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NAME: May STD.: SEC.: ROLL NO.: SUB.: Uvea

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		Prominent Corneal Nerves		
		Isotopes in Ophthal		
		Oculogyric Crisis		
		Colour Doppler in Ophthal		
		Neuroimaging Ophthal		
		OCP & Eye		
		Stem Cells		
		fungal Orbital Inf		
		Perimetry		
		Artificial intelligence.		
		Telemedicine		

Intermediate Uveitis

Introduction chronic relapsing disease
Insidous onset

Sun Hooking grp – Vitreous is 1° site.
– clinical dx

- Idiopathic
- Systemic Disease.

Pars planitis
- Idiopathic
- Snowbanking + Snow ball formation
× Other Systemic cause

Posterior Cyclitis

Hyalitis

– 15% of uveitis
20% Paediatric Uveitis

Course

Benign Course
Spont resolution

Mpre severe
Prolonged ≤
episodic exacerbation.

+ Systemic dis
Variable course

C/f

Symptoms – Insidious onset of blurred vision
Vitreous floaters
x Pain & Redness
Initially unilateral
» Bilateral though asymmetrical in both eyes
Targeted H/O

VA – Variable ↓↓ – CMO
generally 75%. 6/12 – or better.

Anterior Segment
- Ant Uveitis
- Cataract
  - by steroid & inflammation
- Glaucoma + prolonged inflamm
  - Long term steroids

Post Seg
- Vitreous (snowballs)
- Peripheral periphlebitis (sheathing)
- Snow banking
- NV
- OD swelling » ☹
- CMO (↓ VA)
- ERM on Macula
- RD → Hypotony Phthisis

Targeted H/O

1° MS – Neurological symptoms
20-50yrs ♀

2° Sarcoidosis – Respi symptoms

- Ant Uveitis — few cells, small scattered KP (inferior linear dusts)
  - L TPS = children
    - ↳ Sarcoidosis
    - L Lyme disease
- Vitreous — Vitreous cell & Ant predominance
  - V. condensation & haze (grading)
  - Snowballs

Snowball are whitish focal collections of inflammatory cells & exudates » in inferior vitreous

- Peripheral peiphlebitis — » Multiple sclerosis
  look for Vascular sheathing in other eye.
- Snow banking — grey white fibrovascular or exudative plaque that may occur in any or all quadrants » Inferiorly.
- Neovascularization = Periphery & Snowbank
  - ↓ lead to VH. — » children
    - RD.
    - Cystic membrane formation.
- O

classmate
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Ix

- CBC
- ESR
- CRP
- ~~CXR~~

OCT – CMO
FFA – Assessing severity

Targeted

- Multiple Sclerosis – Neurological symptoms
  – Cranial MRI imaging if suspected
- Sarcoidosis – granulomatous Ant Uveitis
  Serum ACE level
  Chest Xray.
- Lyme dis – Endemic area
- Syphilis – Treponemal & Cardiolipin Ab
- T.B – Quantiferon before starting steroid
-

DDs of Vitritis

- IU
- Fuch's uveitis Syndrome
- Intraocular lymphoma
- Toxocara granuloma
- Whipple disease
- Endog Candida Endoph
- Toxoplasma

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Rx

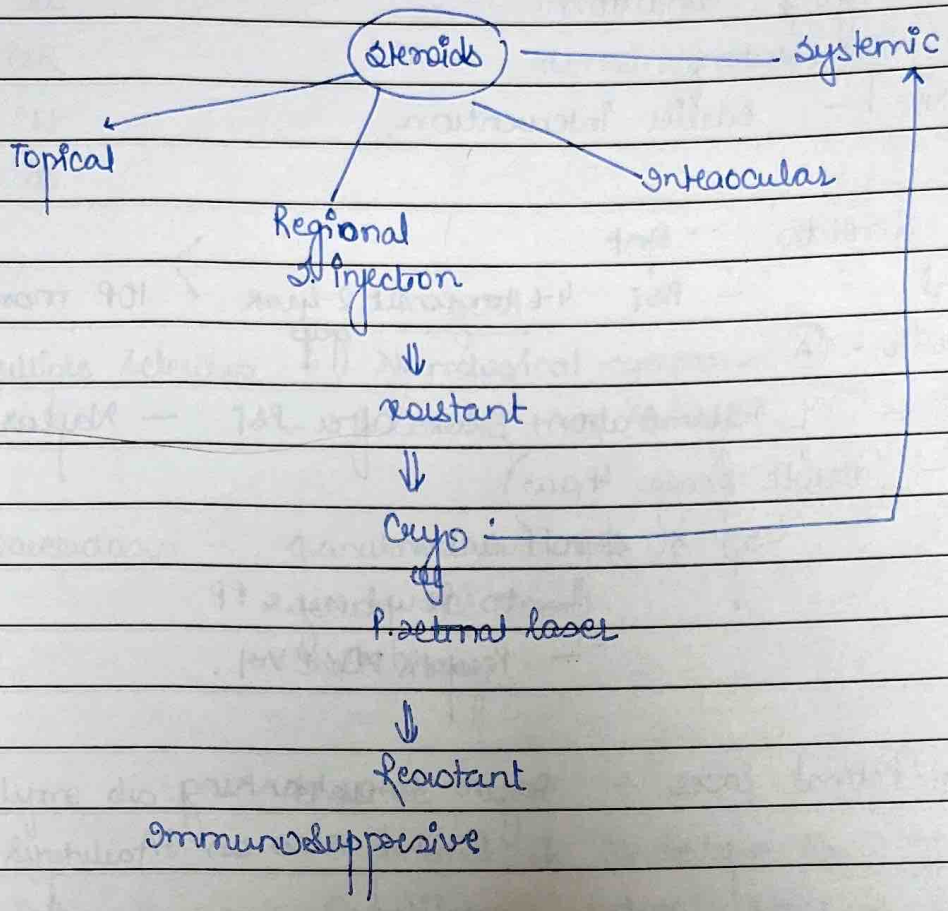
℞ underlying condition
Anti Inflammatory
If NVE — earlier intervention

- Topical steroids — Ant
- Regional " — PST 4-6 times at 2 hrly gap > IOP monitoring
- Intraocular - (A)
- NSAID — If Inflammation even after PST — Naproxen 500mg BD
- CryoRx — (double freeze thaw)
  Lap x steroid action
  ↳ to Periphery & PP
  ↳ Periph NV + VH.
- Peripheral retinal laser — Adj to snowbanking
  Ischemic area on FA

- (A) Intra-ocular — Vitreal Triamcinolone
- Systemic steroid — BSL
  — HTN.
- Immunosuppressive agent — MMF, Methotrexate, Tacrolimus, Cyclosporin
- If refractory - MS related — IFN β.
  Anti TNF — Infliximab
  Intravit Bevacizumab
- PPV — RD, ERM, refl CMO
- Rx Cataract, glaucoma

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℞ scheme



4 step approach

step 4 – Immunosuppresive Agents

3 Cryo | PPV

2 Oral CS

1 PST

Uveal Melanoma

Malignant neoplasm that arises from neuro-ectodermal melanocytes within the choroid, CB, Iris

2nd C 1° intraocular neoplasm of white

Metastasize hematogenously & Kill.

Iris	Choroid, CB.
↓.	↓.
Less Malignant	>>
45-50yrs	55-60yrs

Risk factors → Sunlight exposure
Ocular Melanocytosis
Dysplastic Naevus Syndrome
Monosomy 3
Ch 3

Genetics — GNAQ — Gq α subunit mutation
BRCA, associated protein - I (BAP-I) mutation

CB Melanoma on later pages
Dysregulated Molecular Pathway — Canonical NFKB
L. for Rx Inflammation

Iris Melanoma

Ocular Manifestation → discolouration of iris
× symptoms, on routine Exam.
Localized, dark brown to tan iris tx.

Malignant potential

- Size of Lesion
- Apparent Cohesiveness
- Intrinsic Vascularity
- Effect on Adj ocular tissue

larger lesion
Thickness > 1mm.
Prominent Intralesional B.V. → Spont Hyphaema

Appearance

- Well circumscribed & Cohesive
- Shaggy & dispersion of Tx cells

↑ Tx cell clog → IOP ↑

Pupillary peaking.
Iris splinting
Ectropion Uvidis

Diagnosis

Transpupillary Transcorneal Transscleral

Transillumination

Shadow in PP

\- → Confined to Iris

\+ → Iris & CB

Not of use in darkly pigmented eye.

- Goniophotography
- FFA, ICG
- UBM — Solid vs Cystic
- Biopsy — Incisional vs FNAC

Baseline Systemic Evaluation → x ray.

DD

Naevus of iris

Cyst of Iris PE, Iris Stroma

Metastatic Ca of Iris

ICE lesions

IOFB.

Leiomyoma.

Medulloepithelioma.

Pathology — Atypical Melanocytic cells
↑ N:C ratio

Tx cell – fusiform shape, spindle melanoma cells (>>)
>> spherical " epithelioid " "

∴ better survival

Rx

Observat°
Excision (Iridectomy)
Plaque Radio Rx
Proton Beam Irradiation
Enucleation

Course

↑ IOP
Tx extension
Metastasis

follow up for 2-3y to look for recurrence
Metastasis

Choroidal Melanoma

Ocular features / Manifestation → Painless
Dilated episcleral sentinel BV
Melanotic episcleral nodule through sclera

Appearance Solid dark brown to golden Tx
Biconvex, lenticular cross sectional shape
Break through Bruch's & RPE → Nodular eruption
↓
Mushroom like eruption
- Pigment clumps of lipofuscin pigment on surface
» Small
- Ass ⊆ of Exudative RD

CM Size

	Meta Analysis	COMS
Small	H < 3mm	1·5-2·4
	D < 10mm	5-16
Med.	to.	2·5-10.
	10-15mm.	<16
Large	>5	>10
	>15mm	>16 mm.

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Diagnosis

USG B → Solid. Acoustically dark Mass
Biconvex / Mushroom like] Cross sectional shape

- Acoustic Brightness in their Cap
- Characteristic Relative internal Sonolucency in their basal aspects



A
- Low amplitude internal reflectivity
- Stepwise / decremental reduction in echo spike pattern from front to back of lesion

High reflectivity → Apical Cap
Low Reflectivity → Basal Region

- fluctuations in height of some of intralesional echoes coincident c the pulse

Ix of presence of prominent intralesional B.V fed 4m choroidal ∞ PCA.

FFA
∝ Cross sectional shape of Tumour (Dual Circulation)
Intrinsic & overlying pigmentation
+/- Healthy overlying RPE detachment

Not Beaten thru Bruch's	Hypof	Large intralesional B.V Ill defined smudgy	Intense staining of Tx Accumulation at pin point location
Amelanotic Melanoma	↓ lesional Hypof	»	
Ruptured thru Bruch's		Prominent apical ILBV Slow bt Intense fill	Intense stain

ICG — Hypof throughout study
Larger caliber Intralesional B.V

FAF — Hypo AF

Biopsy

genetic Tx Analysis

CT Scan — Pronouced Contrast enhancement

MRI
- Bright on T_1
- Detection Extrascleral extent

Systemic Eval
CBC. — Xray Chest
LFT. — USG Abd (Esp liver)

Use — Radioactive tracer techniques p32

Usg B Scan
Internal homogeneity with low to medium reflectivity
Choroidal excavation
Orbital shadowing
Acoustic hollowing
Collar stud Configuration

see later pages

Histo Unfav features → ↑ Epithelaid cells
Large Tx dimensions
Tx genetic characteristic
LBAP1 mutation

Extrascleral extension
Ant location

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DoD — On last page

Pathology — Anaplastic Melanocytic Cells . Large N:C Ratio
pronounced Anaplasia — Spindle Melanoma cells — Most fav
" " → Epithelaid — Least fav

Unfav prognostic factors → Large Tx size
+ of Vasc Mimicry pattern
+ of Scleral Invasion
+ of Trans " Tx extension

Low Risk — High Risk.

Rx

Enucleation — Neoadx Resection

Radiation Therapy

Neoadx Resection

Proton beam Irradiation — Plaque Radiotx — γ knife Stereotactic Radiosx — Ext Trans Scleral — Trans Vitreal Endore

Laser Therapy — Cryotx — Observation

Exenteration — Chemotx

Enucleation If ✕ Metastasis

↓

Enucleate

Ipentron COMS ✓

Radiotx

episcleral plaque

↓

Ruthenium 106

Iodine 125

Size = MBD + 3mm

80 - 100 Gy

< 5mm thick

(Ruth)

Proton Beam Irradiation.

↓

Small Tx.

< 15 mm

8-10 mm

I125

Laser tx Diode (TTT) Large spot (1-3mm) 810 nm 60-90s

Dull white discolouration

↓ power, long duration laser tx → intralesional temp.

45-60°C

Prexp i.v. ICG → abs of LASER energy in hypo &

Amelanotic

Argon green. 0.5mm 0.5-1s

TTT

↓

3-5mm thickness

Lasers

< 10mm

Micro Resection →

Transscleral R

- Young
- Healthy
- Thick MM
- Peripheral choroid > 12+3 mm in BD

Endoresection

- Small choroidal melanoma
- 1/2 overlying OD

Transretinal

Subretinal

Massive Extrascleral Tx

Exenteration

Chemo Rx

Not available

Multimodal Rx

DD

Pigmented lesions

- Choroidal Naevus
- Melanocytoma
- CHRPE.
- Hmg — CNV / RAM
- Metastatic Cutaneous Melanoma

Non Pigmented

- Circumscribed Choroidal Hemangi.
- Metastasis
- Solitary Choroidal granuloma
- Post sclerits
- Prominent Vortex Vein ampulla

Tx

Size	< 2.5 mm	> 2.5 - 10 mm	> 10 mm
LBD	< 16 mm	< 16 mm	> 16
			> 8mm in Ht (17 in ON)
	Small	I-125 Plaque brachyRx	Enucleation
	Observe		EBRT

EBRT
Cryo
Laser Ablation
TTT.

	Choroidal Melanoma	Choroidal Naevus
Age	55 yrs	Onset during adolescence
Race	White	White
Sex	-	-
Laterality	Unilateral	Unilateral
Location	Post pole or periphery	Post pole to Equator
Symptoms	Occ Visual loss	Asymptomatic
Colour & shape	Amelanotic to darkly pigmented round to Oval domed shaped mushroom shaped	Flat darkly pigmented to amelanotic, <5DD size
Oss Ophthal characteristic	Shifting SRF, overlying orange pigment, rarely hmg	50-80% drusen, Rare Orange pigment, SRF or CNV
FFA	Early hyperf & late leakage & multifocal punctate hyperf	Hypof unless drusen or RPE changes +nt
USG	↓ to medium internal reflectivity; dome shaped mushroom shaped excavation	<1-2mm thick, variable int reflectivity.
Rx		

Metastatic Ca.	Circumscribed Choroidal Hemangioma
50-59 yrs	30-50 yrs
-	» White
Breast	
- lung	-
20% Bilateral	Unil.
Post pole	Post pole ± 2DD of ON
Occ. Vision loss	Occ. Vision loss
Amelanotic, pale, broad base ± variable thickness	Orange, red, round to oval < 5DD size
Overlying RPE changes often extensive SRF	May have associated SRF or overlying RPE changes
Diffuse late Leakage × dual circulation.	Early pre arterial hyperf of large choroidal vessels ↓; late staining or leakage
Flat or multinodular medium to high Int. reflectivity	Homogenous med - high Int reflectivity.

	Choroidal Osteoma	CHRPE.
Age	10-30 yr	Congenital
Race	White.	
Sex	90% female	
Laterality	20% Bilateral	
Location	Juxtapapillary or Circumpapillary	often peripheral
Symptoms	Occ. Vision loss.	None
Colour & shape	Yellow white to Orange, well demarcated pseudopod margin	Jet black, rarely amelanotic flat oval, well delineated
Ass Ophthal features	RPE changes; Vascular spider; occ CNV	Overlying amelanotic lacunae
FFA	Irregular ~~hyper~~ late staining	Hypofl c. hyperf of lacunae
Usg	↑ Initial spike on A scan that persists at low sensitivity level; acoustic shadowing.	Flat
Rx		

Melanocytoma of ON.	Posterior Scleritis.
30-40 yrs	30-50 yrs
Black	White
-	♀
Unilateral	Usually Unil
Optic Nerve	Peripheral or Post pole
Rare enlarged blind spot	Pain, ant Scleritis
Jet black to brown, occ. fibrillated margin	Same colour as adj RPE.
Can be ass ⊆ Choroidal naevus	Concentric choroidal folds
Hypof, possible late ON. hyperf	Hyper F mottling with multiple pinpoint areas of late leakage
Slight elevation, high, regular internal reflectivity	High int reflectivity thickened sclera & choroid retrobulbar edema.

Iris Cysts

- 1°
  - Epithelial
  - Stromal
- 2°

Epithelial

Arise from iridociliary pig epithelium

3/4 peripheral iris

- Peripheral
- Mid zone
  - Manifest on pupil dilatation
- Pupillary Margin
  - Darkly pigm elongated

Stromal

Congenital

Solitary unil ste ⊆ smooth translucent ant wall

℞ — Aspiration
Sx excision
Ethanol induced sclerosis

℞ → PC.

2°

- Traumatic
  - C. Edema
  - Ant Uveitis
  - Glaucoma
- Extended use of long acting miotics
  - Bil. small Multiple cysts along pupillary border
  - Topical phenylephrine 2.5%
- Parasitic Cyst
  - Rare

CB Melanoma

12% of all Uveal Melanoma

R/F → ↓ Iris M.

6th decade ♀ Visual Symptoms

A.A — Iridociliary Cyst
Uveo-effusive Syndrome

Other CB Tx → Melanocytoma, Medulloepithelioma, Metastases
AdenoCa, Adenoma, Neurolemmoma
Leiomyoma

Dx

Sign
- large Tx
- Overlying sentinel vessel
- Displacement of lens — Astigmatism, Subluxation, Cataract.

Tx
- IOP
- Gonio — ↓ Invasion
- UBM
- Biopsy — FNAC.

Rx
- Iridocyclectomy
- Sclerouvectomy
- Radiotx
- Enucleation.

Choroidal Naevus

5-10%. Caucasians ↓ 1% Malig
Rare in dark skinned races

Histo Proliferation of spindle cell Melanocytes in choroid.

Dx Asymptomatic

Symptoms

Signs
- Post equatorial
- Oval / Circular
- Brown – Slate grey lesions
- Indistinct feathery margins
- Overlying drusen.
- Depigmented halo.
- Amelanotic lesion

features of early Melanoma →
- Overlying orange pigment
- SRF +
- US – Acoustic hollowness
- Symptoms – Photopsia
- Thickness >2mm / Dia >5mm
- Absence of drusen.
- Margin ≤ 3 mm of OD
- Absence of a halo

Ix
- Photographic documentation
- OCT – SRF – High risk
- FAF – Intense & diffuse hyper AF
- Dx of Melanoma

FFA — Melanoma vs Naevus

USG — hollow acoustic appearance
↑ internal acoustic reflectivity

℞ Baseline — FP, USG, OCT.

Review

* Susp features → 6mths

1> → 4-6m.

3> → Refer to Onco Spl.

growth + ℞ as Melanoma.

Choroidal Hemangioma

Circumscribed — Diffuse.

Circumscribed

Mass of varying sized vascular channels within the choroid

dormant. or early Exudative RD.

features Orange Oval mass at posterior pole with indistinct margin that blend with surrounding choroid

↓

Mean Basal diameter — 6mm
Median thickness 3mm

Ix

- OCT — IRF, retinoschisis
- FA — Early spotty Hyperf
  late diffuse but intense Hyperf
- ICGA — Hyper ↷ Hypo.
- AF — Hypo AF
- ~~ICGA~~ — USG — high internal reflectivity with well defined anterior surf

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Rx

- PDT
- TTT
- PhotoCoag
- RadioRx
- Anti VEGF Rx
- Oral propanolol.

Diffuse Choroidal Hemangioma

affects > ½ choroid

» pt c Sturge Weber Syndrome ipsilateral to Nevus flammeus !

Diffuse deep red colour —» marked on PP

Localized area of thickening, simulating a circumscribed Hemangioma

Usg B scan — Diffuse Choroidal thickening

Complication — Retinal Cystoid deg
Exudative RD
NVG

Rx — PDT ⊕ ↓ dose RadioRx

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Melanoma vs Hemangioma.

Choroidal Melanoma

USG
- B Scan
  - Hilton Mars — Acoustic hollowing
  - Base — Choroidal Excavation
  - Behind — Orbital shadowing
- A Scan — Rapid attenuation
  - large Angle K.

FFA

Choroidal Melanoma
- double circulation
- 1st — filling of Abn vessels in choroidal phase fol by diffuse leak
- Overlying Retinal Vasculature seen

Nevi
- Hypo f
- obscure Choroidal f
- ass ⊆ Drusen
- Absence of late staining

Choroidal hemangioma
- Vessels ⊆ in hemangioma fluoresce before surrounding choriocapillaries

Metastatic Tx
- Poor f in early phase
- Indistinguishable from Malign. in late phase.

Covid & Eye

Coronaviridae
↳ Coronavirus genus

RF — Severe Systemic Disease
↑ Abn Blood
↑ Abn Inflammatory } parameters

Routes of transmission

Direct inoculation of Conj by droplets

Migrat" of URTI thr NLD ;

LG involve"
↓
BID route

Why ↓ transmission in Eye

On Conj & Corneal surfaces / epithelia

1) ACE 2 recep — TMPRSS2

↓↓ no. as compared to Respiratory System

Virus ✗ ↓ Heparin SO_4 ↓ ACE 2 recep

2) Lactoferrin

3) • Serum IgA.

Protection → Use goggles, Slit lamp breath shield, Sanitization tech

Prevention → – Antifungal ↑ risk pt
– RVO risk ↑ anticoag given

Eye Manifestation

Before Covid 19 → follicular conj, KC

Acute → Episcleritis, ON, Miller Fisher, CN palsy, CVA ↓ Vision loss, Herpes zoster, O. cellulitis, Ac. Macular NRpathy, Paracentral Ac Middle Maculopathy, CRVO, ROCM

Subacute → Uveitis, CRAO, Pseudomembranous conj

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Late

Blepharitis
Seborrhoeic C
Papillophlebitis
Neurogenic Ptosis

→
→

→

Telehealth / Tele Medicine

Diagnose & Correct Ref. Errors — to correct Eye Que
Essilor Quick chek.

Assess Colour Vision

- Cornea, pupil reflex, Conj, Red Eyes, Lids, Dry Eye, Cataract

Dx & flowcharts

Assess Dry Eye

Binocular Vision fxn — Bynocs

Convergence

Cover test

Retina Evaluation — Amsler grid
Red desaturation test

Retina Imaging

Glaucoma Evaluation

H/O

Connect to Ophthalmologist

Optical dispensing

CL fitting & Evaluation

Low Vision.

Artificial Intelligence & Eye

3 Needs

- Automation
- Insight through Data Analysis
- Engagement & Users

Algorithms

- Machine learning
- Deep learning
- Natural Lang processing
- Virtual reality.

a) Optics

- Intelligent Mirrors
- Transition Virtual Try on
- 3D Virtualize Try On
- Eye Colour Studio
- I-tint
- Lens Scanner
- CLinotracker

Medicines — Eye doc App

Colour blind — Colour blind helper
Colour de blind

Vision

- Eyo check kids
- Eyo check Eyes
- Peek acuity & Peek Retina
- Eye calculator

Refractive Error

- Eye Que
- Eye Mitra
- Click check by Essilor
- Eye Robo 2 win
- Eye Robo Kaleidoscope

Leucocoria — CRADLE

Cataract

- Vula
- Eye Pro app
- Catra System
- Cataract Boost
- IOL & toric lenses
- Eye Pro App

Retina / ARMD / Glaucoma

- Lumus
- Pegasus
- Retina AI
- IDX - DR — FDA appeared
- DR detection by google

Uveitis — UVE - Master

Keratoconus — Kerato detect

CL — CL Cal C app

Retino — Brain — Ai DOC

Rhabdomyosarcoma

Keypoints → soft tissue mesenchymal Tx in children

arise from pluripotent mesenchymal precursors — that normally differentiate into striated msl cell.

70% 1st decade of life, Boys > girls. 5:3.

Embryonal type — Alveolar Type.

Symptoms → Acute to Subacute.
Rapidly progressive Exophthalmos
Eyelid edema.
Ptosis

Retrobulbar Cone 50% — Superior Orbit 25%

Orbital Imaging Irregular, well defined soft tissue mass
Bony erosion may be seen

MRI → T_1 → Isointense - Hyperintense
T_2 — hyperintense.

Echo Variable borders — Well circumscribed
Low to Med reflectivity
Moderate sound attenuation
Irregular shape
Variable Vascularity

Pathology

- Embryonal type → 50-60%
- Alveolar type → 30%

myoglb → specific immunohistochemical marker
Cytoscopy → actin myosin filaments

D.D Inflam processes, Orbital cellulitis, Chloroma, Lymphangioma, Ruptured dermoid cyst.

Staging

- Localized Tx → Completely resected
- Regional spread → +ve Nodes → Grossly resected
- Gross residual Tx → Incomplete resection
- Distant Metastases

Rx

Immediate Rx → To confirm Dx
Rx excision — Well circumscribed

Local Radio Rx

- Stage II → 4000 cGy
- III, IV → 5000 cGy

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Adjuvant Chemo → Vincristine
Actinomycin D
Cyclophosphamide

» fav prognosis for Orbital Rx.

Orbital Cellulitis

Preseptal — Orbital → sight threatening

Subperiosteal abscess < common than Orbital

Surgical Anatomy

Orbital Septum → strong fascial str

↓

att to Orbital rim

÷ Orbit & Preseptum

Arcus Marginalis → fusion of septum ⊆ periosteum of Orbital rim

↓

Barrier to infection.

OS

UL — LL

Levator Aponeurosis fuses ⊆ Capsulopalp fascia & Pul tarsal border

4 Spaces

Intraconal — Extraconal — Subperiosteal — Subtenon

PNS

Frontal

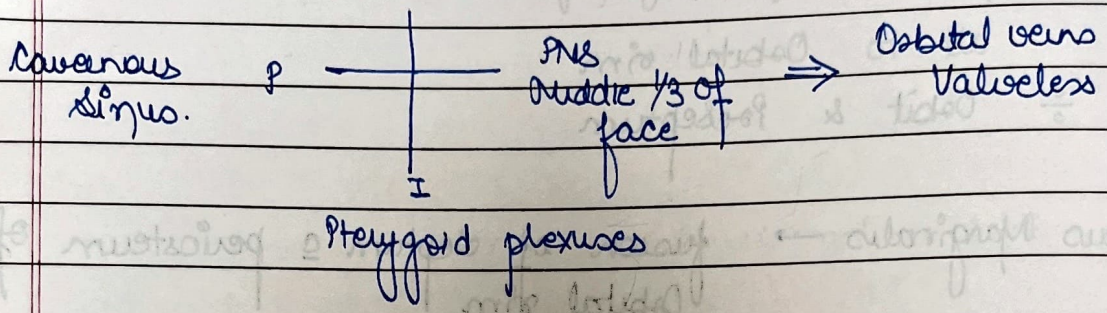
Ethmoid

Maxillary

Periosteum att. Strongly Posteriorly.

•) Defects in lamina (Zuckerkandl's Schiscence)

•) Venous drainage.



Thin Bone ← → Multiple Naturally occuring Bony defects

↓

Numerous NV foramina

⇓

Easy passage Ethmoid & Subperiosteal spaces

Acute Sinusitis → Spread.

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Etiology # >> Children

Age gp

- Neonate
  - Ruptured dacryocele
  - Unl/s Blephaedcay
- Infant
  - Sinusitis
  - Resp tract infection
- Children
  - →
  - Dental abscess
- Adult
  - →
  - →
  - → Trauma
  - → Endogenous 2° to debilitation.

- Unl/s inf from hordeolum & dacryocystitis
- Exogenous C → Penetrating trauma to orbit
  Orbital s/s → Proptosis, Scleral buckling

Classification

a) Chandler's classification #

- gp 1 — Preseptal
- gp 2 — Orbital
- gp 3 — Subperiosteal
- gp 4 — Orbital abscess
- gp 5 — CST.

b) Jain & Rubin's classification

- Preseptal C
- Orbital C
  - C — intracranial spread
  - C — ant
- Orbital abscess
  - Intra Orbital
  - Sub periosteal

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Microbiology <15yrs – polymicrobial, mixed, anaerobic

Wide Ostia in children → » after URTI
but yes resolve also early

Bacterial
- Strep pn »
- Staph aureus
- H. Influenza

Anaerobe
- Peptostreptococcus
- Veillonella
- Bacteroids
- Fusobact
- Eubact

gram neg
- Pseudomonas
- Klebsiella
- Atypical Myco

Etiology

Sinusitis
↓
Strep pn
Hib → ↓↓ bcoz of immunization

Trauma
↓
- Staphylococci
- β Hemolytic Strep

URTI
↓
H. influenza

Cf

Preseptal
↓
- Swelling & congestion of eyelid even of Uninvolved
- Difficulty opening eye
- ✗ Proptosis
- Pain, Watering, Occ fever
- VA (N) Color (N)

Orbital
Conj chemosis, Orbital pain, ↓ VA, RAPD (+)
Acute, Headache
✓ Axial
~~Proptosis~~ (+)
Profound (Restricted)

Nasoocade
- Rb
- NSOI
- O. lymphoma

Off 4m Allergic ↗, Viral C

DD — Orbital lymphoma / Burkitt's
O. leukemia
Rhabdomyosarcoma
TAO.
Post traumatic Hematoma
O. Cysticercosis
NSOL.

O. abscess → Apical

Mx

Preseptal
A+B
Analgesics

~~Septal~~ Orbital cellulitis
↓
Thorough Ix
Admit pt

Ix: ↑WBC (CBC), ↑ESR, Blood urea, Serum electrolytes, Blood cultures

Xray — Mucousal thickening
Sinus Opacification

Usg — To identify infection post to septum

CT — Most widely used
Coronal »
Preseptal, Orbital — Sinus inf + extent of sinus involvement

» → Intracranial involvement → Epidural & Cerebral abscess can be assessed

Subperiosteal

- Convex appearing
- Elongated shape
- Lt rectus mid & ethmoid sinus

Orbital

Extraconal

Intraconal

Patchy enhancement of intraconal fat +nce of gas forming org

True Intra Orbital abscess

Enhancing ring like peripheral mass

Hetero

Homo

MRI — localizing fluid collection such as abscesses
» CST.
» In children.

℞

Admit

I.V access

Send samples

Do imaging

I.V Antibiotics

Analgesics

Nasal ephedrine 0.5% TDS

ENT / Paed opinion

VA, EOM, Pupil — BD checks

Dx / Mx of sexual abscess

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Complication → CST Meningitis. Carotid Occlusion
Epidural abscess, Subdural abscess, Brain Absc.

Blood Derived Product Rx for Ocular Surf Disorders.

Condition affecting tear film < Sjogren
Vit A def.

Tear supplements do not have growth factors — EGF.
NGF, Vit A, TGF α & β.

∴ Autologous Serum E/D

Types — Platelet rich Plasma (PRP)
- Autologous Serum
- Allogenic ↓.
- Umbilical Cord Serum.

Factors in tears —:

Vit A	TGF β	Lactoferrin
EGF	Basic fibroblast growth factor	
IGF	Sub P.	Lysozyme.

EGF → ↑ migrat" of C. Ep Cell
TGF → ↓ Ep cell proliferation
Vit A → ↓ Squamous metaplasia
β_2 μglb → ↓ Collagenases — ∴ » Neurotrophic ulcer » Melt ability

Prep
Whole Bld (10ml yield 5ml)
↓
½ stand
↓
centrifuge 4000 rpm for 10 min
↓
Serum Seperated
↓
If dilute further 50% or 10%.

Storage → × degradation of ut A

-40°C × 1mth

-200 C × 3 mth.

discard after 7 d of use

Ix

PED

SED — Sjogren, KCS, GVH

Diabetes — Post herpetic ulcer — Neurotrophic problem

OS reconstruct"

CLST

SJS, OCP, Alkali burn

SLKC

Rx of Macular Hole

CI

Rheumatoid Arthritis

HSV, Modren's, Hep B, C, HIV

UCS if not fit for ASE

GVHD.] → Pro inflam Cytokines ↑nt in. SS Serum.

Statistics in Medical Research

Categorical vs Categorical

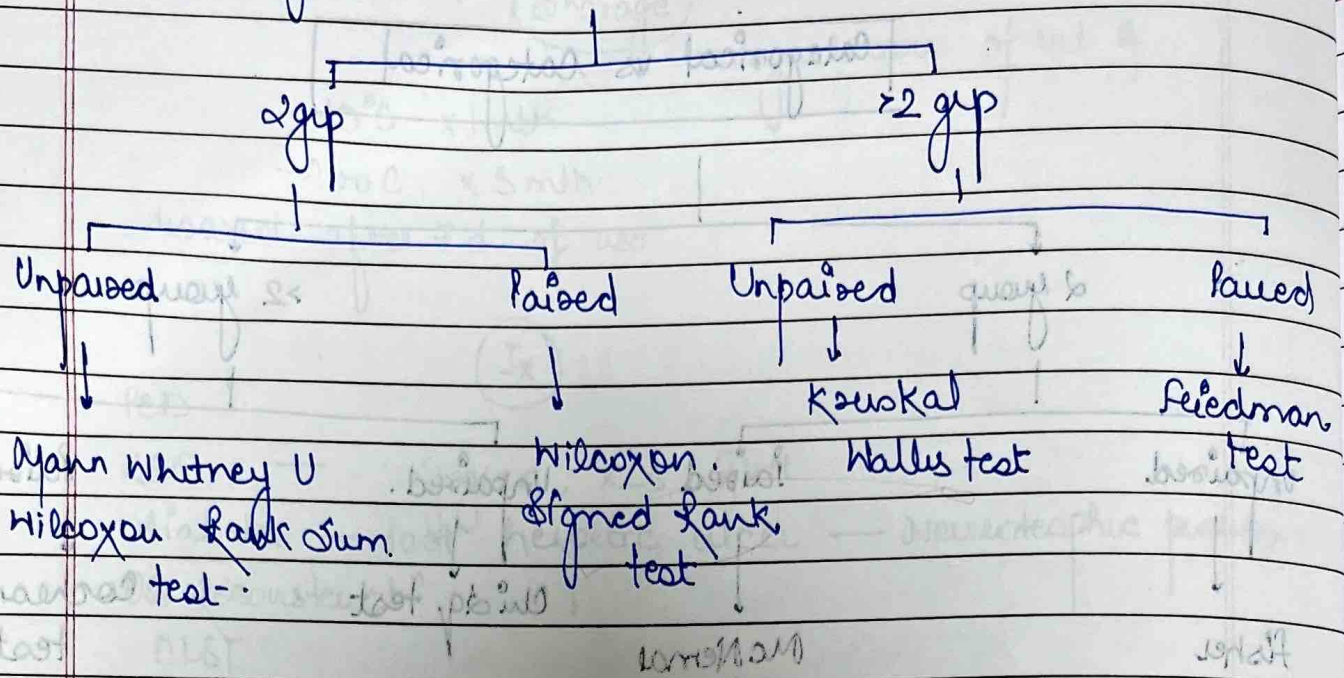
- 2 group
  - Unpaired
    - Fisher Exact test
    - Chi sq. test
  - Paired
    - Mc Nemar test
- >2 group
  - Unpaired
    - Chi sq. test
  - Paired
    - Cochrane Q test

Categorical vs Quantitative (Normal)

- 2 grp
  - Unpaired
    - Student's T test
  - Paired
    - Paired t test
- >2 grp
  - Unpaired
    - One Way Anova
  - Paired
    - Repeated measures Anova

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Categorical vs Quantitative (Non Normal)



Fabry disease

X linked lysosomal storage disorder

def of Enz - α galactosidase A

↓

Abnormal accumulation of glycolipid

♀ O → C gene — develop the disease.

Manifestations.

↓ Systemic

- Acroparaesthesia
- GI tract burning pain
- Angiokeratomas
- Cardiomyopathy
- Renal disease

↓ Ocular

- Cornea Verticillata
- Fabry Cataract
- Corkscrew Conj vessels

- Verticillata — golden brown corneal opacities in a vortex pattern
- Spoke shaped posterior Cataract
- Conj Vascular tortuosity / Aneurysm formation
- Retinal Vascular tortuosity

Micro-ophthalmos

Entire eye is small
AL < 21 D.

- Simple / Pure (Nanophthalmos)
  - ↓ normal
  - AL ↓
- Complex
  - features of dysgenesis
    - Coloboma
    - Orbital Cyst
  - Large of Ocular Abnormalities

Unil / Bil

Vision affected

Sporadic mutation
30% CNS abn.
Environmental Causes
- fetal alcohol Syndrome.
- IU infections

#

Nano-ophthalmos

Simple micro-ophthalmos

- Small eye.
- Ht (N)
- Both eyes are affected

Ocular

Uveal effusion
Thickened sclera
glaucoma - ACG
Hypermetropia
Ametropia
Amblyopia
Strabismus

:) ↑ power lens.

Disorder of Eyelashes

- Misdirected lashes
- Eyelash ptosis
- Trichomegaly
- Madarosis
- Poliosis

Misdirected Lashes

- Anatomy
- c/f → Trichiasis
  - Marginal entropion
  - Congenital distichiasis
  - Acq "
  - Epiblepharon
  - Entropion
- Rx –
  - Epilation
  - Electrolysis
  - Laser Ablation
  - Surgery
  - Cryotherapy

Blepharitis

- Ant
- Post
- Mixed

		Ant		Post
		Staph.	Seborrhoeic	(MGD)
Lashes :-	Deposit	Hard	Soft	
	Loss	++	+	
	Distorted	++	+	
Lid Margin	Ulceration	+		
	Notching	+		++
Cyst	Hordeolum	++		
	Meibomian			++
Conjunctiva	Phlyctenule	+		
Tear film	foaming			++
	Dry Eye	+		++
Cornea	Punctate Erosion	+	+	++
	Vascularization	+	+	++
	Infiltrates	+	+	++
Commonly associated skin disease		Atopic Ø.	Sebaceous Ø	Acne Rosacea
Demodex folliculorum →			Longus	Brevis
Staging				»

Symptoms

↓ Tear Stability
stinging +
Burning
gritiness

- Mild photophobia
- Crusting & redness of Lid Margins

Signs

Staph
- Hard scales
- Crusting
- Mild papillary Conj
- Chronic Conj hyperaemia
- Ptosis / Madarosis / Trichiasis
- Associated tear film instability & Dry Eye Syndrome
- Atopic KC

Sebourhoeic
- Hyperaemic/greasy ant lid margins
- Soft scales

Posterior
- MGD

→ Demodex infestation
- Secondary changes

Treatment

- Lid hygiene — Warm Compress
  Lid cleaning

- Antibiotics — Topical Sodium fusidic acid, Erythromycin, Bacteracin, CPM, Azithro.
  - Oral — Azithro
    Doxycycline
    Erythromycin

- Plant & fish oil supplements
- Topical steroids
- Tea Tree Substitutes
- Tea tree oil — demodex.
- Novel Therapies

Dacryocystitis

Infection of lacrimal sac secondary to obstruction of NLD.

- Acute
- Chronic

Acute → Staph

Chronic → Steep

Acute → Subacute onset of pain in medial canthal area ass. c epiphora

↓

Tender, tense red swelling developing at medial canthus

↓

Abscess formation / Associated Preseptal cellulitis

Rx

- Application of Warm Compresses
- Oral antibiotics
- No irrigation or probing
- I & D
- DCR after infection subsided. & ↓ risk of recurrence.

Chronic Dacryocystitis

- Chronic epiphora ass ⊆ chronic / recurrent unilateral conjunctivitis

- Mucocoele — painless swelling in inner canthus

No swelling ⟶ ROPLAS +ve

↓

Mucopurulent canaliculae reflux.

↓ ↓

∴ DCR ↓

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Bitot's Spot

Small, triangular, white patches on outer & inner sides of the cornea covered by material resembling dried foam which is not wet by tears

foamy spots due to gas production — Corynebacterium xerosis

present in horny epithelium

- Dry Weather
- Night Blindness
- Malnourished child

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Goldenhar Syndrome

Oculo - Auriculo - Vertebral dysplasia

St derived from 1st Branchial arch.

- Pre-auricular tags
- deformities of ext ear.
- Vertebral anomalies
- Coloboma of lids & Iris
- ~~DRS~~

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Prominent Corneal Nerves

- Keratoconus
- MEN Syndrome
- Neurofibromatosis
- Refsum Syndrome

- Acanthamoebic keratitis
- Fuch's Endothelial dystrophy
- Trauma
- Congenital glaucoma.

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Isotopes in Ophthal

Sr - 90
Ru - 106
Pd - 103
I - 125
Ir - 192
Co - 60

Retinoblastoma
Uveal Melanoma
Choroidal Hemangioma
" Metastasis

Oculogyric Crisis

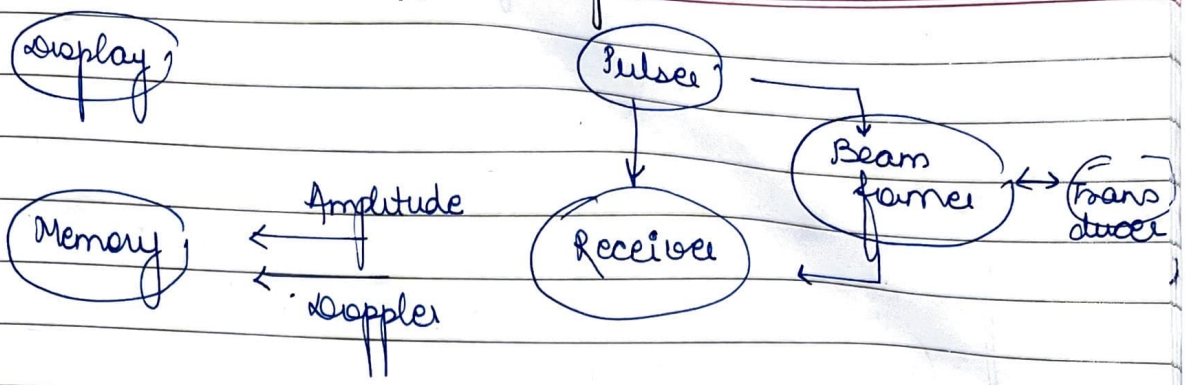
Upward rolling of eyes like seizures

Drugs — Haloperidol
Antiepileptic

Thalamic Dysfunction

Rx — Anti Muscarinic — Benzatropine
Procyclidine
"

Colour Doppler in Ophthal



Uses

Parameters

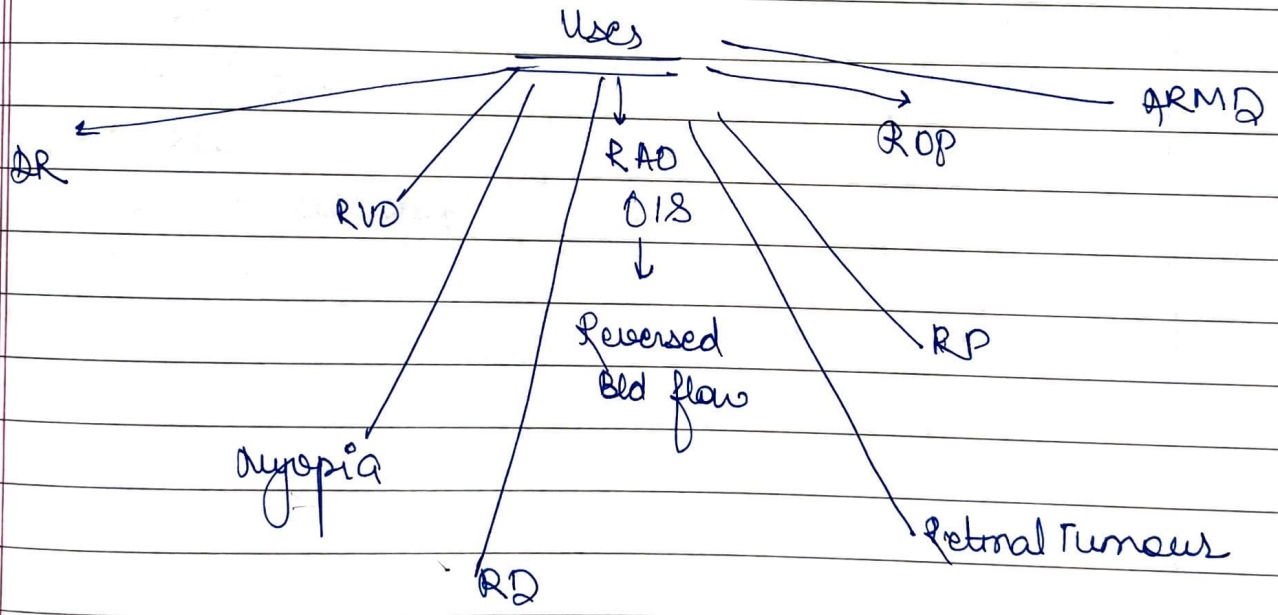
PSV

EDV

MV

$$RI = \frac{PSV - EDV}{PSV}$$

$$PI = \frac{PSV - EDV}{MV}$$



Neuroimaging in Ophthal.

CT

MRI — T_1

T_2

FLAIR

Fat Suppression — STIR

CHESS (FAT-SAT)

Chemical shift Selective fat suppression

FIESTA — fast imaging employing steady State Acq

CISS — Constructive Interference in steady stat

MRA

MRV

CT Angio.

Echo

USG

PET Scan

SPECT

MR spectroscopy

f MRI

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OCPs

~~Benefits~~ ~~Harms~~

~~Harms~~ Benefits

Dry Eye

Corneal Edema

Lens Opacities

Retinal
Neuro-Ophthalmic
Vascular
] Complications

6N palsy

Parietal Syndrome

Hemianopsia

Papilloedema

AION

RVO

- Prevent KCS

- Glaucoma

- Cataractogenesis

- Degradation of Collagen

Antioxidant
Neuroprotection
] Neuro deg eye

AMD OR

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Stem Cells

- Recent advances — retina.

GA — IPSC HLA matched one

Mucor 0. fungal Infection

Mucor — Aspergillosis

Aspergillosis — Immunocompetent — flavus
A. fumigatus — Compromised

Mucor
Non Septate
⊥ branching

Aspergillus
Septate
Acute ∠

Role of galactomannan → Monitor & response
>0.5 — significant

℞ Voriconazole 6mg/kg BD x 1d
4mg/kg BD 1-2wk

Oral

< 40kg → 200mg

> 40kg → 200mg

Perimetry

- Kinetic
- Static

Manual — Static

Automated — Static

Automated Static Perimetry

Standard — White on white

Manual

↓

Lack of standardization of test objects & background & patient fixation.

Automated

↓

Subjectivity of pt & perimetrist

H.

- Random presentation of target
- Estimation of pt reliability
- ↓ variability
- Statistical evaluation of data at many levels

SAP Components

- Perimetric unit
  - ↓
  - Bowl type Screen
  - ↓
  - Goldmann Manual
- Control Unit

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Target type

- Static
- Kinetic
  - ↑ freq of fixation errors
  - Longer testing time

Target projected

- Onto bowl
  - Unlimited presentation location on bowl.
- LEDs
- fibre optics.
  - fixed positions in the bowl

Machines available

- Octopus
- Humphrey
  - Heijl Krakau periodic BS method

- Various test patterns
- Testing strategies (Old)
  - Suprathreshold
  - Full threshold
    - 4 & 2dB.
  - fastpac
    - 2dB ↑
- (New)
  - SITA
    - Std
      - Full T.
    - fast
      - ½ time of FASTPAC.
  - TOP

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Interpretation

Global indices
Short term Fluctuations

GHT
- Within
- Outside
- Borderline
- Low reduction of sensitivity
- Abn ↑ sensitivity

- AGIS score — 4pt
  CIGTS — 3pt

- Trend Analysis
  - Octopus → Delta
  - Humphrey → Statpac
    - I → Normal database
    - II → Glaucoma

Also linear Regression analysis
Glaucoma Change probability

- Glaucoma Progression Analysis
  >3 test pt
- Progressor prog for analysis of serial fields

If 24-2 shows Scotoma — 10-2
Macula test
Size V stimulus

Other types of Perimeter

- Ring perimetry
- Esteemann gods
  - Visually impaired
  - Invented in America
- SWAP
- FDP
- Contrast & Motion Sensitivity
- Random dot Motion Perimetry

SWAP

SAP
↓
Achromatic stimuli
↓
Non selectively stimulate ganglion cells involved in Magno & Parvo
↓
∴ × Early g damage

SWAP
↓
(V) Blue on yellow
↓
Bistratified BY ganglion cell
↓
Sensitive to blue
↓ Koniocellular layer
✓✓
↓
Even SWAP SITA ✓
(5-10 min)

× Adopted SWAP — ↑ Interest variability
Poor specificity — Cataract & AMD

✓✓ Suspected disc ≅ Normal SAP

FDP

Large cells (My) ganglion cells

↓

Magnocellular pathway

↓

Sensitive to motion & Contrast

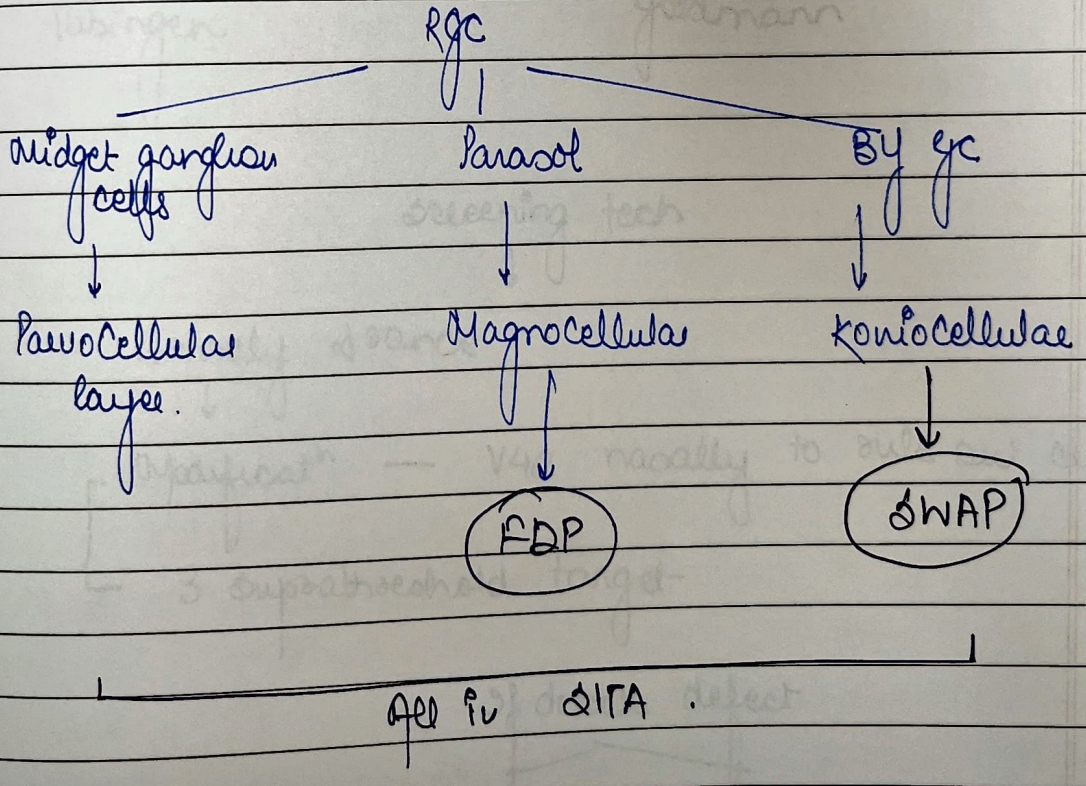
<90s

Quick Acquisition times

↑ Sensitivity

Can be used in Children.

- X for Neurological disorders
- Also use translucent occluder.



Perimetry

- Static
- Kinetic
  - better at fast pace
  - 4 degrees/s.

Isopters
Suprathreshold — Screening

- Objective
  - mERG
  - VEP

Anti VEGF & ARMD

Angiogenesis
↓
Creation of New Bld vessels from existing Blood vessels

Vasculogenesis
↓
Vessels created de-Novo

Modulators of Angiogenesis

- VEGF
- FGF
- PDGF
- MMP inhibitors
- Integrins
- Angiopoeitins

VEGF ⟺ Homology to PDGF

Heparin binding heterodimeric glycoprotein of 45kilodaltor
gene 6p21.3
↓
↑ Hydraulic Conductivity of Isolated μvessels

Ca^{2+} levels NOS levels

6 isoforms 121 145 165 183 189 206
↓
Oct & most form pathologic NV

VEGF

highly rated receptor tyrosine kinases

VEGFR-1 (+) ← HIF (Hypoxia inducing factor)

VEGFR-2 → ↓ bound but » Mitogenic Angiogenic permeability ↑↑

↘ decoy receptor

PDGF

* Plasticity window

expressed in Endothelial cells, Vasc SM, fibroblasts

(X) PDGFR-β → Vasc pericytes detatch

↓

Integrity of vessels lost

Immature vessels highly sensitive to withdrawal of VEGF prior to pericyte recruitment & coverage

(*) ↓

If Coverage Complete then VEGF —(X)→ new vessels

No effect

MMP 2, 9 ... 9 imp

VEGF (+) ↓

digest ECM

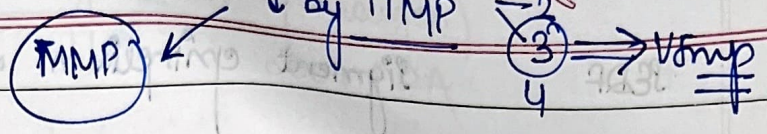
↓

Spread & chemotaxis of actively proliferating endothelial cells

↓

∴ × aggregation to form New capillaries

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TIMP-3 — ECM bound — Critical role in MMP regulation in Bruch's Membrane
→ ↑ amt in drusen & thickened BM
ass ⊆ AMD.

T.

Tissue factor → transmembrane receptor for coagulation factor 7/7a

Vascular injury → Complex ⊆ factor VII

Initiate Coagulation Cascade

Seen part of drusen also

Angiopoietins

Ang1 — Ang 2 — Hypoxia VEGF

Maturation role — Upregulated

New leaky bcs ← binds Tie 2 (Endothelial cell receptor)

Inh. of inflamm pathways — ↑ VEGF mediated Retinal NV

PEDF — Pigment epithelium derived factor

PEDF ⟷ VEGF

↓

Role in VEGF receptor signaling

↓ level seen in AMD pt.

℞

Anti VEGF

- Brolucizumab
- Aflibercept
- Pegaptanib
- Ranizumab
- Bevacizumab
- Conbercept
- Under Ix — RTH 258, DARPins, Abicipar Pegol

(b) Treatment Protocols
- PRN
- Treat & Extend
- Tachyphylaxis & Switch Agent
- New Strategies

(c) Sustained Drug Delivery →
- Encapsulated tech
- Port delivery
- Replenish pump
- AAV gene transduction (Fovista)

(d) Combination therapy
- Pegpleranib
- OHR 102
- Squalamine
- X82
- Zimura

VEGF 165

Pegatanib (Macugen)

VEGF A inh. 2004 FDA

RNA oligonucleotide ligand (Aptamer)

↓

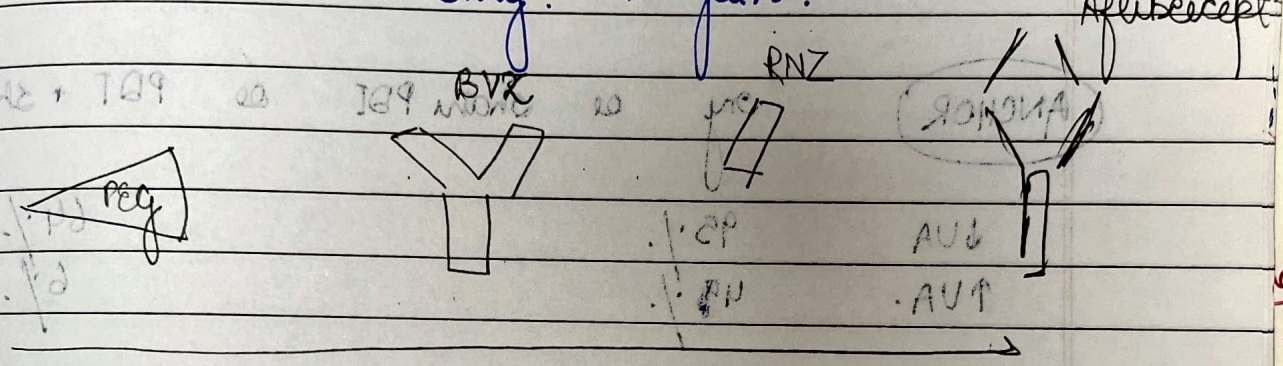
inh VEGF 165

a) VISION study

0.3, 1, 3mg ↑6wk ↓48wk

↓ 2yrs

0.3mg ↑ gain.



Ranibizumab

VEGF A

2006

48 Kilodalton

Recombinant, humanized IgG1

Monoclonal Ab fragment

↓

VEGF A 1/2 life = 7 days

MARINA 0.3, 0.5mg vs sham

VA ↑ (15 letter) 34% 5% in 2yrs

ANCHOR inj @ sham PDT @@ PDT + sham inj

↓UA	95%	64%
↑UA	49%	6%

Studies

Anchor	RBZ vs PDT in classic		RBZ > in 2yrs
Marina	RBZ	occult	better
PIER	RBZ mthly x 3mth	↘ 4mthly	
Excite	Pier vs Anchor.		Monthly better
PRONTO	OCT guided		
SUSTAIN	PRN guided		

Habour RBZ < 0.5mg / 2mg x benefit. higher dose

SAILOR. RBZ in larger population

Horizon Long term safety & efficacy

RBZ + PDT

Focus	RBZ + PDT		Combinat^n better
Protect	Same day ..		Was safe
TORPEDO	PDT → RBZ	Neovasc	
Denali (USA)	R	Subfoveal	No use of ↓ fluence PDT
Mont Blanc (Europe)	Summit trial		
Everest Asia			

RADICAL → ↓f PDT + RBZ → PDT + RBZ + Dexa → RBZ

Combinat^n better

Bevacizumab (Avastin)

149 kDa full length humanized monoclonal IgG1 Ab.

↓

VEGA

2004

3* lucentis size

(ANA) – systemic 5mg/kg

↓ CCT = 112μ 14 letter gain

CATT study

IVAN study

lucentis = Avastin

ABC BVZ vs PDT/Macugen BVZ ≫

Aflibercept

115 KDA recombinant, chimeric, decoy receptor

VEGFR1 + VEGFR2 fused to fc portion of human IgG1

↓

binds VEGA, B, PlGF

2011

100%

VIEW 1 2mg/4wk 0.5mg/4 2mg/8 0.5mg/4

VIEW 2

3 monthly loading & then ↑

good

every 2mt

CLEAR-IT 2. PRN dosing

Brolucizumab

26KDa humanized, single chain Ab fragment

↓

VEGF A Inhibitor

HAWK
HARRIER
} ≤ Eylea

└ 6mg B ≈ 2mg Eylea ⇒ =

↓ every 12wk ↓ 8wk

» ↓ central subfield thickness

Conbercept (China)

fusion protein combines ligand binding elements taken from

VEGFR 1 — VEFR2

2013

↓ 2nd EC domain

↓ 3&4 binding domain

+ Fc portion of IgG1

» affinity due to EC domain
↑ ½ life
+ affinity for PlGf (Placental)

AURORA Study
Phoenix Trial

Other Anti VEGF

RTH 258

targets all forms of VEGF-A

26 KDa

Benefits of small Molecule

↑ retinal penetration

↑ conc of drug at target tissue

↓ systemic exposure

OSPREY trials

DARPins

Abicipar Pegol 14-21 KDa single domain proteins

1/10 size of IgG Ab

thermal stability

½ life > 60 days

↓ immunogenicity as no Fc portion

→ potent antagonist of all VEGF A isoforms

Rx protocol

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PRN
(As needed Rx)

Retreat if → ↓VA 5 letters
↑ CSMT = 100μ
New thing

Visits = Mthly protocol
↓
bt 3-4 ↓ injection /yr

a) Pronto — OCT based
b) SUSTAIN
] 9 inj / 2yrs

MARINA
Anchor
24 inj / 2yrs

1 year BCVA same

c) CATT — Avastin vs Lucentis

d) IVAN " " in UK

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Treat & Extend (TREND)

till there is no macular fluid

LUCAS study

TREND study

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Tachyphylaxis

SEVEN Up study – 7yrs outcome in Anchor, Nauna & horizon studies

Sustained Delivery Systems

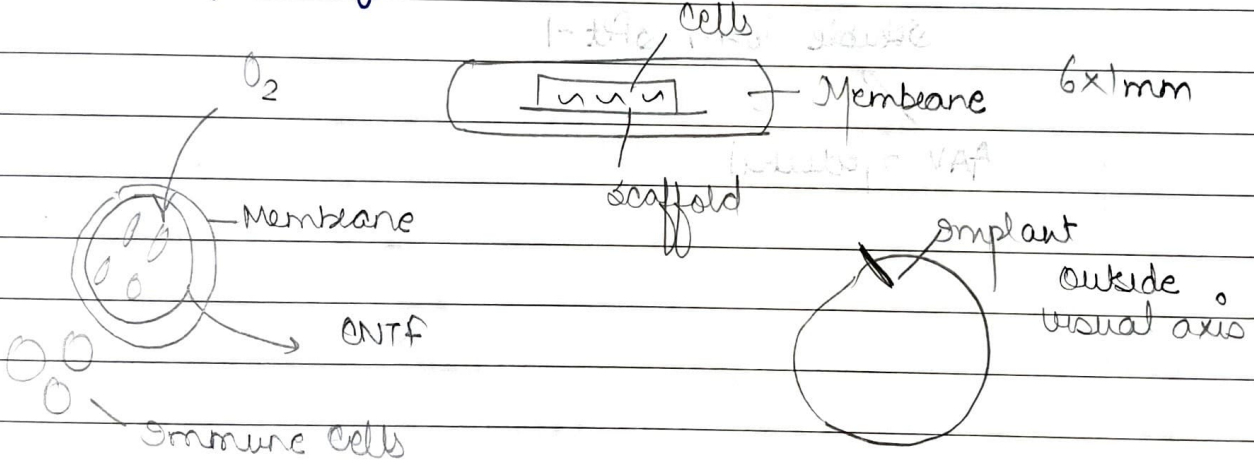
↓ ½ life ∴ repeated dosing.
Risk of reactivation, breakthrough bleeding ↑

- Encapsulated Cell Tech.
- Port Delivery System.

Encapsulated Cell Tech → Neurotech NT 503
Encapsulated RPE cell line
↓
secrete VEGF R

NT506 < Anti PDGF, Anti VEGF

NT501 → CNTF



Port Delivery System → Forsight VISION4 has developed 2010
- 250µg – Bolus
- 500µg / 250µg – slow.

LADDER study		10mg/ml	40	100
	Refill	8.7mth	13	15

Replenish Micropump → refilled via 31g needle

AAV gene transduction →

VEGFR1 2

↓

flt-1 fek-1/KDR

↓

Soluble form sflt-1

↑

AAV mediated

Combinations

Pegpleranib → Fovista (PDGF inhibition)

Squalamine targets VEGF, PDGF & bFGF thru calmodulin binding

~~X-82~~ dual kinase inhibitor
- VEGF
- PDGF

Zimura Anti C5 aptamer
+ Lucentis inj