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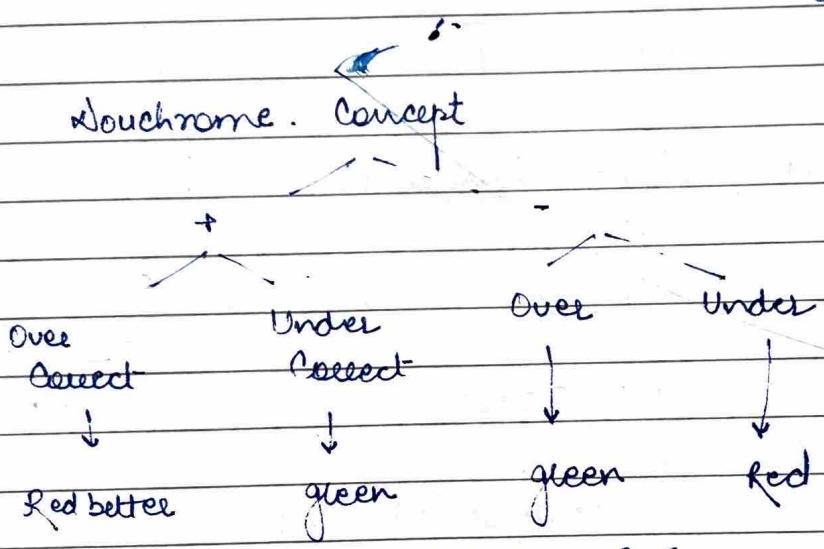
- Addition for Near Vision

35 - 40yrs	+ 0.75 to +1
40 - 45yrs	1 - 1.50
46 - 50yr	1.5 - 1.75
50 - 55yrs	1.75 - 2.25
>55	2.5 - 3.50

- Diff

Near	Addition
+ or -	+
	done in DS
	× DC

- Duochrome Concept



Ideal = R=G
else R>G

- Pinhole

Chromatic Abberation = 0
1/60 — 6/9
Central Opacities worsen over pupil

Royal Air Force Rule

DATE
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- Amplitude of Accomodation — Letters
  Convergence
- NPC

Dioptres → Acc
Cm → Convergence
Age ∝ Dioptes

Mild → Moderate → Severe

Retinoscopy

× 1D but at Working Distance

Sphere - Sphere

+2.50
-0.50
+2.50/-3.00×90°

- Hurtle's Exophthalmoscope — Measure Prophai's

Retinoscopy remember :-

Arms length
Neutralize / × Accomodation
Deduct 2D for Working distance
Deduct for dilation.

FFA

DATE
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Diff b/t ICG . FFA Autoflourescence

OD	ICG	FFA	Autoflourescence
Vessels	Black	White	Black
	White >> Protein bound	White	Black

Leak - BV

? See

Hyper

Pseudo filters are defective

Hypo

Window defect

NB

→ RPE defect/Atrophy
→ Macular Hole

due to Choroidal Vasculature

Pooling Below.

→ PED
→ SRF

well defined margins

Leaking Above

↑ Size
↑ Intensity
Well defined

Staining below.

Can be commented only in late phase when dye not in vessel but in tissue

Normal vessels — Abnormal vessels

Collaterals
× Leak / IRMA

NVE
Leak.

disc scar
Bare sclera
fibrous tissue

Hypo

Block
Anatomically visible

Vascular filling defect
can see in according phases — A
Capillary

ICG

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To study choroidal vasculature
↑ ʌ 805 – 835μ
Ba.
FFA blocked by RPE.

Seen by enhancing tech. 1/25 flourescence.

ICG – 98% protein bound ∴ × leak
by

Other uses – Capsular staining] costly & toxic.
ILM staining

CNVM – PPV
Pachychoroid pattern – IPCV – Large Serous PEDs
Chr. CSCR
Choroiditis

Hot spot – Hyperf leaking area <1DD
Plaque – >1DD area of hyperf ↓ evident leakage

↓ harm than FFA.
ICG – 10-15g powder

Early	1 min - 3 min	Choroidal
Mid	3-15 min	" + Retina
Late	15-45 min	Disc black (as × leak)

Early
Rapid – Choroid A, V, CC.
Early fil RA stenes
× RV visible
Gradual fading of Choroidal outline filling & H2O shed zone get filled

Mid
Fading of C. Vasc
Dyn ↓.
RV ✓

Late
Hypo of C. Vasculature against hyperf of extra choroidal tissue
– RV × visible

Tuberous Sclerosis

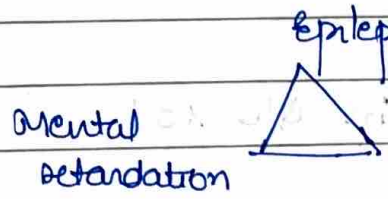
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Bourneville Disease

Autosomal dominant phacomatosis

↓

development of hamartomas in multiple organ systems from all primary germ layers



Vogt's Triad.

↓

Sporadic case 60%

AD. cases 40%

Signs

Cutaneous

- Adenoma Sebaceum
- Ash leaf spots
- Shagreen patch
- Subungual haemartoma
- Cafe-au-lait spots
- Skin tags

Neurological

- Intracranial paraventricular subependymal astrocytic nodules
- Learning difficulty
- Seizures

Visceral

- Renal angiolipoma
- Cardiac rhabdomyomas
- Pulmonary lymphangiomatosis

Ocular features

- Patchy iris hypopigmentation
- Atypical iris coloboma
- Retinal Astrocytomas — size of disc around retina mainly near Optic nerve head.
- Retinal hamartomas
- Angiofibroma of lids
- Poliosis

ONTT Trials

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Profound Visual Loss

↓

No H/O Optic Neuritis ⟶ ON +nt
Multiple Sclerosis ⟶ MS +nt
] observation is rule

↓

MRI – 1 area of demyelination

↓

Rx with Methylprednisolone
250mg over 30-60min QID x3d

↓

Oral Prednisolone 1mg/kg/day x11d

↓

tapered over next 3 days

Normal
↓ → Severe
↓ → Bilateral
Pulse i.v steroid

Optic Atrophy

Primary
- Chalky white
- Sharp Margins.
- Normal vessels & arteries.

Compressive
- Tumour.
- Aneurysm.
- Bony lesion.
- Post traumatic

Secondary
- Gray pallor.
- Ill defined margins
- Sheathing & narrow.

Papilloedema
- with water marks

Inflammation
- O. Neuritis
- Perineuritis
- Multiple Sclerosis

Consecutive
- Waxy pallor.
- Marked attenuation.
- Secondary to retinal disease & destruction of ganglion cells.
  - PRP
  - Chorioretinitis
  - Path. Myopia
  - Advanced Retinitis Pigmentosa
  - CRAO.

Glaucomatous.
Segmental
Hereditary

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Diabetic Retinopathy classification

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ETDRS or Modified Airlie House classification

- NPDR
- PDR

NPDR

No. → 1yr.

Very Mild	Mild	Moderate	Severe (4+2+1)	Very Severe
Microaneurysm	• μAn.		1 or >	2 or >
↓ 1yr.	• Retinal haemorrhage	✓ 20 Mod-large In 1-3 Quad	4 → In all 4 Quad.	
	• Exudates.			
	• Cotton Wool Spot.	✓		
	• X IRMA.		1/> IRMA.	
	• X Sig. Venous beading	✓ 1 Quad	2/> Quadrant.	
1yr.	6-12mth	6mth.	4mth	2-3mth.
PDR.	26%	26%	50%.	–
High risk PDR.	1yr. 8%	8%	15%	45%.

PDR

- Mild - Moderate.
- High risk.
- Advanced ∆ Eye ~~disease~~ disease.

Mild - Moderate	High risk	Advanced ∆ Eye ~~disease~~ disease
NVD	NVD 1/3 DA	TRD
NVE	NVD + VH	NVI
	NVE + 1/2 DA of VH	Mixed: Pre-retinal, Retrohyaloid, Integ.

Lacrimal gland — Palpebral lobe of L.g

Sarcoidosis

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Conjunctiva → Nodular, translucent, Orange coloured nodules in folds of Lower fornix.

Cornea — Calcification, Keratoconjunctivitis Sicca.

Iridocyclitis — Acute — + Hilar LN pathy + Erythema Nodosum
Chronic — granulomata in Iris.

Uveitis — Posterior — granulomata in Retina
- Retinopathy with Candle wax like deposits of Exudates along the vessels
ON - Edema — Atrophy
Chorioretinitis
Periphlebitis

Uveoparotid fever or Heerfordt's disease — Bil Uveal tract + Parotid gland + CN (diplopia)

Dx — Pulmonary changes — Non Caseating granuloma
Bone lesions in bones
Spleen.
Skin
Parotid gld.

Ix — Chest X ray → LN pathy + P. fibrosis
Gallium scan of Head/Neck/Mediastinum
ACE level
Serum electrophoresis for ↑γ glb
Biopsy of any Nodules
Kveim test
↑ ESR
↓ WBC.
A:G ratio disturbed
↑ Ca.

~~Thesis~~

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grading of Vitreous Haze

Haze Severity	grading
good view of NFL	0
Hazy	1+
	2+
	3+
	4+

clear disc & vessels
hazy
Only ✓ ✗
✗ ✗

SUN (Standardization of Uveitis Nomenclature) working group.

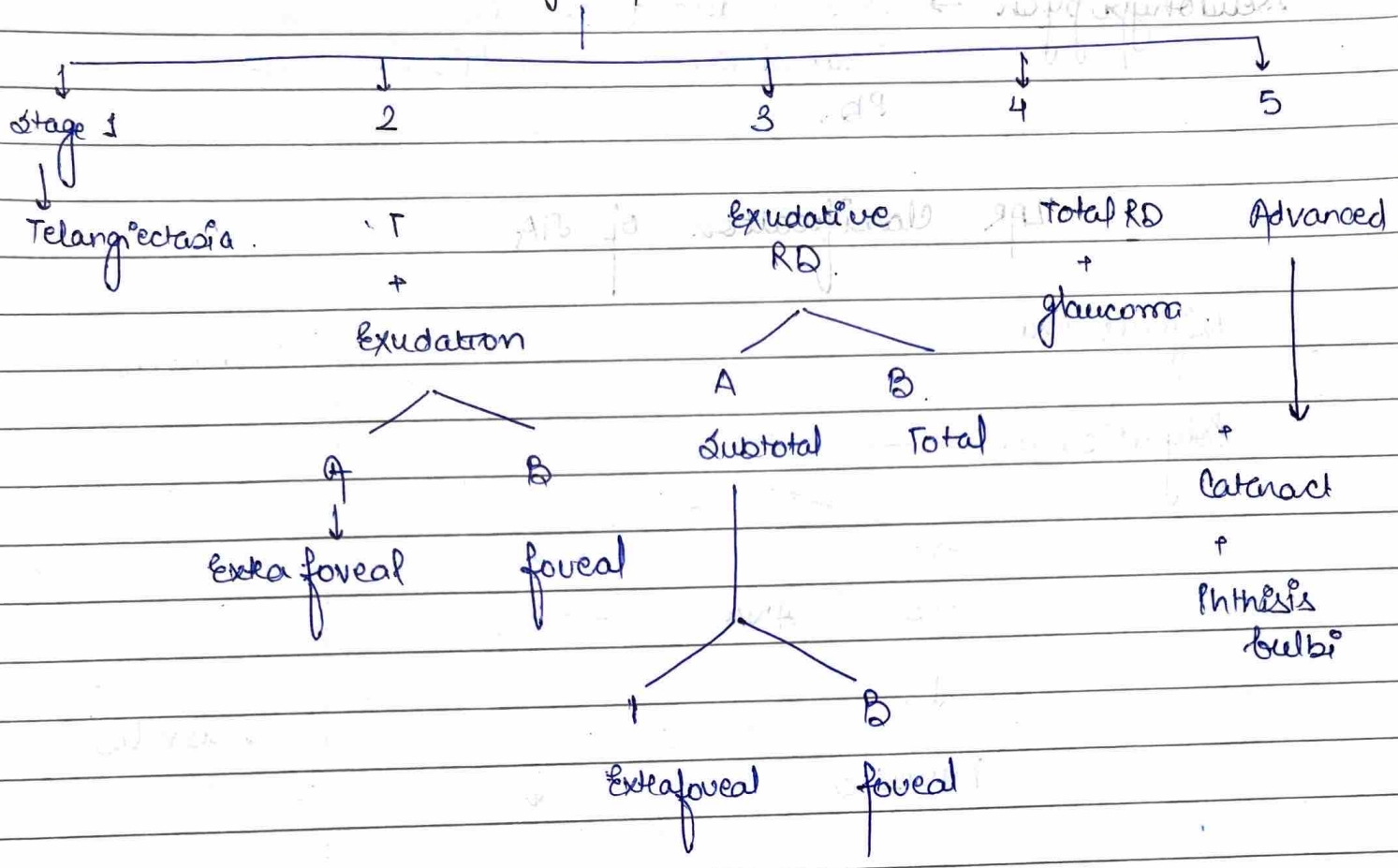
AC cells 1mm × 1mm slit beam

grade	Cells in field.
0	<1
0.5+	1-5
1+	6-15
2+	16-25
3+	26-50
4+	>50

flare

0 — None
1+ — faint
2+ — moderate & iris/lens details clear
3+ —
4+ — dense plastic aqueous

Stages of coat's disease



grading of Vitreous Haze

good view of NFL	0
Clear disc & vessels but hazy NFL	1+
Disc & Vessels hazy	2+
Only disc visible	3+
disc not visible.	4+

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Pseudohypopyon → Less Induced uveitis
Triamcinolone Injection
Rb.

ILAR Classification of JIA

Oligoarticular
Polyarticular — RF

-ve
+ve ANA
↑ uveitis

+ve
-ve.
↓ uveitis

Systemic Still disease.
Enthesitis related.
Psoriatic
Undifferentiated

AAU

Non granulomatous
Fuch's
JIA
Behcet's

Granulomatous
MS
Sarcoidosis
TB.
VKH
SO
Less Induced uveitis

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DD of Congenital Esotropia

- Pseudoesotropia
- Duane's syndrome
- DRS
- Nystagmus Blockage Syndrome
- Congenital VI N Palsy
- Early onset accomodative Esotropia
- Sensory Esotropia
- Esotropia in neurologically impaired

Differentiate b/t Congenital Esotropia & 6th N palsy

- Patch test
- Doll's Head Manouvre

	6th N palsy
Abd ✓ in (a)	

DVD

Dissociative Vertical Deviation

Elevation ✓	Abd	x.
	Add.	✓
	1° gaze	x
Comitant		Incomitatant. >> 10 deg field.
✓	Variability of Hyperdeviat°	x
x	Pattern:	V pattern.
= .	Hyperdeviation.	> hypertropia in Upgaze
✓	ass Torsional move°.	x
x	Hypotropia in Opp Eye.	✓

IOOA

Inferior Oblique Over-action.

Harvey Lincoff

Lincoff's Rule

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Superior RD

12 Oclock

Inf RD

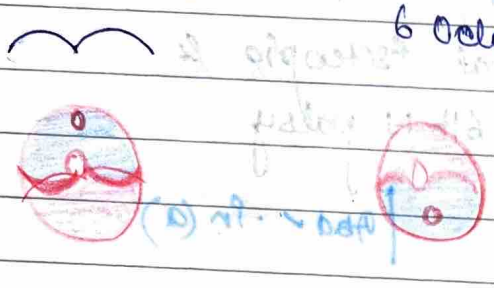
a clock RE of 6 Oclock

Edge » Extensive has break

Bullous

↓

Superior breaks



Subtotal

Keratoconus H/O

DATE
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- ADV
- Uni — Bil
  - Trauma
  - VKC
  - Down's

Repeated rubbing of eyes

Systemic — Down's, Marfan., OI, VKC, Blue sclera, Aniridia
Leber Congenital Amaurosis, RP.
Atopy, floppy eyelids, CTD — MVP.

Monocular diplopia.
Haloes
Ghost ~~vessels~~ images
Myopic Astigmatism — Not correctable with glasses.

H/O Hydrops. — Pain, photophobia, ↓ vision. — improve / deteriorate.

- Scissoring reflex — Retinoscopy
- Vogt's striae
- Fleischer ring.
- Oil droplet sign
- Munson sign.
- Hydrops
- Floppy Eye Syndrome
- Obesity
- PMMA use.

CSCR H/O

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Symptoms

Blurred vision
Rel Central Scotoma
Metamorphopsia
Dyschromatopsia
Hyperopic shift.
Micropsia
↓ Contrast Sensitivity
Sup field defect
Prolonged after image

Signs

NSD → CSCR, Optic Pit (OD)
PED — CSCR, Occult CNV, PCV
Loss of foveal reflex
Yellow discoloration of retina
" dots
Subretinal fluid.
Inf Bullous Exudative RD.

Amsler grid
CS.

Risk factor

Age
Sex
Race
Steroid administration
Cushing / Endog Cortisol
H. pylori, GERD
Preg
Psycho stress, depression
Medication - Antipsychotic
Sleep Apnea Synd.
Type A personality
Abn in Coagulation
Drug — MBK Inh.
PDE-5 Inh

HTN
Post transplant.

Uveo Meningitic Syndrome

Vogt Koyanagi Harada (VKH)

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Skin Changes
Ant Uveitis
Neurological changes
Exudative RD.

Prodromal phase — N: meningitis, CN paresis, Meningismus *
Auditory — Tinnitus, Vertigo deafness

Acute Uveitis — Bil Ant granulomatous Uveitis
Multifocal post Uveitis
Diffuse choroidal Infiltration.
Dalen Fuch's Nodules
Vitritis
Papillitis
Exudative RD
Ciliary effusion & Iris lens diaph rotation

Convalescent stage — Alopecia
Poliosis
Vitiligo
Sunset glow fundus (depigmented fundus)
Sugiura sign (depigmented limbal lesion)

Chronic Rec phase — Smouldering Ant Uveitis
Complications — &.

· Diag Criteria

1. Absence of H/O of penetrating Ocular trauma
2. " " other ocular disease entity
3. Bilateral Uveitis →#
4. Neurological & auditory manifestations
5. Integumentary finding

- Complete — 5
- Incomplete 1-3 *4/5
- Probable 1-3

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Ix Lumbar px — Transient lymphocytic pleocytosis + Melanin containing macrophages

FAF — Serous detatchments
OCT — SRF
USG — diffuse Choroidal thickening
UBM — Ciliary effusions
FFA — Multifocal hyperfl dot at level of RPE
↓
Subretinal Pooling
Chronic phase — RPE window defect
ICGA — hypofl spot late phase

* Meningismus — Headache, malaise, fever, nausea, abd pain, stiffness of neck & back

#

Early Manifestation
diffuse chorioditis ← Ant Uveitis
≤ or ≤ out → Vit Inflam Rxn
OD hyperaemia
manifest as — SRF, Bullous Exu RD

Late
← (a)
(b) Ocular depig ; Sunset glow Sign
(c) Nummular CR depig scar
· RPE clumping
Rec/c the Ant Uveitis

$ — Complication — Cataract, 2° glaucoma, Subretinal NVMembr, Subretinal fibrosis, OA, Chronic pigmentary changes

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DD in CSCR of findings

- SRF
  - CSCR
  - Malig HTN
  - Toxemia of Preg
  - Harada variant of VKH
  - Post scleritis
  - CNVM
- PED
  - Occult CNVM
  - PCV
- NSD
  - Optic Nerve Head Pit.

DD of CSCR

- Pachychoroid condition
  - ~~Harada~~
  - Occult CNVM
    - PCV
    - ~~Harada~~.
  - → Ocular toxoplasmosis
    - Path myopia.
    - Choroidal rupture
    - AMD.
    - Angioid streaks
    - Post Inflammatory
    - Ch. Osteoma.
- Anatomical
  - Exudative RD
  - ONH pit
- Vasc disorder
  - Malignant HTN
- Post Scler
  - Harada variant of VKH

Myasthenia gravis

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Mal involvement — LPs → EOM → Orbicularis oculi → Proximal limb mal (Triceps, deltoids, iliopsoas) → mal of facial expression → mastication → speech → neck extensors

Symptoms — Diplopia → Repeated closure of lid
Ptosis → Prolonged Upward gaze
Slurred speech / facial mal
Impaired swallowing / Nasal regurgitation of liq.
Neck pain / Hypercapnia
Weakness — diurnal variation.
Breathing difficulty
Weakness of grip / proximal leg mal.

Signs

Eyelid → Ptosis / diplopia — Induced by repeated closure of lid
prolonged upward gaze

- Until Ptosis — On attempt to elevate ptotic lid there is contralateral lid retraction.
- Cogan twitch
- On looking up / stare — Transient eyelid retraction (Post tetanic)
- If MG + but no Ptosis ✓ retraction ⇒ MG + Thyroid.

EOM — Hypermetric saccade
hypometric.
Small, jerky (Quiver)
Gaze evoked Nystagmus

Orbicularis Oculi — 1) Ptosis + Weakness of OO + Ophthalmoplegia (Open ≤ Rband)
2) Orbicularis Oculi peek phenomenon
3) Ectropion of LL as day progresses

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Pupillary fxn → Oculomotor disturbance + dilated, poorly reactive pupil] × Myasthenia

Accomodation → Acc fatigue with blurring of near vision

Blepharoptosis + facial weakness
- Myasthenia
- Myotonic dysteophy
- Oculopharyngeal dysteophy
- Mitochondrial myopathy

Clinical tests → Sleep test — 30-45min Prosogone 2-5mm
Ice Test — 2min — diff > 2mm.

Cataract H/o

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Age
Race.
Smoking
UVB radiation.
Diabetes

Age.
Race.
Trauma.

Personal H/o — Smoking, fat consumption., Wt status.
Nutrition & supplement usage

Past H/o — Diabetes, Haematological condition.
Myopia. Osseous Condition.

Occupational — Radiation Exposure.

Drug H/o — Corticosteroids, Miotics, Toxins. ∠ Cu. iron.
Exogenous estrogens

O/E

Wt ↓

Syndromes — Dystrophica Myotonica
Down's Syndrome.
Lowe's
Treacher Collins Syndrome.

Presenile Cataract <.50yrs — Hereditary
Dm.
Myotonic dystrophy
Atopic dermatitis

Congenital Cataract

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Syndromes
- trisomies
- Skeletal disorders
  - Stickler.
- CNS
  - Norrie's Syndrome.
- Renal
  - Lowe
- Dermat
  - Cong Ichthyosis
  - 9. pigmenti.
  - Schafer.
  - Siemen's
- Musl
  - LA
  - Myotonic dyste
  - Cardiomyo
- Digital
  - Rubenstein Taybi
  - Ellis Van Creveld Syndrome.

Maternal — Malnutrition — Non familial zonular Cataract.
Infection — Rubella., Toxo, CMV.
Drug — Thalidomide, CS.
Radiation

Fetal — Anoxia. — Placental Hmeg
Birth Trauma
Metabolic disorders — galactosemia.
galactokinase def.
Neonatal Hypoglycaemia
Congenital anomalies — As abv.
Ocular dis — PHPV, Aniridia, AC cleavage syndrome
RDP, Lenticonus post, Micro-ophth. Cong glaucoma
Malnutrition.

H/O. on basis of Morphology.

- Anterior Polar Cataract — Ophthalmia Neonatorum → Corneal Perforation
- Lamellar — Vit A def
  Hypo Ca^{2+}
  Maternal Rubella.

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DDx of Leucocoria.

Retinoblastoma
Cong Cataract
ROP
PHPV & PFVs
Coloboma of choroid
Toxo cara Endophthalmitis
Coat's disease.
Inflammatory deposits in vitreous following plastic cyclitis & choroiditis.

Exam

Density & morphology of Cataract — by DDO.
Visual fxn.
Associated Ocular defects. —— Nuceo-Opthalmos
Glaucoma
PHPV
ON hypoplasia
Rubella retinopathy

△

- Density of Cataract.
- Unilateral / Bilateral → Prognosis
- Time of presentation — Cong / devel.
- Associated Ocular defects → C/I. for Sx.
- Associated systemic defects

Investigation — TORCH test.
Urine for reducing sustances — galactosemia
RBC transferase / galactokinase levels
Lowe's syndrome — Urine chromatography for a.a
Hyperglycaemia — Bld Sugar level
Hypocalcaemia — Serum Ca^{2+} K^+, Xray skull.

Cataract

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Clinical features

glare.
Uni-ocular diplopia / Polyopia.
Coloured halos.
Black spot in front of eyes.
Image / blur, distortion of images & misty vision
Loss of vision
- Painless progressive
- day blindness. — ISC, ~~ANB~~ Cupuliform.
- Night problem — cuneiform.
- Progressive Index Myopia

2nd sight / read without presbyopic glasses

Signs

VA.
Contrast sensitivity.
Iris shadow.
Slit lamp examination. — grade.
Specific shape.
DSO.

Origin of EOM

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Recti

Origin

Annulus of Zinn.

MR — LR

MR — 6mm straight

LR — anterolat 40-45° ≤ sagittal plane

Insertion

Equator at Spiral of Tillaux.

SR 7.9

LR 6.9 — MR 5.5

IR 6.8

Vertical

23° ≤ sagittal plane

Obliques

Origin

Anteroinf ∠ of Bony orbit in orbital plate of Maxilla.

↓

51° postlat.

↓

Below IR

Longest

60mm

SO.

Superomedial part of optic foramen.

↓

// upto trochlea

↓

Posterolat 54° ≤ sagittal plane

↓

Trochlea is fm. origin.

10mm Postrochl. — 4mm Trochlear — Post troch.

40mm. — 20mm

Longest.

Shortest

37mm

IO

x Tendon.

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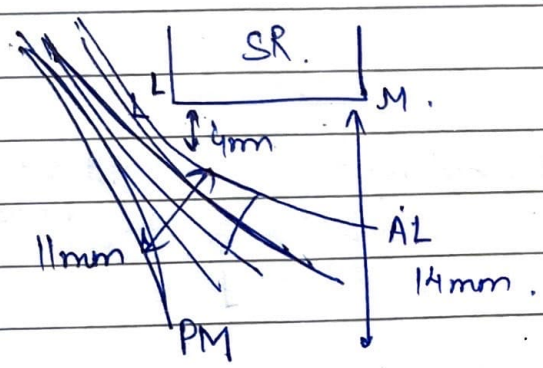
Insertion

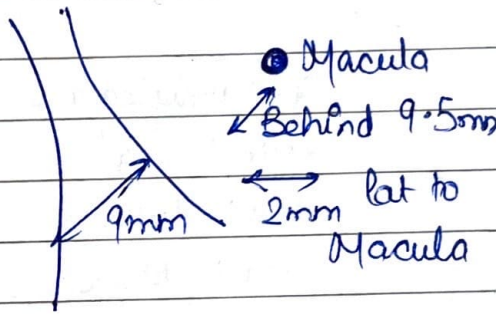
fan shaped
passes beneath SR
att posterior to Equator

SR

Lat end → 4mm post & Ant to Lat end of SO.

Medial end → 14mm → Post & Medial





Post fibres – depression
Ant – Intortion

Elevation
Extortion.

Retinitis Pigmentosa

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Night Blindness
Deafness
Late onset of Walking / Ataxia] Usher's

Polydactyl.
MR.
Truncal obesity.
Hypogonadism.] Bardet Biedl.

Neurological — Lawsen Moon.
Inverse RP — Retinal deg
Renal — BP check, urine. RE/ME.

Ophthalmoplegia
Retinal deg
Resp distress
Heart block] Kearns Sayre Syndrome] Ragged red fibres

- Congenital Amaurosis of Leber — RPE 65.
- RP Albescens
- Progressive rod Cone deg
- Juvenile Macular deg (Stargardt disease)] ABCA4
- Pericentral — 5-30° else RP — 20-40°
- Paravenous
- Unilateral

Atypical RP

Clumped pigmentary deg → ↑ Blue Cone fxn → Enhanced S cone syndrome

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Congenital stationery Blindness — Oguchi disease
fundus albipunctatus
Congenital Nyctalopia ≤ Myopia
(Schubert - Bornschein type)

RP.		CSNB.
✓	Intraretinal pigment migration	× if Early
✓	Attenuation of vessel	
	Long term prognosis	good

XR
♀ tested
Aton. ERG & fundus finding
30-45yrs
Blind.

AR.
Normal
60yrs

Vit A — 15,000 IU/day — 25,000 IU/day bt Lung Cancer
Vit E > 400 IU/day
DHA → 600mg BD x2yrs
fish.

Vit A → ↓ 20%.
Vit A + DHA → 40-50%.

Sporadic — favourable

Inherited
AD. — Best prognosis
XLR — Least Common
Worst prognosis

→ Sudden >50yrs — PNS, CAR.

Night Blindness — Uncorrected myopia
Visual field Loss
Loss of VA.
Difficulty in reading
Current Medication / Chronic Medication — HCQ, Phenothiazine
Nutritional supplements
Intestinal Sx
Liver disease

Hearing Loss → high tone
→ Congenital profound

Polydactyly
MR.
Renal disease

Family H/O — Consanguinity

O/E

Refraction — Uncorrected Myopia.
Near vision.
HVF 30-2, 60-2.
Colour vision.
AP → of ↑ pressure ⇒ ↓ ERG amplitudes
PSC → HA 2% duck ↓ Sx

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Serum phytanic Acid — Refsum
Serum lipoprotein electrophoresis
Fasting Serum Vit A level
Serological testing of Syphillis.
Fasting Serum Vit E levels — Ataxia.

℞

Cataract
× Smoking
Low UV Lon Aids
Nanometer Controlled Sunglasses — upto 550 nm.
& side shielding
Indoor Amber spectacle block 511-527 nm.

CMO — Tab Diamox, E/D Dorzox.
Vit A supplement
Lutein & Zeaxanthin] ✓ RHO, mutation
(X) ABCA4 mutation (Stagardt's)

CCB.
× Retinotoxic drug — Phenothiazines
HCQ
Tamoxifen.
Vigabatrin.

Squint

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Superior — Intorters
Oblique — Abductor
Recti — Adductor.

If you take a muscle to same direction of action along horizontal axis — it intorts or extorts (Torsion)

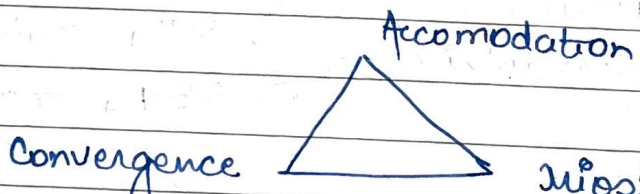
⊥ axis

Recti	67°	(23°)
Oblique	39°	(51°)

Duction — Monocular
Vergences — BSV
Versions — BSV

Binocular, Simultaneous, Conjugate
Disconjugate.

Near Triad



Type of Convergence → Tonic
Proximal
fusional
Accomodative.

Cardinal gaze - position of gazes are identified in which one muscle in each is principally responsible for moving the eye into position as follows

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Diagnostic — Nine — 6 Cardinal + 1° + Elevator & depr
(2 Mus of 1 eye)

Normal Value are —

	Δ	N
Convergence	15-20 Δ	25 Δ
Divergence	6-10 Δ	12-14 Δ
Vertical	2-3 Δ	
Cyclovergence	— 8°.	

Sensory perceptions/ Anomalous states — Confusion, Pathological diplopia

Confusion - Simultaneous appreciation of two superimposed but dissimilar images caused by stimulation of non-corresponding retinal points by images of different object.

Pathological diplopia
Simultaneous appreciation of two images of same object falling on non corresponding retinal points

Adaptation
Sensory — Motor

Suppression — -ve.
Central — Peripheral
× Confusion — × Diplopia
Monocular — Alternating
Facultative — Obligatory
↓
Intermittent Exo.
Duane Syndrome.

Motor: Recti
Face turn. — where eyes cannot
Torsion → Head tilt
righting reflex. — Chin lift.
AV pattern

- Fusion
- Blind Spot Mech.

Surgery

Weakening

- Recession — x ⊘O
- Disinsertion — x suture
- Post fixation suture

MR → Conv Excess ESO.

SR → AVD + recession

Strengthening

- Resection — rectus only → ⊘O
- Tucking
- Advancement

Botulinum

- Chemodenervation.
  - To determine risk of post op diplopia.
  - To assess potential for BSV
  - In LR palsy
  - Patient c/ cosmetically poor deviation — c/ Multiple squint ⊘x.
- Essential Blepharospasm.

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Types of Vitreous

1° — Hyaloid Vasculature

2° — In vitreous Cavity

3° — Zonules & Suspensory ligaments

Chances of early Liquefaction of vitreous

Age
> Myopes
Intraocular Inflammation.
Surgical Aphakia
Trauma.
Wagner & Stickler hereditary Syndromes.

Abnormal firmer attatchments of vitreous & retina.

Lattice degeneration.
Enclosed Oral Bays
Retinal tufts.
Posteriorly advancing vitreous Base.

Complications of PVD →

Tractional detachment.
VH.
Retinal Break.
VMS. —— CME
Foveal cavitation
Macular Hole formation
ERM formation
Macular Cyst formation

Eye & Amyloidosis

Dry Eyes — A. in lacrimal gland.
Perilimbal microaneurysm in Conjunctiva.
Reduction of Corneal sensitivity
Pupillary change — Scalooped configuration. Unequal size & Non reactive to light & near reflex
Pseudopodio-lentis
↑ IOP & GON
diffuse fibrillar opacities throughout vitreous — Cobweb, glasswool or Cotton Wool appearance
Retina — Perivascular Infiltrates & sheathing

↳ FAP Type I & II ↳ TTR. gene
Ass. Cardiomyopathy
Neuropathies.

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Seven Lings of Trauma

1. Sphincter Tear
2. Iridodialysis
3. Angle recession
4. Separation of CB att to SS — Cyclodialysis.
5. TM tear.
6. Zonular dialysis
7. Retinal dialysis.

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ERG

Waves

a wave → neg — Photoreceptors

b → +ve. — Mullers, bipolar cells
- b_1 → rod + cones
- c_1 → cones

c — neg — RPE & photoreceptors

Latency — Stimulus to start of a wave.

Implicit time → " to b wave peak.

Types

→ Full field ERG
generalized retinal disorder
- Scotopic → b wave
- Photopic (30Hz) → a + b.

→ Multifocal ERG
↓
topographic map of retinal fxn.

→ Focal ERG — macula

→ Pattern → GC fxn.
detect subtle ONeuropathy.

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ECG

Aeden Ratio :- $\frac{\text{Light peak}}{\text{Dark trough}}$ > 1.85 185%

Colour Vision

Tritan — 414 - 424 nm.

Deutan — 522 - 539 nm.

Protan — 549 - 570 nm.

- Defacient → Anomaly
- Absent → Protanopia

- Blue - yellow defects → Acquired macular defects.
- Red green defect → Optic nerve lesion.

- Ishihara test → Red green
- Hardy Rand Rittler test → All 3.
- City University test → ∘ ∘ ∘ ∘ ∘
- Farnsworth Munsell 100 - hue test → 85 caps

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CRAO

8-9 wks (2mth) NVG

CRVO.

5mth

Types of Emboli

- Cholesterol
  - commonest
  - smaller
  - yellow / glistening (Hollenhorst plaque)
  - Atherosclerotic OA or Aortic arch
  - CRAO.
- Calcium (Calcific)
  - Cardiac valves
  - Ophthalmic Artery Obstruct^{n}
  - PL neg → choroidal vasc compromise due to OA obst or ON damage
- Fibrin.

FFA

↑ Choroidal filling
delayed filling of retinal circu

+

RAPD.

fundus

X Cherry red spot

ERG.

a & b lost

a wave +
b lost

Ciliaretinal Artery Occlusion

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Etio.

- Isolated entity
- CRVO
- AION

Visual prognosis: CRVO — good. AION — bad.

Optic Nerve

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- Intraocular portion — 1mm.
- Intraorbital — 25-30mm.
- Intracanalicular — 5-9mm.
- Intracranial — 10-16mm.

Field defects

- Central or Centrocaecal ✓
  - Unilateral
    - Sudden → Optic Neuritis
    - Gradual → Compressive lesion.
- Papillomacular bundle
  - Bilateral
    - Poor Nutrition
    - Tobacco, alcohol neuropathy
    - Toxin induced
    - Hereditary ON
    - Infiltration of ON
    - Bilateral Compressive lesion
    - Bilateral ON.
- Nerve fibre Bundle defects ✗
  - glaucoma
  - ON drusen
  - ION
  - PION
  - Chronic papilloedema.

Causes of

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Trichomegaly — Drug Induced — Topical Pg Analogues
Phenytoin
cyclosporin

Malnutrition
AIDS
Porphyria
Hypothyroidism
Familial
Congenital — Oliver Mc Farlane
Cornelia de Lange
Goldstein-Hutt

Madarosis —

- Local
  - Chronic Ant lid margin disease
  - Infiltrating lid Tx
  - Burns
  - Radio Tx / Cryo Tx } of lid Tx
- Skin disorders
  - Generalized alopecia
  - Psoriasis
- Systemic disease
  - Myxoedema
  - SLE
  - Aeq. Syphilis
  - Lepromatous leprosy
- Following removal procedures for Trichiasis

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Poliosis

Ocular
- Chronic Ant Blepharitis
- Sympathetic Ophthalmitis
- Idiopathic uveitis

Systemic
VKH
Waardenburg syndrome
Vitiligo
Marfan
Tuberous Sclerosis

Canaliculitis

Acute
↓
Herpes Simplex

Chronic
↓
Actinomyces israeli
↓
Probing punctum.

Dacryocoele vs Encephalocoele
Pulsating swelling

Chronic Canaliculitis
Dacryocystitis
Lacrimal Sac involvement +

Tech of Massage of LG ⇒ LSac → Rupturing a membranous obstruction by hydrostatic pressure

Index finger placed over Common Canaliculus to block reflux → Rolled over the sac → Massaging downwards.

Lid Retraction

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- Neurogenic
- Mech
  - Hx overcorrection of ptosis
  - Scarring of UL skin
- Congenital
  - Isolated
  - Down
  - CHS
  - Transient eye popping reflex
- Muscl
  - Prominent globe
  - Idiopathic
    - → Uraemia (Summerskill sign)

- Contralateral limb ptosis
- Unopposed levator action due to facial palsy
- 3N Misdirection
- MGJWP
- Parinaud syndrome — Collier sign
- Infantile hydrocephalus — Sun setting sign
- Parkinsonism
- Sympathomimetic drops.

Chiasma
□
sella

↘ Prefixed → Optic tract lesion

↙ Post fix → ON lst.

Buckle

Vitreous base – Lattices Max
└ Band Buckle done
+ 360° encirclage done to support other retinal lesions

- Segmental localized Buckling with sutures — Buckle without encirclage.
- Scleral Buckle.

Multifocal

Amo | Alcon.

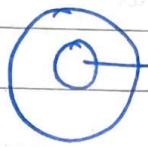
	Ant	Post
Diffractive surf		
Off of Apodisat^{n}	x	✓
		Pupil dependant lens

↳ Step Ht & gap b/t ring
At periphery power ↓.

Trifocal & Symphony

Trifocal

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Trifocal Centre 3-4 mm. मे 3 zones

Intermediate zone for Computer work.

↳ Roto symphony.

Glaucoma

Optic Nerve Head changes — ONH

Visual field defects — VFD

+

Raised Intraocular tension — IOP

ONH	+	+	-
VFD	-	+	
IOP	-	-	↑
	POAG suspect	Normal tension glaucoma.	Ocular Hypertension.

Red free light — RNFL layer - glaucoma
NVE.

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Theories regarding ↑ IOP associated with steroids :-

Lysosomal memb
← CS stabilize.
Hydrolases
× GAG (TM) → depolymerize
∴ retain water in Extra cellular space ∴ Narrowing

Endothelial cells (TM)
← CS
phagocytes of debris in AQ
∴ block.

Accumulat^n of dihydrocortisols
5 hydrocortisol (TM)
Exog. gluco-corticoid activity ↑

PG E&F
← CS
↓ IOP

Che 21 gene
↓
TIGR of Myocilin
↓
TM ↓ permeable to AQ Humour drainage
↓
JOAG

TIGR — TM Inducible glucocorticoid receptor protein

λ freq → nm

193 nm → Excimer Argon fluoride → PTK, PRK, Lasik, Laser

514 → Argon green. → Trabeculoplasty, Iridoplasty, Pupillomydriasis, Retinal Photocoagulation ⇒ Commonly used

532 → Freq. double Nd YAG.

714 → Krypton Red.

800 → Diode laser

532, 714, 800 → Retinal Photo Coag → DR, CSCR, CNVM, Angioma, R. Break, R. Tumour.

1053 → Femtolaser → DALK, SALK, FemtoSx.

1064 → ND YAG. → Post Capsulotomy, Iridotomy, Vitreolysis

Focus on Ophthal

Thermal
- PhotoCoag: Argon, Krypton, Freq. double Nd:YAG, CW; dye, diode, Long Pulse Ndyag
- Photovap.: CO_2

Photochemical.
- Photoablate.: Excimer Arf., Freq. quad Nd yag, Holmium yag, Freq. double Dye
- Photoradiat°: dye., gold vapour, diode (689)

Ionizing → Photodisruption: Q switched Nd YAG, Mode locked Nd: YLF, Er: YAG, Holmium YAG, Er: YLF.

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Papillae → Tufts of capillaries infiltrated by inflammatory cells & seperated by septa bound down by tarsus & s/o.
Inflammation of Conjunctiva

Shield Ulcer → Ass ⊆ VKC usually have lower border in upper ½ of visual axis

Cameron classification

Grading of Corneal Ulcer.

Features	Mild	Mod	Severe
Size of Ulcer (mm)	<2	2-5	>5
Depth of Ulcer (%)	<20	20-50	>50
Infiltrate			
Density	Dense	Dense	Dense
Extent	Sup	Mid stroma	deeper than mid stroma
Scleral involvement	×	×	✓

Ocular Tumours

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Benign Epibulbar Tx
- Conjunctival Naevus
- Conjunctival Papilloma
- Limbal dermoid
- Dermolipoma
- Pyogenic granuloma
- Mixed benign
  - Epibulbar telengiectasia
  - Reactive pseudoepitheliomatous hyperplasia
  - Melanocytoma.
- Benign Melanosis

Malignant & Premalignant Epibulbar Tx
- Primary Acquired Melanosis/ PAM — Histology
- Conj Melanocytic Intraepithelial Neoplasia (CMIN)
  - clinical

- Conj Melanoma
- OSSN
- Lymphoproliferative lesion.
- Kaposi Sarcoma.

Iris Tumours
- Iris Naevus — Marker of Uveal Melanoma
- Iris freckle (Ephelis)
- Brushfield spots — Down's
- Lisch Nodules — NF1
- Iris Melanoma
- Metastatic Tx
- Mixed — Juvenile Xanthogranuloma
  - Leiomyoma
  - Melanocytoma
  - Vascular Tx

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Iris Cysts

1° | | 2°

Epithelial — Stromal — Traumatic

Miotics extended use

Parasitic Cyst

Ciliary Body Tumours

Ciliary Body Melanoma

Medulloepithelioma

Choroid Tx

Choroidal Naevus

Choroidal Melanoma

Choroidal Hemangioma — Diffuse / Circumscribed.

Optic Disc Melanocytoma.

Choroidal Osteoma.

Metastatic Tumours

Neural Retinal Tumour

Retinoblastoma

Retinal Astrocytoma — Tuberous Sclerosis

Retinal Vascular Tx

- Capillary hemangioma — VHL.
- Coloboma "
- Congenital Retinal Arteriovenous Communication

→ Grp 1 – Retinal Macrovessel

Grp 2 – AV comm.

Grp 3 – Typical racemose lesion c early sclerosis

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Vasoproliferative Tumour (VPRT) → Intermediate Uveitis
Ocular Trauma
RP

Primary Intraocular lymphoma

- Hodgkin.
- Non Hodgkin.
- CNS B cell lymphoma.
- Primary vitreoretinal lymphoma (PVRL)

Primary Uveal lymphoma.

Tumours of RPE

- Congenital hypertrophy of RPE.
  - Solitary (Unifocal)
  - Grp. Multifocal
  - Atypical.
- Combined hamartoma of retina & RPE
- Congenital simple " of RPE
- Adenoma & Adenocarcinoma of RPE
- Hyperplasia & migration of RPE } Simulating Uveal Melanoma

Paraneoplastic Syndromes

Bilateral diffuse Uveal Melanocytic proliferation (BDUMP) — Small Cell Ca Before
Cancer Associated retinopathy
Melanoma Associated Retinopathy — Cutaneous Melan after

Lasers Courtt

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- Coag
  - Argon
  - Krypton
  - Dye lasers
  - ↓ Retina
  - TM
- Disruption
  - Nd YAG / Q Switched / Mode locked
  - ↓ Iris
  - Post Capsule
  - Uveacoats
- Ablation.
  - Excited dimer mid IR lasers
  - ↓ Cornea
  - Lens.

Dye

- Green
  - 488 nm
  - ↓ Photo Coag
  - x FAZ
  - Abs by Hb Melanin.
- Yellow
  - 560 m
  - ↓ 30% Energy
  - NVD.
  - ✓
- Orange
  - 630.
  - Choroidal hemangioma
  - ✓
  - x
  - ✓ RPE
- Red
  - .
  - Outer portion of FAZ to & NV.
  - x
  - ✓ »

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AMD

Outer Retinal Corrugations. ⟺ BLD Basilar Laminar Deposit

- Basal Laminar Deposit
  - ↓
  - RPE & its BM
- Basal Linear Deposit
  - deposit of membdebris RPE BM & inner collagenous layer of Bruch's Memb.
  - ⇓
  - Drusen.

PED

PEDs from inner collagenous layer of Bruch's Memb.

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BRVO

♀ = ♂ 60-70yrs

3* common

Normal disc

Isch.

AV crossing

On retina away from disc

CRVO

♀ >65yrs

NVI, NVA »

»

Behind Lamina Cribrosa

Peripheral Corresp part of disc shows disc edema

Dense segmental defect ≤ larger Hoptes

Hemi CRVO

NVE, NVD

NVG face

Isch/Non Isc

≤ in ON

Collateral OD. ≤ in ON

Ischaemic CRVO

Thrombus adj to lamina.

» Complete., Non perfused retina

80%

Venous Stasis retinopathy

Severe

<6/60

Dense Scotoma

»»

↓ b/a amplitude

Marked

Tomato Ketchup Retinopathy

>10 DA CNP.

↓

45-80%.

Intractable

» Severe

Non Ischaemic CRVO

Not in lamina nor peripapillary.

Incomplete, ½ fused

20%.

Hemorrhagic R.

Mild

>6/60

× RAPD

Mild.

Disc Edema

Perimetry — × defect

ERG — Near Normal

Venous dilatation ↓

FFA

» Collateral

5%.

NVI

CME

Complication

Prognosis Better

VA improvent »

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CRVO IRV

< 50yrs Bilateral

Homocysteine
factor V.
Leidan Mutation
Protein C & S.
Apn fibrinogen level
APLA
Lipid Anti Coagulant factor

Hyperviscosity state — Polycythemia
leukemia
SCD.
MM
Waldenstrom Macroglubinemia
Dehydration
↑ Hematocrit

Association — HTN
DM.
CAD
Hyperlipidaemia
Atherosclerosis

↑ risk — OAG

Predisposing Condition — ION.
Tilted disc
ONH Drusen.
TAO.

Other Causes → OCP
Diuretics
Hep B vaccine

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In young if » disc Edema — Papillophlebitis (Non isch CRVO)

History
Exam — VA
Pupil
IOP
NVI
Undulated gonio — NVA.
20D
90D.

Inv OCT
FFA
Visual field.
ERG.

CRVO		DR	Ocular isch syndrome
Unil		Bil	
✓	✓ Veins thrug		dilated, x tortous Mid periphery Amaurosis fugax. TIA, Ocular pain

Visual field defects

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Central scotoma.

- Demyelination
- Toxic & Nutritional
- LHON
- Compression.

Enlarged Blind spot

- Papilloedema
- Congenital Anomalies

Respecting Horizontal Meridian.

- AION
- Glaucoma.
- Disc Drusen.

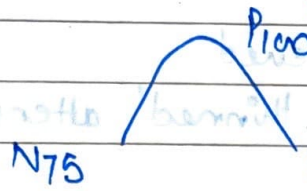
Respecting Vertical meridian.

Upper temporal defects

- Tilted disc.

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VEPs — Pattern ERG check Central & perifoveal

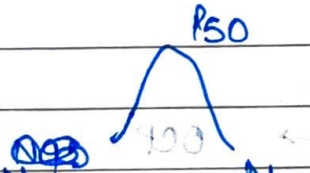


Prolonged P100 latency. —— remains
Amplitude ∝ VA ∴ not reliable — Normalizes

In **ON dysfxn** — Prolonged P100 latency >118ms
Inter Ocular diff >9ms.]*

Other Causes of ↑ P100 latency — Compression
glaucoma
Dopamine deficiency
Non Organic visual loss
defocusing of eye.

Pattern ERG — check Central Retinal ganglion cell layer



	PERG	VEP
Optic Neuropathy	Near Normal	delayed
Ant Visual pathway / Maculopathy	P50 amplitude ↓	delayed

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Pachychoroid states

>300μ → CT.

Outer — Haller Layer thickened

Inner — Sattler layer . thinned/ attenuated.

Eg

- PPE — Pachychoroid Pigment Epitheliopathy ↓↓ CSCR
- CSCR — Central Serous Chorioretinopathy
- PNV — Pachychoroid. NeoVasculopathy ↓↓ PCV.
- PCV — Polypoid. Choroidal Vasculopathy
- Perlpapillary Pachychoroid Syndrome PPS . v. Uveal effusion Syndrome
- FCE — Focal Choroidal Excavation.

Cicatrizing Conjunctivitis causes → OCP.
Linear IgA dis
SJS
Perinneal AKC
GVHD
L after BM
HSCT.

Dermolipoma of O.D → Prominent lacrimal gld lobe
Orbital fat prolapse
lymphoma.

Pigmented lesion on Conjunctiva → Conj Naevus
Benign Melanosis
Cong Ocular Melanocytosis
2° pigmentation of Addison
Ppg Sq cell Ca
PAM | CMIN.

Mitomycin → PAM 0.04% QID ×7d → 4 Cycles.

Susac Syndrome
SNHL
RAO — Encephalopathy

Types of Emboli — Hollenhorst (Cholesterol)
fibrin platelet aggregates
Non Scintillating White calcific particles

OIS + Non Ischaemic CRVO — Venous stasis retinopathy

Calibre
↓ Artery → HTN
Wide Vein → DM
↓A ↑V → CAD
↑V Tortuous → ↑ Vascular ↓ flow

Elschnig spots — focal choroidal infarcts seen as small black spots surrounded by yellow halos

Siegrist streaks — flecks arranged linearly along choroidal vessels — Ix. of fibrinoid necrosis associated ⊆ Malignant HTN.

Roth spot — Retinal hmg ⊆ white centre —— whitish element — coagulated fibrin in most cases.

DoD — SABE HTN Leukemia
DM Anaemia

Grading of NVI

Grade	
0	No Iris NV
1	<2 Quad of NV at Iris pupillary zone
2	>2
3	Grade 2 + < 3 Quad of NV at Iris ciliary zone & ectopion uvea
4	>3 Quad of NV at Iris ciliary zone & ectopion uvea.

Causes of Horner Syndrome

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1st Order (Central)

- B.S disease
- Syringomyelia.
- Wallenberg Syndrome
- Cervical SC.
- Diabetic AN.

2nd Order (Preganglionic)

- Pancoast Tx
- Carotid Aneurysm.
- Neck Surg

3rd Order (Postganglionic)

- ICA dissect^{n}
- NP Tx
- CS Mass
- Otitis Media

Cluster Headache.

Light Near Dissociation

Unilateral

- Adie Pupil
- Afferent Conduction defect
- HZO
- Aberant reg of 3rd CN

Bilateral

- Neurosyphilis
- Type 1 DM
- Myotonic dystrophy
- Parinaud Syndrome
- Familial Dysautonomia
- Encephalitis
- Chronic Alcoholism

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DDx of Bitemporal defects →

- Dermatochalasis
- Tilted disc
- ON Coloboma
- Nasal Retinoschisis
- Nasal RP
- Final Visual loss.

- Congeausity $\propto \frac{1}{\text{Location}}$

Ant → Incongeaus
Post → Congeaus

Cogan's Dictum →

Lesion in Occipital lobe.	Lesion in Parietal lobe
Infarction	Tx
✓	Smooth pursuits ✗
Symmetrical	OKN Asymmetrical

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30°

50° — Wide field

100° — Ultra field

NVI classificat^{n}

JNC HTN classificaton

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- How to tell Si Oil is in AC
  - No Conventional Cursent of AC Cell
  - Shiny reflex

- Types of PHPV — Y λ I X

IOP → 5Gμ = 3mm of Hg

10μ = 0.7mm of Hg

2mm — 1 Wall + fat decompression

Myopic — Paravascular RD

Myopic Macular Hole RD.

Upto C3 — gas = Si Oil

Macropapillae — 0.3 - 1mm

Giant papillae — 1-2mm,

Degenerative changes in Conjunctiva

- Concretions
- Pinguecula
- Pterygium

Pinguecula — Hyaline infiltration & elastotic degeneration of sub mucous tissue

Pterygium — Triangular encroachment of vascularized granulation tissue covered by conjunctiva in the interpalpebral area

Conjunctival Cysts →
- Lymphangiectasia
- Lymphangiomata
- Retention cysts of Krause
- Subconj — Cysticercus cyst
  Hydatid cyst
- Epithelial implantation cysts.

Tx. Conditions

Congenital Tx — Dermoid
Dermolipoma

Papillomata
Simple granulomata
Pyogenic granuloma.
Sq. cell Ca.

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Basal Cell Ca
Lymphoma
Kaposi Sarcoma
Pigmented Tx
- Nevi / congenital Mole
- Precancerous Melanosis
- Malignant Melanoma.

Disorders of Ocular Surface
- Xerophthalmia
- KCS (Sjogren Syndrome)
- Dry Eye
- MGD
- Symblepharon
- Conjunctivochalasis
- Atypesis

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D.D of crystalline corneal deposit

- ICK
- Schnyder's
- Cystinosis
- Hyperglob.
- Lipid keratopathy

D.D of Punctate lesion

- EKC
- Pharyngoconj fever
- Herpes
- Vaccinia
- Thygeson SPK.

Deg changes in Cornea

1° — 2° — Infiltration.

Arcus Senilis
Juvenilis
TMD
BSK.
Climatic droplet keratopathy
Salzmann Nodular degeneration

Keratoglobus	Vs	Buphthalmos
(N)	IOP	↑
clear.	Cornea	hazy
	Astigmatism / RE	
WTR.		
Normal	DC L.	deep.
x Cupping	OD.	✓

Shield Ulcer = Vernal keratopathy.

Secondary fuch's dystrophy — ABK, PBK.

Neuroparalytic — 7N

Neurotrophic — 5N

Deposition of Material in Cornea

Gargoylism — lipid infiltration
Calcareous deg
Cystenphra vrica
Fanconi Syndrome — Cystine
Wilson Disease — Cu.

Pigmentation of Cornea

Argyrosis — $AgNO_3$

Chalcosis — Cu.

Wilson — Cu.

Chrysiasis — gold

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Hypopyon in HLA B27

Less Mobile bcos > ↑ Fibrin
CCC +

Hypopyon in Quiet Eye — Rifabutin induced AU
Pseudohypopyon in Masquerades
Lens induced uveitis

Dsp Migratory transient retinitis — Behcet's
Fern pattern of leakage on FA.
└ Heales bg without scaring.

Ypab's Steige → x > 3yrs age.
x > 12.5 mm
↙
Endothelial growth.

IOP
↑ Succinyl Choline
Ketamine
↓ Avidoz
Sevoflurane] prefered

Papilloedema — Champne Cork appearance
Corpora Amylacea

Atrophic — gliosis

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Abberation ~~< 0.3~~ in 6mm zone.

∠ Alpha < 0.3mm
>0.5mm — unacceptable — × Bernium 10L.

Spherical Error — grade IV Abberation

SA	<-0.15	<0.15 — +0.15	+0.16 — +0.33	> +0.34
	↓			
	+SA	0SA	-SA	-SA
			↓	↓
			Alcon IQ	Amo Technis

Retinitis + Pain ⟹ Think of ARN.

H/O
- Chicken Pox. → VZV
- H/O Encephalitis (HSK) → HSV I.
- H/O Maternal Infection → HSV-II

Scleritis
- Viral: Diffuse >> −
- Bact: Nodular >> +

Pus points

Trabeculitis

Raised IOP + Pigmented KPs

⇓

Rule out Retinitis.

Acute Uveitis

Look for yellow thing in Retina.

Periphery → ARN

Headlight in fog → Unifocal Retinitis
Toxoplasma.

No yellow thing → Pars Planitis
Endophthalmitis

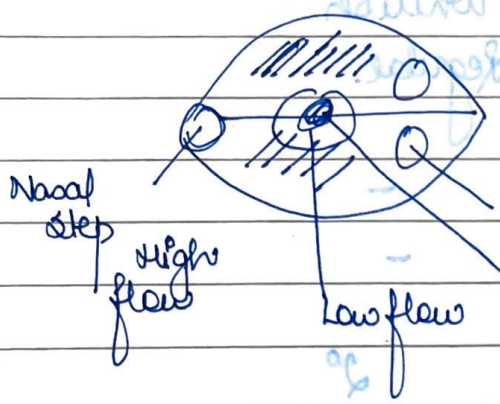
ARN → Central clearing.

Bags

Fat ↑ on Upgaze.

fluid.

Mt fuji sign / Volcano sign. → c/o Angle closure due to Lens



PVD stages Johnson & Sebag

Stage 1 — Perifoveal detatchment Vit att to fovea, OD, MPR

2 ✗ ✓ ✓

3 ✗ ✓ ✗

4 Complete

Retinal Edema → Ribbon like Choroidal vessel not seen
Light reflex is scattered

IRMA — Opening up pre-existing embryonic channels/vessels in hypoxic state

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Wheal and flare

Active		Inactive
Yellow	Colour	Whitish
Fluffy	Margins	Regular.
+	R. Edema	−
+	Hmg	−
3°	dimensional	2°

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Drinker — B12 def.

Sleep → CRAO
→ CRCR
→ Progression of glaucoma
→ OSA → benign hypertension.

1) Pure Nasal 2D — small part of face then

-5.0DS	-5.00	+0.5 x 90°
	-4.5	-0.5 x 90°
-4.0DS	-4.00	+0.5 x 90°

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Immunosx from very 1st day -:

SO
VKH
MFC & parasites
BC.
Behcets & RV, Rheumatoid diseases
PAN
HG
Tubercle IAAU.

Types of Night Blindness

Hereditary

Oguchi
Fundus Albipunctatus
RP
CSNB

Acq

Vit A def
Glaucoma
Choroiditis
Myopic deg
Uncorrected Myopia
Post LASIK
Certain drugs

CSNB

Dominant

ERG — Cone ✓
Rod ×

EOG (N)

Recessive

↓
↓

(N)

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D.D of Optociliary shunt

Meningioma
ON glioma
CRVO
ICH
Glaucoma.

Braley Sign — Differential IOP in thyroid.

Hoyt Spencer Triad — of ON Meningioma

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Retinitis

Focal

Toxo.
Cysticercosis
Masquerade.

MF

Syphilis
CMV.
Herpes.
Candida
Sarcoid.

Choroiditis

Focal

TB
Sarcoid
Masquerade

MF.

VKH.
SO.
TB
Syphilis
Sclerosing

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DD of Salmon Patch — Amyloidosis
Sarcoidosis
Orbital lymphoma. Leukemia
Lymphoid hyperplasia
Rhabdomyosarcoma.

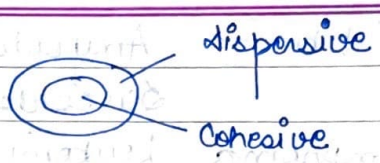
Exophthalmometer
Relative
Absolute.
Comparative

? To Measure Proptosis
- Naffziger
- Hertel Rule
- Hertel
- Luedde — facial asymmetry
- a) Naugle's b) Mutch — # Orbit
- Topometer — Non Axial

Optical
Mech
Luedde's
Hertel's
Gomaz

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Soft shell Tech



Vancomycin — Always in Saline

Mx of Congenital Cataract

Dense

1/2

Uni

Upto 6 wk
Urgency
else poor prognosis

4-10 wk
Eye ⊆ dense done first.

Bilateral

Nov Dx Rx . Optical iridectomy

Defer Dx.

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D.D of Peripheral Corneal thinning –:

TMD.
Mooren's Ulcer
Fuchs's degeneration.
Pellucid Marginal deg.

Lucid interval +nt in BSK → Lack of Bowman's in periphery
– Buffering capacity of limbal vessels which prevent ppt of calcium

D.D of Congenital Corneal Opacity – STUMPED.

D.D of dermoids – Dermoid
Corneal Keloids
CHED
Peter's Anomaly
Sclerocornea

x PG in SNS → Ant Uveal effusion

Pentacam

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22°

b
a

SB (a=b) | SRAX > 22° — suspect

Lazy 8 — Curvature Map

Nazi logo → KC precede

Kissing bird → PMD

Smiling pattern → Post op Ectasia KC

TL
Pupil Centre
Q value
Elevation pt in central sup & inf points.
Angle kappa

TL > 470 μ

y co-ordinate < −0.5 mm

Q Value — 0 to −1 — 0 — Prolate
N — −0.26 to 0.35 — + — Oblate

Elevation Map

	A	P
Myopic	< 8	< 18
Hyperopic	< 7	< 28



hourglass shape is Normal

Pentacam	A	P
Normal	< 12 μ	< 17
Susp		
Risky	> 15 μ	> 20 μ.

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Elevation Map S-I < 30μ.

PTI
CTSP
} should be within dotted lines

deviates at 6 mm of after it
↓
Normal.

Pupil — Angle Kappa x co ordinate < 0.2 mm
No sign matters

(b) Curvature Map → ← + Diameters both eyes.

c) Pachymetric Map — (N) [At 5mm circle S-I ration. <30μ.
Thinnest b/t 2 eyes <30μ.
Pachy apex - Thinnest. <10μ

Susp → decentered (y) > 0.5 mm.

KPS > 1.5 — In lower part.
Corresp elevatn at back
Susp

PI > 1.1



a) Belin Ambrosia display (BAD) → Total
BFS.
Minus. — green.

BFS — 8-9mm

TL - 4mm] Enhanced

2 > 2.5 red

Ant 12μ
P 20μ. Red

>1.5 yellow

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- Placido
  - Reflection
    - Keratometer
  - Projection
    - Computerized VK
- Elevation
  - Scanning slit (a)
    - Orbscan
  - Scheimpflug (b)
    - Pentacam
  - Mixed
    - Sirius
    - Galilei
- Mixed
  - Point source
  - Colour LED
    - Cassini

PMD

- Curvature / Power Map
  - Bell shaped
- Pachymetry
  - Kissing Bug
- Saggital elevation
  - Crab claw

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Orbscan Indices

Kmax >48D.
Pachy <470μ
PE >50μ.

Forme fruste — ↑ Cylinder.
Not able to refract
Inf steepening / Skewing] Curvature.
Min 3 mths apart.

1 eye KC others.

→ Corneal hysteresis
↓
ICL.

KC suspect — 1/3.

Progression on Orbscan 0.5/6yr. 6mth
1D/1yr.

Ch 11

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Examination of Anterior Segment:

Conjunctiva

- Eversion of Upper lid – Probe or finger
  - × Upper fornix
  - Double eversion of lid
    - Desmarre's retractor
    - Tumours
    - FB
    - Inflammatn
    - Papillae / follicles
      - Ocular surface
      - Tear film.
    - Cysts
    - Concretions

- Congestion of conj Vessels + White gone around cornea + Mucopurulent discharge
  - ↓
  - Conjunctivitis

- Marked lacrimation + Photophobia + Blepharospasm + Lacrimation
  - ↓
  - FB presence.
  - Misplaced lashes
  - Abrasion
  - Erosion.
  - Ulcers
  - forms of Keratitis.

Congestion

- Conjunctival.
  - ↓
  - Circumcorneal zone – Beight red dilated corneal loops
    - ↓
    - blanches fornix inward.
- ~~Corneal~~ Ciliary
  - ↓
  - Inflam of iris or sclera
  - dusky, lilac tint
    - ✓
    - 10% Phenylephrine
    - direct pressure
    - filling of vessels

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Sclera

- Episcleritis — Raised, congested, painless nodules
- Deep Scleritis — Deep red, dusky congestion
- Blue Circumcorneal — Very young children
  Staphyloma ta
  Scleral ectasia with herniation of Uveal tissue
  ↑ IOP
- Darkness around ant ciliary vessels perforate sclera — In ↑ Melanosis or dark complexion people.

Cornea

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Surface — Vascularization — Sensations — Staining — Opacities

Vascularization → Endothelium

Sensations → Curvature.

Staining: Sheen, Shape, Size

Surface

N – Bright, lustrous, transparent

Placidokeratoscopic disc – Erosion.

Keratoconus, & Astigmatism

Vascularization

Location — Distribution — Degree & depth

Location: Sup, Deep

Distribution: Localized, general

Degree & depth: Peripheral

- Deep Vascularization is more than two quadrants is considered as high risk factor for graft rejection following Keratoplasty

Superficial
- limbus into Corn.
- Bright red
- Well defined
- Branch dichotomously
- Arborescent fashion.
- Raise epithelium over them
- Uneven

traced

Deep.
- abruptly ends on limbus
- Red blush
- Ill defined
- parallel to each other
- Radial in direction
- Hazy Cornea.
- Smooth.

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Sensations

- Wisp of cotton wool
- Herpes Keratitis ↓ Sensations ∴ minimal gross changes
- Corneal Aesthesiometer — Horse hair of varying length
  Longest ∝ Threshold.

Staining

Fluorescein.
↓
Denuded epithelium.
Brilliant yellowish green with cobalt blue light

Rose Bengal.
↓
diseased & devitalized cells.
↓
Superficial Keratitis

Alcian Blue
↓
Mucus stain
↓
Def in tear formation

Opacities

SPKs.
KPs — Inflammation of Uvea

Fresh	Old
White, round dome shaped	flatter, smaller, crenated & pigmented

Large
Mutton fat
Waxy
↓
Mutton fat.
Granulomatous Uveitis

fine.
Fuch's Cyclitis
HZ. Uveitis

Endothelium

Subj
↓
Specular Exam tech

Age ∝ Pleomorphism.
Polymegathism.

Obj → Confocal μ.
↓
Specular μ.
E. Count = 2800 cells/mm²
Intraocular Sx — loss of. cells.

Curvature

Keratometer

Thickness
↓ 0. pachymeter on slit lamp
Ultrasonic pachymeter

Anterior Chamber

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Depth

Contents

Depth = 2.5mm deep

Shallow — . young & old age
Deep periphery than centre — iridocyclitis
Iris bombe — centre deep . periphery shallow

One side shallow — subluxation of lens.
recession following trauma.

AC depth =< $\frac{1}{4}$ Corneal thickness = ACG

> $\frac{1}{2}$

Explain Von Herrick method — 60° aims, 15° magnif. ✓✓

Contents

Protein transudation from iris or ciliary vessels produce an opalescence of aq. — Aq flare.

Slit lamp 2mm × 1mm 45° L.
Hogan et al.

	flare.	cells/field.
0	Absent	0
1+	faint, barely detectable	5-10
2+	Moderate, Iris & lens clear	10-20
3+	Marked hazy	20-50
4+	Intense fibrinous aq.	>50

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Contents
- Cells
- flare
- Hypopyon
- Hyphaema.
- Hfilariae.

using 1mm slit

grade.	Cells in field.
0	<1
0.5+	1-5.
1+	6-15.
2+	16-25
3+	26-50
4+	50+

Flare

0	None.
1+	Faint
2+	Moderate (Iris/lens details clear)
3+	Marked (Hazy)
4+	Intense (fibrin/plastic aq)

Pupil

Size — Reflexes — Reactions.

Size

Large

Bilateral

- Non Reactive
  - Mydriatics
- Large, Immobile
  - ON Atrophy
- Dilate & immobile
  - III N palsy (Absolute)
- III N + fibres to ciliary ganglion — O. internal

Unilateral

- Irritation of Cervical SN
- Horner Syndrome

Oval in Vertical axis
- Acc

Small

- Swollen LN in neck
- Apical pneumonia
- Apical pleurisy
- Cervical rib
- Thoracic aneurysm
- Syringomyelia.
- AC And Poliomyelitis
- Meningitis.

Small

Drugs — Miotics / Morphine

\+ Immobile — Old Iritis & Post Synechiae

\+ " + Muddiness of iris — Iritis

Bilateral — Irritation of III N due to central lesions Pontine Hmrg.

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Reflexes

Pre-Req — ↓ illumination of Exam room.
look at distance
focused & bright light.
Before Mydriatics

Direct & Consensual — Accomodation

Hemianopic pupillary Rxn (Weenicke)
↓ lesion in O.tract
Nasal ½.
Temporal ½.] Slit lamp.

Swinging flashlight test — 3s
Magnitude =
Afferent pupillary defect / Marcus Gunn pupil
Ix of ONS — Retrobulbar Neuritis

Rxn

ARP — Tectum Syphilis — Small x sect to light Consec ✓
light near dissociation

ARP.
Small
x
Contraction.
Syphilis

Size
Rxn to light
Convergence
Etio

Adie Pupil
Dilated
Vermiform ★ slight Constriction
Sluggish (★) ↑ latent period & unduly sustai
Unknown
Young ♀
Unilateral
Absent Knee Jerks
✓
Constrict.

Ass

x Dilate

Atropine
0.1% pilocarpine

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Lens

Slit lamp —— Ophthalmoscope.

confirm Opacities

Slit lamp Bimicroscopy

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- Diffuse illumination
  - Direct
  - Tangential
- Focal
  - depth
    - Direct
    - Indirect
- Retro
  - Iris —
  - ghost vessels
  - KPs
  - Corneal Dystrophy
  - fundal glow →
    - Cataracts
    - C. Scar
    - Deep C. vessels
    - Transparent Cysts
    - refractile bodies
  - Iris hole
- Specular reflection
  - 30°
  - 2mm
  - Eisner grid
- Scleral Scatter
  - ★
  - → Vesicular Corneal Opacities
  - → Vortex dystrophies
  - → Early Corneal edema

Direct, diffuse Magnifi
- Colour
- Size.
- Relative position.

Tangential
- Contrast
- Texture.

Tonometry

- Digital
  - Obv superior tarsal plate
- Indentation of Schiötz.
  - 4wt
    - 5.5
    - 7.5
    - 10
    - 15g
  - 2-4mm
  - ✕ — Cs coats
  - — Steep, thick, Irregular corneas
  - — ↑ Myopia / hyperopia
  - — Miotics use
  - — Vasodilators / Vasoconstrictors
  - — 10 Sx. (VRSx)
- Application.
  - Goldmann
  - Perkin
  - Mackay Marg
  - move^{n} of plunger
  - Tonopen
  - NCT.
  - ↓
  - Imbert-Fick principle
  - Ocular rigidity ⇔ Induced capillary force
  - 0.05ml aq displaced

Goldmann used ⊂ Haag Streit Slit lamp — flat, circular plexiglass plate 7mm, Anaesthetic cornea 3.06 mm dia flat

0.1g spring & lever system.

Prism apex to apex

- Anaesthetize Cornea

Apply 1% flouroscein dye

Mires

Thick. Excess Over estimated — Thin Scanty Under

flouroscein

- Corneal astigmatism
- Scarred. Cornea

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Indentation → Schiotz, Herrington, Grants, Maurice

Soft eye > Hard eye.

Truncated cone

- Principle
- Parts — Handle, footplate, Plunger, Lever, Wt
- Tech → 3-4 scale is best reading
- Scale — Friedenwald

1948 — 1955

0.0245 K. 0.0215

⇕

Goldmann applanation.

- Errors — Inherent in instrument
  - Contraction of EOM
  - Errors due to accomodat"
  - Ocular rigidity
  - Variation in Corneal curvature & thickness
  - Scale reading
  - Bld vol. alteration
  - Moses effect
  - Repeated measurement
- Sterilizat"
- Electronic Schiotz

Applanation

Principle

simple plattener

Variable area (fixed force) — Maklakov of Kapla

Variable force (fixed area) — Mackay Marg

gonioscopy

- Recesses of angle of AC. (glaucoma)
- FoB
- Tumours.

Indirect

Goldmann. Angle mirror. — at 62°
Zeiss four. 64°

Posner "
Sussman.
Ritch Trabeculoplasty

Direct

- Koeppe — Dome shaped lens
- Barkan — Quater sphere Sx & Dx
- Swan Jacob — Dx gonio lens for ♀

Modified Zeiss with hangers
Hand held Zeiss
2 at 59° 2 at 62° ± Convex lens over.
mirrors.

Landmarks — Behind ⟶ forward

Ant surf of Iris
grey coloured, anteromedial surface of ciliary body
White line of scleral spur.
faintly pigmented trabecular meshwork covering canal of S.
Schwalbe's line. (Peri extent of DM)
Post surf of Cornea.

Shaffer's grading

grade	Angle width	Configuration	Chances of closure	Str visible on gonio
IV	35-45°	Wide open	Nil	SL → CB
III	20-35°	Open	Nil	SL - SS
II	20°	Moderate narrow	Possible	SL - TM
I	10°	Very Narrow	High	SL.
0	0°	closed	closed.	None of Str

Retinal

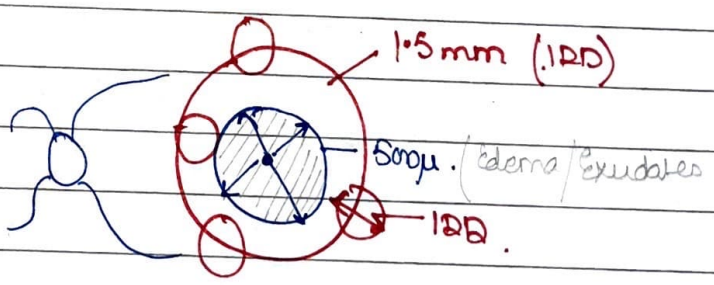
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Arteries	Veins
Brighter red	Purplish tint
Narrower	Fuller.
	Wider Calibre

Vessels

Choroidal	Retinal
Broader	
Ribbon like	
Without any central streak	
Anastomose freely	x
Albinos & High Myopes.	» Visible

CSME → Edema / Hard Exudates present ⊆ in 500μ of foveal centre
or
Edema of >1DD (1.5mm) in extent, any part of which is within 1DD of foveal centre



Lebo

Amaurosis fugax.

Optic atrophy
↓
Maternal Inheritance.

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RPE 65 – Congenital Amaurosis of Leber
ABCA4 → Stargardt's disease
RDH5 → fundus albipunctatus.

Hess Chart

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Pre-Requisite

a) foveal projection

b) Hering & Sherrington laws of innervation

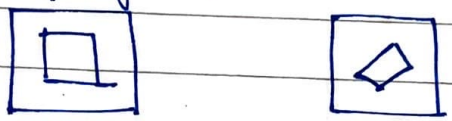
c) Dissociation of eyes by complementary colours

How to read →

Which eye affected ? —— Smaller field

↓

Neurogenic | Mechanical (Restrictive)



// walls

↓

Underacting.

↓

Overacting

⟹ Diagnosis.

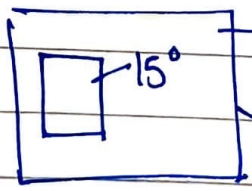
Pt seated at 50 cm

Pt → green light

Red filter — fixing eye.

green — Eye being tested

Reversible Red. green glasses



□ — 5° angle

→ subtle defects picked up by it

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Lee's adaptation

Uses mirror dissociation

Adv over Hess

↓ freq suppression

Pt eye more visible

Full dissociation > easily achieved.

- Papilloedema — 10
- Diabetic Retinopathy — 20
- Hypertensive Retinopathy — 15

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Q1 S.S of fibrous Membrane in AC

Q2. SOV causes

Q3 PDT

CSCR – Acute – Wait 03 mth for Laser

Q4 Types of Extraction –

Q5 Dog types

Q6 Diff b/t OSSN & Pterygium

Q7 Tacrolimus

Layers of Retina

Out

Retinal Pigment Epithelium

↓

Layer of Rods & Cones

↓

Ext limiting Memb

↓

Outer Nuclear layer

↓

Outer Plexiform layer

↓

Inner Nuclear layer

↓

Inner Plexiform layer

↓

ganglion cell layer

↓

In Nerve fibre layer

↓

Int limiting Membrane

Ocular Manifestations of HTN

Albuminic retinitis

- HTN retinopathy
  - Acute Malignant
  - Chronic
- HTN choroidopathy
- HTN optic neuropathy

HTN = Arteriosclerosis ∴ Age imp

- Arteriolar Narrowing – Long standing HTN
- HTN Arteriosclerosis ⇔ Involutional Arteriosclerosis

↑ in elastic tissue/Msl

↕

Hypertrophy/Hyperplasia of Arteriolar SM.

↓

In intima Collagen fibres replacing Msl.

- A:V Ratio
- Light reflex
  - Normal: Thin line of light ≤ normal column of blood
  - Cu-Wire: dull reflex broader ≤ Mild Arteriosclerosis
  - Silver Wire: Red brown × apparent flow
- AV Crossing changes
  - Gunn's Sign: AV nicking occurs as overlying venules are compressed
  - Salu's Sign: ↑ sclerosis, AV cross at Acute ∠, Obtuse ∠
  - Bonnet Sign

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Cotton Wool spots - foci of capillary non perfusion in damaged terminal arterioles result in CW spots.

↓

An area of Axoplasmic transport disturbance caused by focal retinal ischaemia.

- Retinal Edema
- Serous Exudates
- Exudative RD
- Macular Star
- Macroaneurysm
- CME, ERM

→ of acute → DR
- CRVO
Hyperviscosity syndrome
Neuroretinitis
Radiation retinopathy

DoD

High altitude retinopathy

>10,000 - 30,000 ft

Hypoxia

Hmeg

- Marked ↑ arteriolar & Venous dilatation
- Papilloedema
- VH.
- Rod threshold elevation
- ↑ light adaptation recovery time
- paradoxical pupillary dilatation
- flicker fusion decrement

Wardman classification

I	II	III	IV
dilated veins & ~~hmrg upto~~ IRD. hmrg	Moderated 2DD	Advanced 3DD	engorged > 3DD
		± paramacular hmrg ± VH (mild)	± ✓ ± ✓ (major) Disc edema

Circulation

Choroidal

Acute HTN »

» Sympathetic NS (ANS)

HTN → C. aut constrict

↓

damage to endothelium & ↑ BBB

- Shorter distance
- fewer branching

» Systemic HTN transmission

ONH

½ Autoreg

Incomplete BBB.

Retinal

Autoregulatory mech ∴ maintain tone ≤ sudden

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HTN Choroidopathy

Young pt ≤ pliable vessels × sclerotic

RF — Toxemia of Preg
Renal disease
Pheochromocytoma
Essential HTN
CT D

Arterioles — fibrinoid necrosis if Acc/Malig HTN

↓

replacement of SM = fibrin platelet
Plasma protein material

≤ Angiotensin II

↓

Vasoconstriction

↓

Patchy non perfused area of choriocapillaries ⇒ C & RPE Isch

↓

RPE yellow → Irregularly pigmented ≤ depigmented lesions (Elschnig spots)

1/6 - 1/3 DD size
mid periphery, vicinity of OD

FFA — Irregular filling pattern
delay filling time
window defect

Chronic — Siegrist's streaks — Area of hyperpigmentation overlying sclerotic choroidal arteries in attenuated chorio-capillaries

↓

Advanced stage

Acute, focal RPE lesions ↳ ft PT
└ but foveolar distribution along major arcades

Classification	Hmrg	Retinopathy Exudates	Sick Edema	Arteroles AV Ratio	Focal spasm.	Arteriosclerosis Light reflex	AV crossing defect
Normal/Stage 0	–	–	–	3:4/2:3	1:1	Fine yellow add	Nane
Grp I / Stage 1	–	–	–	1:2	1:1	Broad yellow Red	Vein depress AV nicking
2	–	–	–	1:3	1:2	Cu Wire × visible	Vein depression
3	+	+	–	1:4	1:3	Silver Wire Not visible (Bld column)	± devia Disapp of veins
4	+	+	+	Fibrous/ fine chords	No distal flow Blocking spoke	,,	distal dilatn

Keith Wagener Barker

Classification

Keith Wagener Barker (1939)

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	Stage 1	2	3	4
	Slight	Narrowing Sclerosis	definite	
	✓	✓	✓	
	✓	Tortuosity	(2)	.
		focal constriction	✓ +	
		AV nicking	✓	(3)
		Cotton wool Spots	✓	+
		HE	✓	
		Hmrg	✓	
		Papilloedema		✓
		Disc Edema.		

Scheie Classification 1953

Arteriosclerosis			Staging of Retinopathy		
grade 1	Broad	Min.	Stage 1	* focal const, diff AV nar	
2	Prominent	✓	2	✓	" »
3	Cu wire	»	3	1+2 + Hmrg	
4	Silver	Severe	4	Retinal edema + HE + OD edema	
	Light reflex	AV Nicking			

Wong & McIntosh 2005

	Description	Systemic	
Mild	AV nar, focal, Nicking, Silver	Stroke, CHD, CVS	Weak
Moderate	Mild + Hmrg, MA, Cotton wool, HE		Strong
Accelated	Moderate — OD swelling	ass ↑ mortality & renal failure	

HTN Optic Neuropathy

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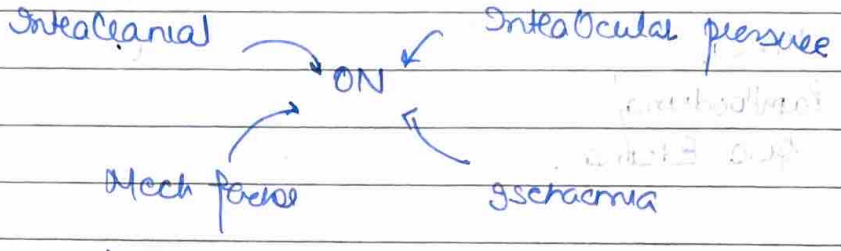
Malignant HTN — ONH Swelling

↑

Plasma leakage
Disruption of NF
Loss of Axon.
Subsequent gliosis

↓

2° encephalopathy
Ischaemia changes



» NAION

Salu Sign.

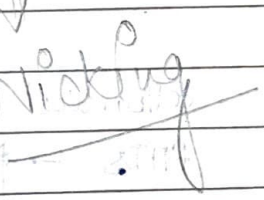
Deflection of vein at AV crossing

Bonnet Sing

Banking of veins distal to AV crossing



Gunn Sign — Tapering of vein on either side of crossing.



HTN retinopathy

DATE

Chronic	Malignant / ~~Acute~~
Arteriosclerosis	Retinal arteriolar Spasm
AV nicking	superficial R. Hmrg
Cu wiring / Silver wiring	Cotton Wool spots
Retinal Hmrg – flame shaped	FIPTs
Cotton Wool Spots.	Elschnig Spot
RNFL losses	Serous Retinal detachment
Remodelling changes – CNP	Optic disc Edema.
– shunt vessel	
– aneurysm.	
○ Gunn sign	
○ Salu sign.	
Hmrg – flame shaped / splinter RNF layer.	» in no. & severity
Hard Exudates – OPLs	
Macular star	
Cotton Wool spots – NFL	Cotton wool spots → ↑ size, ↑ in no.
Occlusion of terminal arterioles	FIPTs – focal dilatat° of terminal
	retinal arterioles – Autoreg mech
	break → BBB x → Transudation
hypo. FFA	hyper └ along the vessel course
Sinous course	Straighter course of retinal arteriolar tree
FIPT – focal Intraretinal perivascular transudates	
FIPT → x ↓ acs ⊆ Capillary obliteration	
x CWS spots	
hyperf & leak on F. Angio.	

Pathophysiology

Atheroscelerosis
↳ Cholesterol beneath tunica (intima) of BV

Arteriolo → Hardening of A. due to fibrosis in T (media)

A = 110μ. Vein = 150μ dia

Arteries > b/t NFL & ganglion cell layer
Capillaries — deep — Inner Nuclear layer
• After 1st br → × elastic fibres
× nerve fibres

Ophthal	Retina
↓ Symp NS	×
∴ ANS control.	×

2 vessels cross have common adventitious sheath
Many AV crossing > temporally as nasally straighter course

change in dia = Resistance ∝ d^4.

BBB • ∝. Acute HTN.

Retina — Autoregulat^n — Metabolic needs ↑ O_2, ↓ pH, ↑ CO_2.

Choroid → ↑IOP → Choroidal Hmrg
as no. Compensatory changes.



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PAGE

DOV

- **Painless**
  - **gradual progressive**
    - **<40yrs** → Refractive Error
      - Cataract
      - RP
      - MD
    - **>40yr** → Cataract, Presbyopia, DR, ARMD (Dry)
  - **Sudden**
    - **<** → RD, VH, ARMD (Exudative)
    - **>** → DR, HTN, Post Uveitis
- **Painful**
  - Uveitis
  - Corneal Ulcer
  - ACG
  - Endophthalmitis
  - Retrobulbar Neuritis

Classification of Injury

- **Close globe**
  - a) Contusion
  - b) Sup Lamellar
  - c) Foreign Body
- **Open**
  - a) Penetrating
  - b) Perforating
  - c) Ruptured
  - d) Mixed
  - e) IOB retention.

grade
Zone
RAPD.

- Congruous — Extent & depth of Scotoma is same.
  - └ Seen in Cortical lesion

Incongruous — Chiasma

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Sup RD — Detected earlier
Inf field defect while reading

D.D of CSCR — Exudative RD on Macula.
Post Scleritis
HTN "
CNVM
PCV.

Vancomycin 1g

10mg = 0.2ml
100mg = 1ml.
1mg 0.1ml

1000mg 10 ml
100 mg 1ml
10mg 0.1ml
0.9ml
10mg — 1ml
1mg 0.1ml

D.D of Panuveitis — TB Endophthalmitis
VKH Behcet's Disease
Sarcoidosis Symp Ophthalmia

Ix — FFA, FAF, OCT, ICG

How to decide to give Steroids in NPDR
· Dexamethasone Challenge test
↓
Triamcinolone.

Aneurysm — Worst headache
Ophthalmoplegia
Pupil

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Intermittent Ophthalmoplegia
↓
Convergence +nt
Adduction limitation
Abduction Nystagmus

1st sign of CVT — 6th N° first affected bilaterally

Nerve Palsy — Isolated
Multiple
Accompanying Syndrome

Superiors — Intorters
Obique are abductors

SO palsy

Intortion — Abduction in Down gaze
Depression — Adduction
Abd in — Down gaze

Position in which SO tested — Adduction.

Ptosis
True
Pseudo
↓
IR underaction.

Ask pt to fixate both eyes. Come //

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Opp Intorsion — Opp Head tilt
Face turn — Opp side
Chin depress.

- Occular toxicolis

- ↓ Vision in DM
  - Subfoveal Hard Exudate
  - Macular Edema
  - VH

- Macular Ischaemia — Featureless retina
  Vision ↓
  » Reddish as thinning of retina
  × Perfused ∴ appears pale

- Post PDT — drastic Vision drop.

RAPD — grade
Neutral density filters — used in Bil RAPD

Uveitis — hyperintense on T_2 weighted.

Optic Nerve Test

Str — Fxn

Exam
USG
CT

Colour
Acuity (VA)
Light
Contrast

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Carotido-Cavernous fistula

↓

Dilated Superior Ophthalmic Vein

c/f — Exophthalmos
Chemosis
↑ IOP.

Dilated tortous veins on affected side of Eye

Inv — MRA, MRV

Rx — Coil
glue dye - Onyx (Cyanoacrylate)

Degeneration associated with Retinal Break :-
Lattice Retinal degeneration
White without pressure
Focal pigment proliferation or clumping
Diffuse chorioretinal degeneration
Cystoid Retinal degeneration of Peripheral retina
Retinoschisis

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Reservoir Insert → Topical – Ocusert – Pilocarpine
Vitaseet – ganciclovir
Medium/ Retiseet – flucinolone acetonide
Posurdex – dexamethasone
I-vation – Triamcinolone

Drug delivery routes → Oral
Parenteral
Topical
Sub Conj
Intracameral
Intravitreal
Sub tenon's
Intra Scleral
Subretinal
Suprachoroidal

TM system — Pressure dependent

Knoblauch Syndrome — (18) collagen affected

$\downarrow O_2$ in vitrectomy fluid — imp step in ↓ lens formation in Nuclear Cataract.

(*) — Intravitreal injection of NOS inhibitor. L-NAME ✓
blunts Myopia & axial expansion induced by goggles or neg spectacle lens wear.

(•) disrupting dark light phase. — for Rx of Myopia ✓

DATE
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Mast Cell — Skin — Tryptase & Chymase
Mucosa (like Conj) — Only Tryptase

MC stabilizer also inhibit leucocyte activity

Triple Action Drug

- H_1 Antag
- Mast Cell Stabilizer
- NSAIDs

- Optivar
- Alocril
- Alamast
- Zaditor.

Soft steroid — Fred Mild
FML
Lotemax
Vexol.

Cyclosporin — 2% VKC.
Dry Eye - 0.05% Restasis

HSK

Necrotizing	Non Necrotizing
+	Significant Vascularization —
+	Significant thinning —
• —	Endotheliitis +

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Dry Eye future Rx

- Activation & Mobilization of APCs
- Histamine blockers
- Targeting cell adhesion factors (VCAM-1, ICAM-1, Integrins)
- Targeting specific chemokines (CCR3)

Dry Eye emerging Rx

- Novel IS & IM.
  - Cell adhesion blockade
  - Chemokine & Chemokine receptor blockade
  - Novel Calcineurin Inhibitors
- Topical hormonal Therapy
  - Anti Androgen
- T cell suppression
  - Tolerance
  - T-regulator cells

- Tear complement Replacement
  - Lactoferrin, Lysozyme, Lipocalin, ECF, Lipid & fatty acids
  - Endothelin I, NGF, TGFα, TGFβ
- Secretagogues
  - lacrimal
- Novel cholinergic agents ≤ good S.E profile
  - Mucin.
- P2Y2 Agonis

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	Early	Moderate	Adv
Target IOP	<18	<15	<12
MD	<5	6-12	>12

Diminution of Vision

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- Distant
- Near

- Cortical blindness
- Hysterical
- Malingering
- Uraemia
- Bil → • CO poisoning
  • Quinine toxicity

Distant

- Gradual
  - Pain −
    - Errors of Refraction
    - Opacities in Ocular media
    - Chronic Optic Neuropathy
    - Chronic Maculopathy
    - Chq Retinopathy
    - Amblyopia
  - Pain +
    - Trauma
    - Corneal Ulcer
    - HZ.
    - Interstitial keratitis
    - Ac. Iridocyclitis
    - ACG
    - Endophthalmitis
- Sudden (Unilateral)
  - Pain −
    - CAO
    - RVT.
    - VH.
    - CME.
    - RD.
    - AION

Near

- x even after 45 yrs
  - Myope
  - Does not do. work at 30cm.
- Gradual
  - Presbyopia.
  - PCC
  - PPC
  - MD.
  - Bil large corneal Opacity on Nasal side
- Sudden.
  - Cycloplegic
  - Io
  - Total O.
  - Spasm of Acc
  - Iatrogenic
    - Aphakia
    - Pseudo.

Both

- Uncorrected Aphakia
- Pseudophakia.
- Advanced Cataract
- MD
- CACG.
- Uncorrected errors of Refraction

Night Vision (Nyctalopia)

Contrast Vision also reduced

Treatable
- Vit A def (Xerophthalmia)
- Cataract
- Post refractive Sx
- RD
- Phenothiazine toxicity
- Cirrhosis

Non Treatable
- RP.
- Choroideremia
- Congenital stationary NB
- Progressive Myopia

Sudden onset >30yrs
- LPNS
- CAR.

- < 5yrs → Vit A deficiency.
- Adult → Retinitis Pigmentosa

↓ Day Vision (Hemeralopia)

- PPC
- C Nuclear C
- Macular lesion
- Central C Opacity
- Cone Dystrophy
- Aniridia
- Albinism
- Trimethadione

DATE

Colour Vision / Chromatopsia

- Genetic » ♂
- Immature Cataract
- Optic Neuritis
- MD.

Red
↓
Hmog

Blue
↓
After Cataract
Show Blindness
Resolution of Optic Neuritis

Diminished field of Vision (Scotoma)

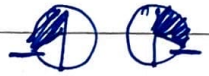
DATE
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- Central / Peripheral
- Unilateral / Bilateral
- Simultaneous / following
- Positive / Negative
- Relative
- Congruous / Non "
- Homo / Hetero
- Scintillating – Migraine

(A)

Central	Peripheral
• ON	• Adv glaucoma
• Retrobulbar Neuritis	• RDystrophy
• Macular lesions	• C "
	• AION.
	• Pit Tx
	• Drug Ix
	• lesion of chiasm OT, OR.

Congous field defects – edges of Scotoma in each eye are Symmetrical.



Diplopia

- Of single obj
- Short outline of main image & 2nd image fainter
- Overlap or seperated by gap
- Horizontal or Vertical or Tilted
- Dist in b/t changes & gaze
- " " " disappear on head tilt
- " closing of 1 eye

Uniocular

obstructing affected eye

- Recent CD
- High Astigmatism.
- Subluxated Lens
- Iridodialysis
- Displaced IOL
- RD
- Early Senile Cataract

Binocular

closing of 1 eye.

- Paralytic Squint
- Restrictive S.
  - Dysthyroid. Oculop
  - Blowout # of orbit
  - Post op entrapment of mal
  - MG
  - Retrobulbar growth
  - Trauma to Mal.
- EOM Paresis
- Displaced globe

Polyopia

- Incipient stages of Immature Cataract

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Metamorphesia

- Macco.
  - RD
  - Medema.
  - AR MD.
  - CSR. (CSCR)
  - Macular Hole
- Micro.
  - CSCR (Subretinal fluid)

Photopsia

flashes of light.
- Transient
  - Retinal or Cerebral Irritat"
  - Impending RD
  - PVD (Vitreous shrinkage v. liquefaction)
- Recurrent
- Best seen in dark.

Mechanical Irritation of retina in process of seperation

Chromatopsia

Light coloured obj — whitewashed
White obj — tinged.
- Red — Erythro
- yellow — Xantho
- Blue — Cyano.

— Recent Aphakia
Pseudophakia
Some drugs.

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Coloured Haloes

Unil — Bil

Prodromal stages of ACG
Corneal Edema
Incipient stages of Cataract
Mucopurulent conjunctivitis

Glare

Discomfort of bright light

- Large pupil
- Myopia
- Use of mydriatic & Cycloplegic
- Imm. Cataract
- Recent Aphakic
- Large Iridectomies
- Albinism.

Visual Hallucinations

DATE
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Formed.

- Temporal lesion
- Charles Bonnet dis
- Electrolyte disturbance
- ↑ fever

Unformed.

Occipital lobe lesions

- Liver, kidney failure
- Diazepam/ Alprax, LSD
- Parkinsonism

DATE
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Asthenopia

- Insufficiency of convergence
- Phoria
- EOM imbalance
- Uncorrected refractive error
- Astigmatism
- Presbyopia.

Floaters

- Casting of shadows of collapsed collagen fibrillae.
- network of vitreous on retina (Entoptic phenomenon).

- Retinal degeneration.
  Younger age. Myopes
  Retinal tear.
  VH.

Amaurosis fugax (complete)

- Valvular defect
  Arrhythmias

Bil — Ac Nephritis (Beg)
CRD
Uraemia

Page evoked fugax — ON sheath meningioma

Amblyopia (½ loss of sight)

Unilateral
- Anisometropia.

Bilateral
Bil Cataract
CO
Bil ↑ Errors.

Vision loss ± Normal fundus

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Amblyopia
Central blindness
Retrobulbar neuritis
Cone-rod dystrophy
Chiasmal tumour.

Headache

- Uncorrected errors of R
- Wrong glasses
- Accomodation & Convergence disparity.
- Mal Imbalance.

History taking

DATE
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1) HOPI

Ocular — Visual / Non Visual / Mixed.
Non Ocular

(a) Visual — Asthenopia.

(i) Diminution of Vision.
- Age of Onset
- Gradual / Sudden
- Uni / Bil
- Duration
- Progression — Steadily Worsening
  - Improving
  - Static
- Pattern — Constant
  - Intermittent
  - » Distant / Near / Mixed
  - Night
  - Colour < Red / Blue
  - Field of Vision. (Scotoma)
  - Contrast Sensitivity
  - Vision in bright light

Scotoma

Central / Peripheral.
Uni / Bil
Simultaneous / Following
Positive / Negative

Congenital / Non "
Homonymous / Heteronymous
Relative / Scintillating

Techn

DATE
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(ii) Diplopia / Polyopia < Uniocular / Binocular

(iii) Metamorphosia < Macropsia / Micropsia

(iv) Photopsia / Chromatopsia

(v) Coloured halos < Unilateral / Bilateral

(vi) Glare / Photophobia

(vii) Frequent change of glasses

(viii) Floaters.
(ix) Flashes.
(x) Visual Agnosia
(xi) Palinopsia
(xii) Dyslexia
(xiii) Visual hallucination < Formed / Unformed

Non Visual

1 Redness
2 Watering
3 FB sensation
4. Discharge
5. Dryness
6. Itching
7. Pain in & around eyes
8 Change in appearance of eye
9 Growth of eyes & its adenexa.
10 Change in colour of pupil — Cornea — Lids.

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11. Whitening of Eyebrows & lashes
Bitot Spots!

Non Ocular.

Headache
Vertigo.

HOPI
Past H/O
Allergy & drug Rx.
Family H/O
Occupation
Personal H/O.

Retinal detachment

DATE
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Predisposing factors H/O → Myopia
Previous Intraocular Surgery (Aphakic / Pseudo)
Family H/O of RD
Trauma
Inflammation
ARN Syndrome → R. Necrosis + Break.
CMV retinitis

Symptoms — Floaters.
Photopsia.
Fall of veil.

Signs — .

Complication — Proliferative Vitreoretinopathy — PVR
Fluid — Quadrants (1-4)
- Moderate
Marked
Massive

DATE
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Lagophthalmos - Incomplete closure of palpebral aperture when an attempt is made to shut the eyes

→ Cicatrization
→ Congenital deformity
→ Ectropion
- Paralysis of orbicularis
- Proptosis
- Orbital tumour

Ptosis

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Drooping of upper eyelid to a level that covers more than 2mm of superior cornea.

Unilateral
Congenital

Conjunctival Symptoms

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- Redness
- FB sensation
- Lacrimation
- Normal vision
- Stickiness
- grittiness
- Photophobia
- Dryness
- Growth over Conj.

Signs

- Hyperaemia →
  - Acute
  - Recurrent
  - Chronic → Dusty, Exposure to heat
    - FB
    - Concretion
    - Ingrowing lashes
    - Alcohol intake
    - Allergic Conditon

L>U = Malingerers

- Discharge
  - Watery
  - Mucoid
    - Viral (Ropy) + Itching
    - Allergic
  - Mucopurulent
    - Bacterial
  - Purulent

- Stickiness
- Waking up Morning
- Needs cleaning repeatedly
- Pain & Mild lid Edema
- Watering of Eye — FB.

- FB Sensation — Dry Eye, Eye strain, Trachoma, Contact lens induced PC., Trichiasis, FB

- Tear film Assesment
- C. Inflammatory Rxn.

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Follicles | Papillae | Granulomas

Follicles:
- Yellow white
- Round elevations
- 1-2mm dia.
- Lymphocytes aggregation.
- Sub epithelial fibroid layer
- C. Normal

Papillae:
- Hypertrophy of Vascular Sy
- ✗ in Newborn.

Granulomas:
- ∈ Inflamm tissue
- FoB ✓

Trachoma — UL > LL
- Deg changes ✓
- Scarring

- Subconj Hmg — Ecchymosis — Rupture of Small Vessels
  - Head injury
  - Pressure on thorax — Cloud
  - Recurrent —
    - Elderly ∈ fragile vessels
    - Systolic HTN
    - Local trauma
    - Eye Sx
    - Bleeding diasthesis
    - Leukemia
    - DD Kaposi Sarcoma
    - In Subarachnoid # Temporal side later
  - Severe Conj. Staining — Old Vomiting / Heavy wt lift
  - Children ∈ Whooping Cough, Scurvy, Purpura, Malaria

- Chemosis — Edema
  - Acute Inflamm — gonorrhoea, Panop., Hypopyon Ulcer — ACC Type, Insect bite
  - Obstr of Circulatn — Pulsating Exophthalmos, Dysthyroid Eye disease
  - Abnormal Bld Condition — Nephritis, Ah, Urticaria. — Angioneurotic Edema

Corneal Ulcer

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- Pain — Sup > deep
  - Acanthoamoeba — Radial peripheritis
  - Sudden relief of pain — Perforation
- Redness — Pt associated conjunctivitis
- ↓ VA — Sps involving central cornea
  - Pseudomonas
  - Staph
  - Fusarium
  - Associated pupillary membrane
  - Hypopyon
  - Cataract
  - Glaucoma
  - Endophthalmitis
- Onset of disease

Ac	Chr
Staph	Acanthoamoeba
Pneumococcus	Moraxella.
Pseudomonas	CONS
	Nocardia
	Atypical Mycobacterium.

- Predisposing factors

Ocular
- Trauma
- Contact Lens
- Lids & Adnexal Inf
- Ocular Surf disease
- Allergic Eye disorder
- Bullous keratopathy
- Topical medication
- Prior Ocular Surgery

Systemic
- Diabetes Mellitus
- Sjogren Syndrome
- SLE
- AIDS
- Advanced malignancies
- Connective Tissue disorders
- Alcoholics
- Extremes of age
- Measles malnutrition

Occupational
- Farmer
- Animal Handler
- Gardeners

Ocular

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- **Trauma** – Veg Matter – Mycotic, Acanthoemba Keratitis
  Human/Animal bites ∟ Anaerobes.
  ∴ extensive necrosis

- **Contact Lens** – Type
  Duration
  Method of Lens care Hygiene
  Disinfection.
  Frequency of Lens replacement
  Orthokeratology – Pseudomonas
  H/O Smoking – Corneal Hypoxia

  Swimming Pool/ muddy H_2O – Acanthoemeba.

- **Lids & Adenexa** – Dacryocystitis – Pneumococcus.
  Canaliculitis – Actinomyces.
  Lid Pbn – Trichiasis
  Coloboma
  Ectropion.
  Entropion.
  Lagophthalmos
  Exophthalmos
  Proptosis
  Blepharitis
  Meibomitis

- **Ocular Surface Disease** Any eye Disease
  Chemical Injury
  Allergic Eye Disease

- **Bullous Keratopathy** – Time
  Steroid use
  Use of BCL

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- Prolonged Drug Usage
  - NSAIDS
  - Anaesthetics
  - Antibiotics
  - Antiglaucoma medication.

  ↓

  Corticosteroids
  - affects precorneal tear film
  - Local ocular Immunity
  - Uses → Chemotatic factors → ✗ → Neutrophil migration
  - Superinfection.

- Prior Ocular Sx — LASIK - Mycobacterium Chelonei
- Systemic factors — DM / Alcoholics / Debilitated — Moraxella Lacunata.
  - AIDS
  - Sjogren.
  - SLS

DM
- BM & Hemidesmosome attatchments Impaired
- Duplicated & thickened BM
- Anchoring fibrils to stroma are weak.

⇓

Erosions.

AIDS / Malig → Candida.

Sjogren / RA → Corneal Melt

- Other Systemic factors — Burn.
  - Semicomatose
  - Comatose
  - Prolonged Ventilator Support
- Children — Measles
  - Stevens Johnson
  - Malnutrition
- Occupation - Animal handlers - Listeria Monocytogenes

Clinical Exam & Signs

1. Facial Stc — Blisters of HZV & HSV
   Presence of facial palsy.
   Abnormal blink rate.
   Excessive Corneal/ Conj Exposure (Proptosis).

2. VA → digital tonometry

3. Eyelids — Lid swelling
   Circumciliary congestion
   Evert the eyelid

4. Lacrimal Sac — ROPLAS

5. Tear film Analysis — Menisci — Numerous cells & debris
   filaments — stain.

6. Conjunctiva — Chemosis — Membranes
   ass c Conj Severe
   - Gono
   - Pneumo
   - Haemophillus

   Papillae
   Circumciliary flush/ Prominent limbal vessels
   Type of discharge & its colour

Watery	Mucoid	green
Viral	Bacterial	Pseudomonas

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Cornea

Location

Central
Paracentral
Peripheral – ≤ in 3mm of limbus
Shield ulcer
Cornea involved – ½ – Total

Central
↓
Severe reduction VA.
Poor visual prognosis

Staph.

Peripheral
»

Mycobacterium TB
HSV.

Shape

~~Bord~~
Punched out
↓
Bacterial

Dry Looking Hyphate
Feathery margin
↓
Fungal

Dendritic
Geographic
Amoeboid
↓
HSV.

Ring shaped
↓
Acanthoamoeba.

Margins

Well defined margin
↓
Healing
Sterile

Indistinct margins
↓
Active

Overhanging
↓
Mooren's Ulcer

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Size — Size of Ulcer
Depth.
Infiltrate — Extent
Scleral involvement

Epithelial defect — Infiltrate size
— Defect — Fluorescein stain
Rosebengal dye — stain margins in Herpes
— Epithelial edema.

Infiltrate — single/ Multiple

Sensations — ↓ in. normal cornea in case of HSV.

Special features

Surrounding Cornea — Clear./Hazy

Clear
↓
Gram +ve Cocci
Candida

Hazy
↓
Pseudomonas — ground glass

Corneal Vascularisation — Sup/Deep
Quadrant Wise

Corneal thinning/perforation — Thinning
Perforation
Descemetocoele — Fail of Medical Mx
Surgical Rx

Seidel's test

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AC — Shallow AC
IOP] Seidel's test
Flare
Cells
Hypopyon — No Height
Fixed — Mobile
Fungal — 10min supine

Iris — Synechiae
NVI
Uveal prolapse - Corneoiridic scar

Pupil

Lens

Scleral involvement — Scleorkeratitis — Acanthoameba
Immunologic disorders

Serial Photographs / Diagrams
USG — Vitritis
Endophthalmitis
Perforation — rule out — Endophth
CD
RD

Optic Neuritis

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History — Age of Onset. DOV — » Monocular
Rapidity of Onset. — Slow progressive — Compressive lesion
Occurrence of any previous episode
Presence of pain on Eye movements
Uni/Bilateral (#)
Frontal Headache, tenderness on globe
Movement > Phosphenes, Lhermitte Sign, Uthoff phenomenon.
Sound Induced
Other ON

Etio

- Demyelinating (*)
- Para Inf
  - H/O Viral fever
  - Immunization.
  - Bilateral papillitis
- Infectious.
  a) Sinus —
  recurrent attacks
  ≤ headache.
  Uni. DOV.
  b) Cat scratch/Bite.
  c) Tick Bite
  d) AIDs H/O
  e) HZO, Immuno Compromised
  f) Truncal/Palmar Rash — Syphilis
- Non Inf.
  Sarcoid

Visual obscuration of bright light.

Intentional Tenor, gait

Exam — VA, Convergence (INO)] MS.
CV Nystagmus
Pupil.
Vitreous for cells → Sarcoid, IU.
OD. → lumpy appearance — Sarcoid
Visual fields >11Bars
VEPs ↑ Latency or Inter Ocular diff >9ms
Stereo-acuity — Pulfrich phenomenon.

DATE
PAGE

Multifocal ERG | Full field.

Sarcoid — ACE
TB — PPD
Lupus - ANA
Lyme's titre.
AJ — ESR, Anti Cardiolipin Ab, CRMP-5, NMO IgG
LHON test

Ix — CBC ESR.
RPR. FTA-ABS test
CRP ANA test
MRI of Brain & Orbit ± gadolinium Enhancement
MS Rule out ICSOL

Neurologist
Lumbar Puncture — Oligoclonal banding
Culture staining

Systemic features of MS

Uthoff

Lhermitte

Spinal Cord
- weakness
- Stiffness
- Sphincter disturbance

Brain stem
- diplopia
- Nystagmus
- Dysarthria
- Dysphagia.

Cerebral
- Hemiparesis
- Hemianopia.
- Dysphasia.

Psychological
- Depression
- Euphoria
- Intellectual decline.

Acc to laterality DoD

Unilateral
- NAION
- Inf.
- Compressive
- Retinopathies
- Infiltrative.

Bilateral
- LHON.
- Chiasmal
- Tobacco related.
- Toxic
- Nutritional.
- NMO.