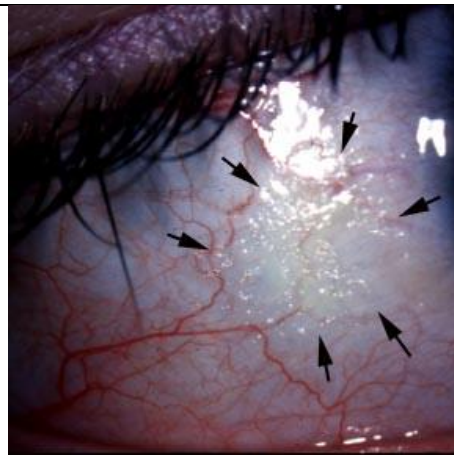


Subconjunctival hemorrhage

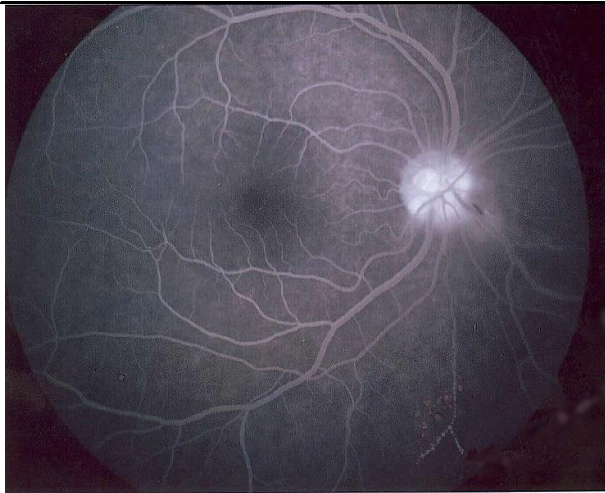
SUTURAL congenital cataract



Patient with leukokoria, with following histology of specimen after enucleation is suggestive of Retinoblastoma



Bitot's spots



Fluorescein angiography

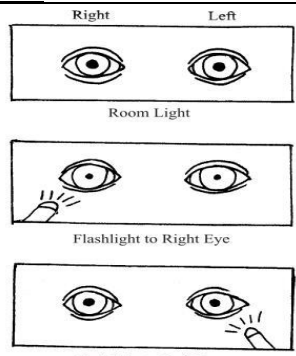
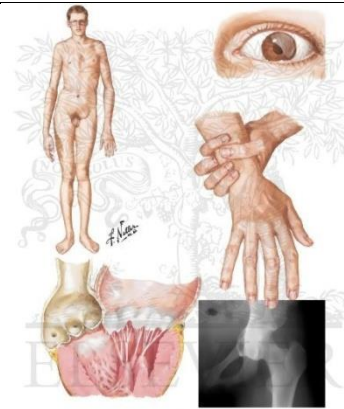


Figure 3: Swinging flashlight test.

. What is seen here :RAPD



Thyroid ophthalmopathy



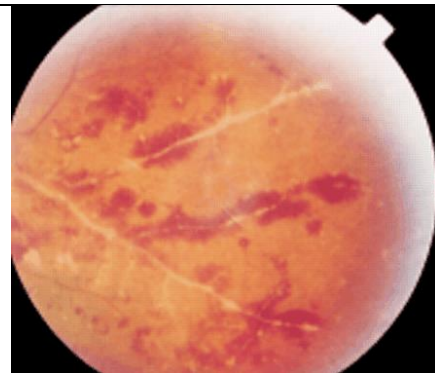
a. syndrome

Marfan's

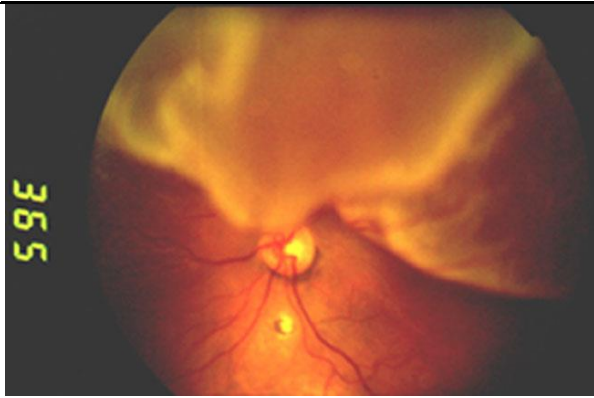


shaped hemorrhage

flame



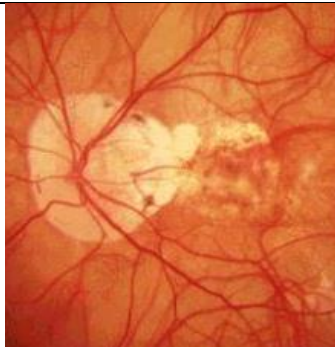
A young man with painless blurring of vision with fundus showing vasculitis and hmges no systemic illness cause-eale's



myope with painless sudden loss of vision
a.rhegmatogenous RD



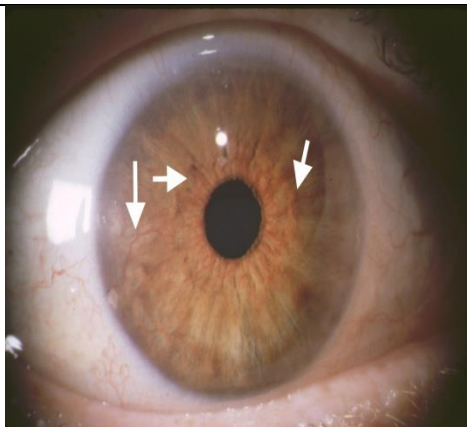
SHIRMER'S TEST



Young MYOPIC man
WITH FOLLOWING LESION AT MACULA AND LOSS
OF VISION is FOSTER FUCH'S SPOT

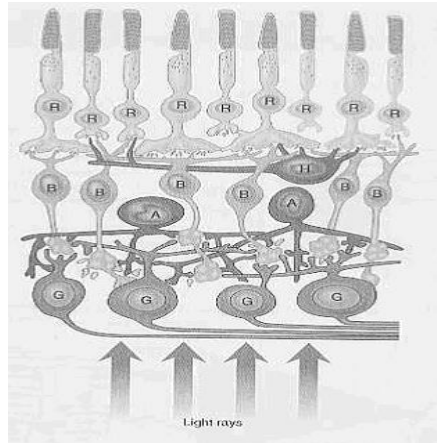


hypopyon



Rubeosis
iris

What is G



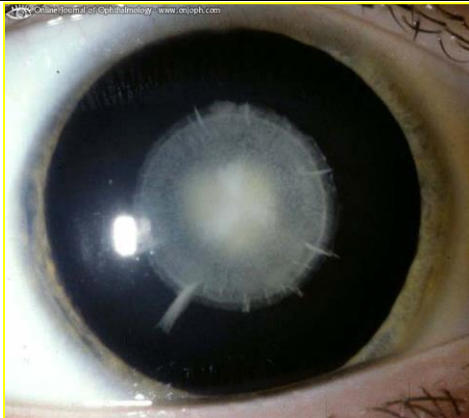
GANGLION CELLS



Pachymetry

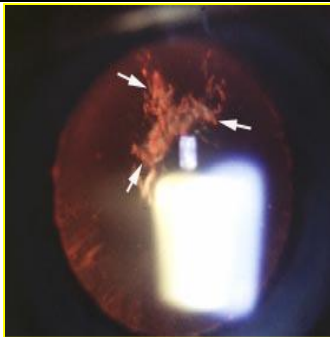
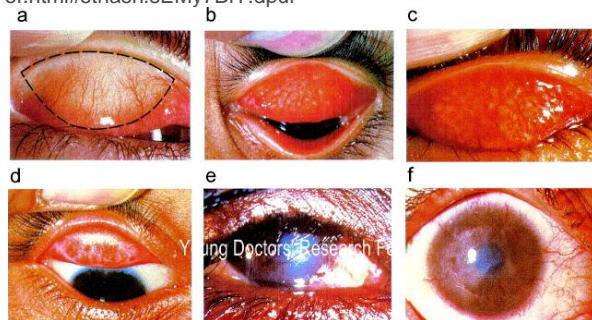


Angular conjunctivitis



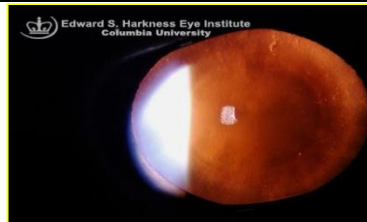
Congenital Cataract
M/C type:
Zonular/Lamellar/Rider's Cataract

(a) Normal conjunctiva, showing area to be examined. (b) Follicular trachomatous inflammation (TF). (c) Intense trachomatous inflammation (TI) (and follicular trachomatous inflammation). (d) Conjunctival scarring (TS). (e) Trichiasis (TT). (f) Corneal opacity (CO) - See more at: <http://medilinks.blogspot.in/2012/01/images-for-trachoma-who-grading-of.html#sthash.sEMy7BiY.dpuf>



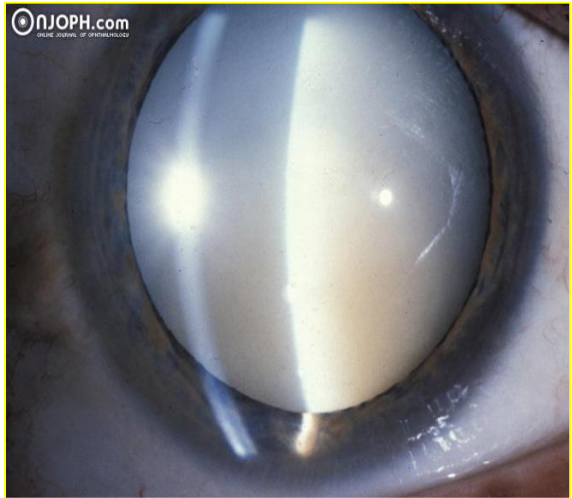
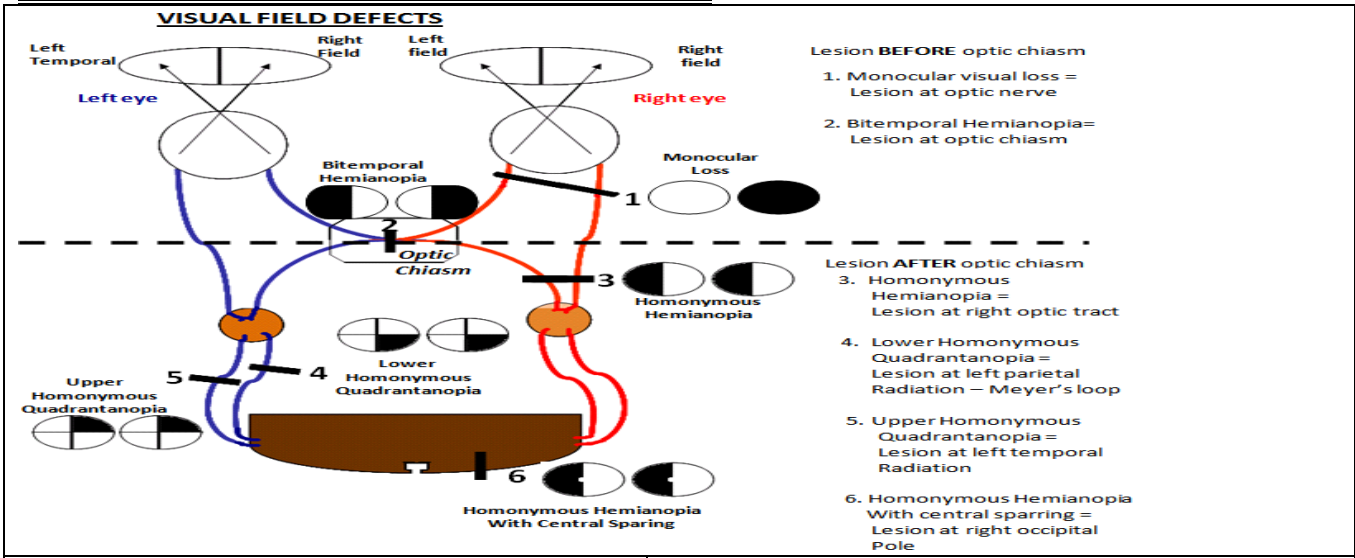
Christmas tree

Cataract

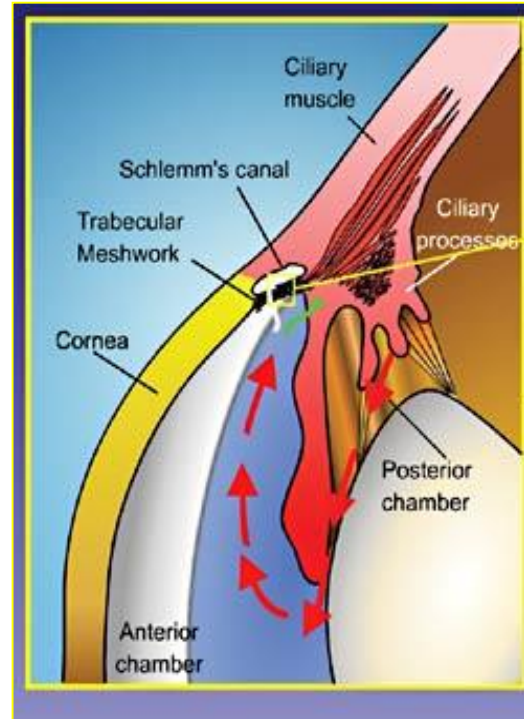


Oil droplet Cataract

(Galactosemia)



senile cataract mature

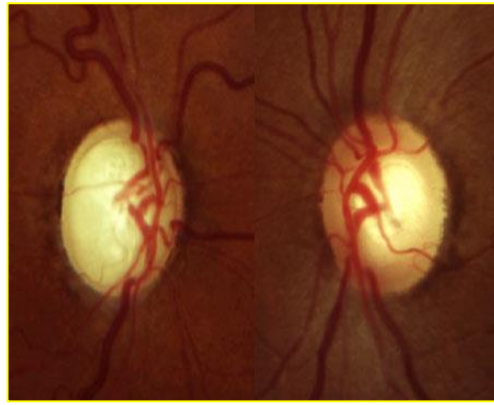


HUMOUR FLOW

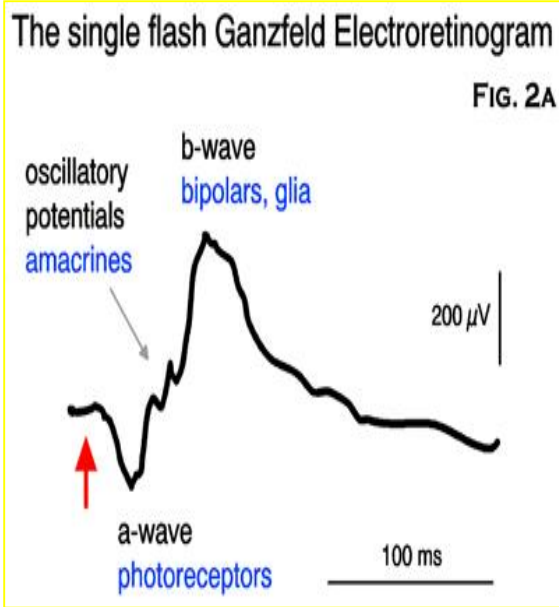
AQUOUS



Humphrey's Perimeter



• Disc Pallor.GLAUCOMA



ERG



RETIINOBLASTOMA